UNIVERSIDAD DE CÓRDOBA

# THE USE OF MULTISENSORY TEACHING METHODS IN STUDENTS WITH DYSLEXIA: POSITION AND VIEWPOINTS OF KINDERGARTEN AND PRIMARY SCHOOL TEACHER IN HERAKLION PREFECTURE

# EL USO DE MÉTODOS DE ENSEÑANZA MULTISENSORIALES EN ESTUDIANTES CON DISLEXIA: POSICIONES Y PUNTOS DE VISTA DE MAESTROS DE JARDÍN DE INFANCIA Y ESCUELA PRIMARIA EN LA PREFECTURA DE HERAKLION

LAMPRINI ANNA GAITANIDI

DIRECTORS:

Dra. Esther M. Vega Gea

Dra. Carmen Corujo Vélez

PROGRAMA DE DOCTORADO DE CIENCIAS SOCIALES Y JURÍDICAS
Febrero, 2024

TITULO: *The use of multisensory teaching methods in students with dyslexia: position and viewpoints of kindergarten and primary school teacher in Heraklion prefecture*

AUTOR: *Lamprini Anna Gaitanidi*


Campus de Rabanales
Ctra. Nacional IV, Km. 396 A
14071 Córdoba

https://www.uco.es/ucopress/index.php/es/
ucopress@uco.es

UNIVERSIDAD D CÓRDOBA

**FACULTY OF EDUCATIONAL SCIENCES AND PSYCHOLOGY**

Programa de Doctorado en Ciencias Sociales y Jurídicas

# The use of multisensory teaching methods in students with dyslexia: positions and viewpoints of kindergarten and primary school teachers in Heraklion prefecture

# El uso de de métodos de enseñanza multisensoriales en estudiantes con dislexia: posiciones y puntos devista de maestros de jardín de infancia y escuela primaria en la prefectura de Heraklion

**DOCTORAL THESIS**

Lamprini-Anna Gaitanidi

DIRECTORS:

Dra. Esther Mª Vega Gea

Dra. Carmen Corujo Vélez

# INFORME RAZONADO DE LAS/LOS DIRECTORAS/ES DE LA TESIS

Este documento se presentará junto con el depósito de la tesis en https://moodle.uco.es/ctp3/

## DOCTORANDA/O

Lamprini Anna, Gaitanidi

## TÍTULO DE LA TESIS:

El uso de métodos de enseñanza multisensoriales en estudiantes con dislexia: posiciones y puntos devista de maestros de jardín de infancia y escuela primaria en la prefectura de Heraklion

## INFORME RAZONADO DE LAS/LOS DIRECTORAS/ES DE LA TESIS
## (se hará mención a la evolución y desarrollo de la tesis, así como a trabajos y publicaciones derivados de la misma)

El trabajo realizado por la doctoranda a juicio de las directorasde la misma, reúne todos los requisitos para ser presentada y sometida a valoración.

La ejecución de la misma se ha efectuado en menos de cinco años, necesitando solicitar una prórroga, debida fundamentalmente a dos factores, por un lado las consecuencias derivadas de la pandemia sanitaria internacional (COVID-19), y por otro, la finalización de la elaboración del documento final de la Tesis. No obstante, al tratarse de una tesis basada en educación, más concretamente en las dificultades de aprendizaje, el espacio temporal utilizado no resta validez ni transferencia los resultados obtenidos.

En cuanto al desarrollo del trabajo, resaltar que la principal dificultad que se encontró la doctoranda fue el acceso a la muestra de estudio, lo que conllevó a realizar algunos cambios en el desarrollo metodológico de la tesis, de ahí que se haya tenido que solicitar un cambio en el título de la Tesis.

La fundamentación teórica, aunque inicialmente expone el entorno de conceptualización de las dificultades de aprendizaje y, más concretamente de la dislexia, manifiesta un especial interés en la figura de los y las maestras, en relación a la educación multisensorial y su implementación en el aula tanto para estudiantes con o sin dislexia.

En el apartado referente a la metodología y el proceso de diseño, ésta ha tenido presente en todo momento las normas y preceptos que rigen cualquier tipo de investigación en el campo de las ciencias sociales, y más concretamente en el campo de la educación. Por tanto, en esta parte de la tesis se han recogido las evidencias científicas propias de un estudio de esta tipología, siguiendo los pasos necesarios para dotar a la misma del rigor científico necesario que conlleva una investigación de corte cuantitativo.

El instrumento principal para la recolección de datos de la investigación fue el cuestionario, ya que es una de las herramientas más empleadas en el campo de las ciencias sociales. La selección de preguntas se hizo ad-hoc para facilitar los objetivos de la investigación.

Los hallazgos de esta investigación arrojan luz sobre la conciencia de los docentes sobre la enseñanza multisensorial, su aplicación y quién es el más adecuado para implementarla.

Durante la realización de la tesis la doctoranda y sus directoras han publicado un artículo científico en una revista de impacto, cuya referencia es la siguiente: Gaitanidi, L.A., Corujo-Vélez, C., & Vega-Gea, E. (2023). The Impact of Dyslexia Box: A Case Study on Students in an Integration Class in Greece. Education Sciences, 13, 486. https://doi.org/10.3390/ educsci13050486.

Por todo ello, se autoriza la presentación de la tesis doctoral.

**Córdoba, a 21 de febrero de 2024**

**Las/los directoras/es**

VEGA GEA ESTHER MARIA - 44372778M
Firmado digitalmente por VEGA GEA ESTHER MARIA - 44372778M
Fecha: 2024.03.12 23:03:43 +01'00'

CORUJO VELEZ MARIA DEL CARMEN - 28741932M
Firmado digitalmente por CORUJO VELEZ MARIA DEL CARMEN - 28741932M
Nombre de reconocimiento (DN): c=ES, serialNumber=IDCES-28741932M, givenName=MARIA DEL CARMEN, sn=CORUJO VELEZ, cn=CORUJO VELEZ MARIA DEL CARMEN - 28741932M
Fecha: 2024.03.13 08:29:51 +01'00'

Fdo.:Esther Vega Gea y Carmen Corujo Vélez

## RESUMEN EXTENDIDO

### Introducción

El lenguaje es una de las herramientas más importantes que las personas han utilizado para su supervivencia y evolución. Desde la antigüedad hasta la actualidad, ha desempeñado un papel crucial en la transmisión del conocimiento, la comunicación y el desarrollo de la sociedad humana.

El avance de sociedades complejas exigió al hombre gestionar una gran cantidad de información, la cual no podía retener en su memoria. Surgió entonces como una necesidad natural la comunicación de una manera que pudiera preservar esta información, algo que no era posible a través del discurso oral. Así, el hombre inventó la escritura, abriendo nuevos horizontes en el desarrollo del conocimiento y la ciencia. La escritura permitió almacenar, transmitir y procesar una gran cantidad de información, superando los límites de la memoria humana finita y permitiendo la transferencia de información independientemente del tiempo y el espacio (Porpodas, 2002; Harari, 2015). Además, la aparición de la escritura destacó nuevas formas de organización social y del conocimiento, al posibilitar la difusión de información a un gran número de personas durante períodos prolongados (Harari, 2015).

Además, el habla oral incluye algunos elementos no lingüísticos, como movimientos corporales y gestos, que añaden significado adicional y expresión emocional a la comunicación. El uso de tales elementos no lingüísticos puede incluso cambiar por completo el significado de una oración. Esto se puede entender considerando el siguiente diálogo común entre las personas A y B: A: '¿Cómo estás?' B: 'Estoy bien'. La manera en que se emite la respuesta, junto con todos los elementos de comunicación no lingüística, puede alterar por completo su significado. Por ejemplo, aunque la persona B diga que está bien, ¿qué pensaríamos si lo dijera con los ojos llorosos? ¿O si evitara el contacto visual? ¿O si su rostro estuviera enrojecido? En el lenguaje hablado, los estímulos enviados por el emisor y la forma en que el receptor los interpreta crean una variedad de significados diferentes.

Por otro lado, el lenguaje escrito se refiere a la comunicación a través de la escritura y la lectura, utilizando medios como textos, artículos, correos electrónicos, mensajes en redes sociales y otros. Se basa en el uso de letras, símbolos y reglas sintácticas para expresar ideas y pensamientos. El lenguaje escrito permite al emisor organizar sus

pensamientos y seleccionar las palabras adecuadas para expresarlos. Al mismo tiempo, permite al receptor leer y comprender el contenido a su propio ritmo y tiempo. Además, la palabra escrita es importante porque permite preservar la información en el tiempo y registrar pensamientos y opiniones específicos. También es un método eficaz de comunicación para transmitir información a lugares distantes e intercambiar ideas entre personas que no se encuentran en el mismo lugar.

Surge entonces la pregunta: ¿cómo podría transferirse la transmisión de mensajes complejos de la palabra hablada, que a menudo se realiza incluso de forma espontánea o no intencionada, sin perder parte del significado esencial para la comunicación? En la escritura, el uso correcto de la gramática, la sintaxis, la ortografía y la puntuación es vital para comprender y transmitir mensajes de manera eficaz. Los signos de puntuación sirven para separar los elementos de una oración, distinguir cláusulas continuas, cláusulas dependientes y cláusulas entre paréntesis, así como para marcar énfasis, acentuación y pausas en una oración (Mccaskill, 2001). Al mismo tiempo, clarifican el significado (Jackson, 2005; Barón, 2001; McCaskill, 2001).

La cuestión de la necesaria existencia de los signos de puntuación ha persistido desde la antigüedad hasta nuestros días, manifestándose en una frase proverbial asociada a la ambigüedad. Esta frase en particular proviene de la profecía de Pythia en el oráculo de Delfos y constituye un engaño inteligente

"*Ἥξεις ἀφήξεις οὐκ ἐν πολέμῳ θνήξεις"*

La profecía era oral y podía ser interpretada subjetivamente por el receptor. Si esta frase se trasladara a la palabra escrita, seguramente tendría comas, pero esto en este caso particular cambiaría completamente el significado

"Ἥξεις, ἀφήξεις, οὐκ ἐν πολέμῳ θνήξεις." La frase sin comas podría traducirse como "irás, volverás, no morirás en la guerra" mientras que con comas como "irás, no volverás, en la guerra morirás". Así, independientemente del resultado del destino de la persona, el oráculo se atribuyó el mérito.

Toda la complejidad de la palabra hablada transmitida a través del código escrito a menudo dificulta las cosas a los estudiantes. La lectura y la escritura, como capacidades mentales superiores, requieren funciones abstractas y coordinación de mecanismos cognitivos complejos (Porpodas, 2002). El acto de leer provoca la activación de las

correspondientes representaciones mentales de las palabras escritas, incluida información como la semántica, la ortografía, la fonología y la morfología (Akamatsu, 1999). Específicamente, las mismas representaciones lingüísticas mentales también están involucradas durante el proceso de ortografía, por lo que para escribir con precisión una palabra, uno debe tener acceso a estos diversos tipos de información (Russak & Kahn-Horwitz, 2015). Como resultado, la capacidad de ortografía correcta puede funcionar como un vistazo a las representaciones lingüísticas cognitivas que sustituyen el acto de leer. Además, considerando la superposición dentro de estas representaciones subyacentes (Holmes & Carruthers, 1998), la lectura y la ortografía están estrechamente vinculadas, por lo que las mejoras en un proceso pueden resultar en avances en el otro (Degani et al., 2023).

Las ideas centrales sobre los desafíos en la adquisición de habilidades lectoras se centran principalmente en el desarrollo del reconocimiento de los sonidos de las palabras. Como se describe en el modelo de doble vía para la lectura (Coltheart, 2005), la capacidad de transformar símbolos escritos en sus correspondientes sonidos del habla juega un papel vital en el proceso de lectura. Este mecanismo favorece especialmente la ruta fonológica o subléxica, que es una de las dos rutas de lectura definidas por el modelo. Cuando esta ruta se activa durante la lectura, tras un examen visual inicial de una palabra, se hace necesaria una conversión de las letras (grafemas) a sus sonidos asociados (fonemas) para crear la representación auditiva de esa palabra (González et al., 2023).

Durante el proceso de lectura y escritura se activa una función cognitiva compleja que implica la integración de habilidades visuales, auditivas y táctiles-cinestésicas (Minogue & Jones, 2006). Cuando un individuo no logra adquirir habilidades lectoras, esto afecta negativamente su actitud hacia cualquier actividad que implique lectura (Stanovich, 1986). Como resultado, existe un vocabulario limitado en comparación con el grupo de pares y una capacidad restringida para emplear estrategias metacognitivas para comprender textos escritos (Brown et al., 1986). En la misma línea, la comprensión lectora, además de los procesos cognitivos y metacognitivos, también está ligada a la motivación del lector, es decir, al impulso interno del individuo que proviene de un conjunto de objetivos, creencias y actitudes del individuo hacia la lectura (Toste et al., 2020)

Las dificultades en el proceso de aprendizaje pueden deberse al hecho de que los enfoques educativos a menudo no consideran adecuadamente las percepciones sensoriales. Específicamente, teniendo en cuenta que la mayor parte de la información se transmite a través de medios visuales como libros de texto y presentaciones (Volpe & Gori, 2019), es razonable suponer que la visión tiene un papel predominante dentro del aula. Sin embargo, los individuos poseen sistemas multisensoriales para percibir e interactuar con su entorno (Cuturi et al., 2021). Los estudios sobre percepción multisensorial han demostrado cómo la integración de diversas modalidades sensoriales mejora el procesamiento de los atributos de los objetos, como su altura (Ernst & Banks, 2002) o su forma (Helbig & Ernst, 2007). Este mecanismo se reconoce como integración sensorial y tiene lugar cuando el cerebro armoniza diferentes metodologías sensoriales (Ernst & Bülthoff, 2004).

Si las dificultades de lectura no se abordan en los primeros años escolares, entonces en los grados superiores, donde los textos son más largos, el estudiante no leerá para comprender el significado, sino como práctica en el proceso mismo de lectura (Stanovich, 1986). Se entiende fácilmente a través de las siguientes condiciones hipotéticas, imaginemos: A. escuchar un texto silábicamente, con pausas y muchos errores de lectura y B. escuchar un texto del mismo nivel de dificultad que el primero a un ritmo de lectura normal. ¿Cuándo sería mejor la comprensión del contenido del texto? Es seguro que en el segundo caso la comprensión auditiva sería mucho mejor. Lo mismo podría decirse de la comprensión lectora. Los estudiantes que tienen dificultades en la lectura y especialmente aquellos que han recibido un diagnóstico de una discapacidad de aprendizaje específica, sin lugar a dudas, deben tener una intervención docente temprana en lectura y escritura que satisfaga sus necesidades, ya que es la única manera de abordar sus dificultades de aprendizaje (Caravolas, et al., 2005; Harlen, 2007). Otra razón de la necesidad de seguir un programa de enseñanza especializado para estudiantes que no han desarrollado habilidades lectoras tempranas es el hecho de que tienen mayor riesgo de abandonar la escuela (Reschly, 2010) y desarrollar trastornos emocionales en el futuro (Devaney et al., 2018)

Kelly y Phillips (2016) definen el término “multisensorial” como la presentación de información a través de formas visuales, auditivas, cinestésicas y táctiles, con orientación destinada a proporcionar tantas de estas experiencias como sea posible. En consecuencia, el aprendizaje multisensorial depende en gran medida de todos los

sentidos utilizados como método fundamental de retención de información, en contraste con las prácticas más comunes de enseñanza utilizando únicamente la vista y el oído (Boardman, 2020). La investigación realizada por Goswami (2015) y Roulstone et al. (2012) ha revelado que cuando se trata de niños que experimentan dificultades para adquirir habilidades de lectura, el método de enseñanza que incorpora múltiples sentidos, conocido como enfoque multisensorial, tiende a producir los resultados más exitosos en términos de efectividad de la instrucción.

En la misma línea, existen numerosos estudios internacionales que confirman los beneficios de la enseñanza multisensorial para estudiantes con y sin dificultades específicas de aprendizaje (Gaitanidi, et al., 2023; Sadoski et al., 2013), algunos de ellos centrados en las habilidades de decodificación y otros sobre el dominio de la ortografía. Los enfoques de enseñanza que emplean métodos sensoriales se basan en descubrimientos científicos que revelan que durante todo el proceso de aprendizaje, el cerebro absorbe información y mensajes utilizando toda la gama de órganos sensoriales disponibles (Mpastea, 2014). Esto resulta especialmente significativo cuando una vía sensorial particular puede no estar tan desarrollada como otras. En tales casos, resulta imperativo compensar esta deficiencia aprovechando vías sensoriales alternativas (Orton, 1937; Gillingham et al., 1956;).

El objetivo de este estudio fue investigar las perspectivas de los maestros de educación general y especial y de los maestros de jardín de infantes en la prefectura de Heraklion con respecto a la educación multisensorial y su implementación en el aula para estudiantes con dislexia y/o aquellos en educación general.

Más específicamente, según la literatura internacional, la enseñanza basada en el enfoque multisensorial ha demostrado resultados positivos para los estudiantes con dislexia. Esto se debe a que utiliza simultáneamente más vías sensoriales, como la visión, la audición y la cinestésica, conectando diferentes áreas del cerebro con el objeto que se enseña. De esta forma se abordan posibles problemas derivados del procesamiento de información a través de un solo sentido, como el oído o la visión. Esta forma de enseñar permite la participación simultánea de múltiples sentidos, como el tacto, el movimiento, el oído y la vista, en el proceso de aprendizaje. A través de este enfoque, los niños desarrollan diferentes formas de recuerdos, como táctiles, visuales, auditivos o cinestésicos, lo que permite a cada niño aprovechar su potencial para un

aprendizaje eficaz (Loizou, 2016). Sin embargo, vale la pena señalar que, en la práctica, el modo de instrucción predominante en las escuelas todavía se basa principalmente en métodos visuales o auditivos (Syahputri, 2019).

La presente tesis doctoral se estructura en dos partes principales: 1) la parte teórica, que comprende una revisión de la literatura relevante y consta de siete capítulos, y 2) la parte de investigación, que incluye la metodología de la investigación, los resultados y las conclusiones.

A continuación, se presentan brevemente todos los capítulos con su temática.

La parte teórica consta de los siguientes capítulos:

**1) Dificultades de aprendizaje y trastornos específicos del aprendizaje.**

En este Capítulo, primero aclaramos los términos tal como se utilizan en este trabajo. Luego discutimos la prevalencia, indicaciones y desarrollo de los Trastornos Específicos del Aprendizaje (SLD), junto con los criterios de diagnóstico correspondientes según el DSM-5 y la CIE-10. Además, nos esforzamos por definir el término "dislexia" y mencionar sus subtipos, así como discutir las teorías dominantes al respecto y cómo podría diagnosticarse en todo el mundo y en Grecia.

**2) Marco legal y leyes sobre educación especial en Grecia.**

En el Capítulo dos, delineamos quiénes califican como estudiantes con discapacidades y necesidades educativas especiales según la legislación griega. También discutimos los tipos de escuelas que brindan apoyo a estudiantes con necesidades educativas especiales, junto con los mecanismos para financiar las necesidades operativas de las escuelas en Grecia.

**3) Los sentidos humanos y su importancia en el aprendizaje.**

En el Capítulo 3 profundizamos en los sentidos humanos y su importancia en el proceso de aprendizaje. Específicamente, exploramos la percepción sensorial, la interacción entre los sentidos y el cerebro, y la relación entre las experiencias sensoriales y el aprendizaje.

**4) Memoria y aprendizaje.**

En el Capítulo 4, examinamos la interfaz entre la memoria y el aprendizaje. Comenzamos dilucidando el concepto de memoria, discutiendo su integración con el

aprendizaje. Además, exploramos aspectos como la memoria a corto y largo plazo, las estrategias mnemotécnicas y la correlación entre memoria y lectura.

**5) Enfoque multisensorial.**

En el Capítulo 5, nos centramos en el enfoque multisensorial. Después de una aclaración de los términos relevantes, exploramos la contribución significativa del enfoque multisensorial a la educación, particularmente su impacto en los estudiantes con dificultades de aprendizaje. Por último, discutimos el diseño y los beneficios de los entornos de aprendizaje multisensorial.

**6) Intervenciones-estrategias en dislexia.**

En el Capítulo 6, exploramos intervenciones y estrategias para la dislexia. Esto incluye una descripción histórica del método de enseñanza multisensorial pionero de Orton-Gillingham, un examen de varios programas basados en este enfoque y una discusión de intervenciones que aplican principios similares sin estar explícitamente basados en Orton-Gillingham. Además, destacamos otras prácticas de enseñanza efectivas diseñadas para estudiantes con dislexia.

**7) Educación inclusiva.**

En el Capítulo 7 profundizamos en la educación inclusiva. Comenzamos aclarando los términos relevantes e identificando los factores inhibidores de la inclusión. Posteriormente, exploramos métodos para implementar la educación inclusiva y discutimos el papel fundamental del docente dentro de estos métodos. Finalmente, examinamos varios modelos inclusivos, dilucidamos sus beneficios de aprendizaje y discutimos sus implicaciones.

La parte de investigación consta de los siguientes capítulos:

**8) Metodología de la investigación.**

En el Capítulo 8 presentamos la metodología de investigación. Esto incluye delinear el propósito y los objetivos de la investigación, dilucidar los medios de recolección de datos, describir la muestra de la investigación, discutir el método de análisis estadístico empleado y abordar la validez y confiabilidad de la investigación.

**9) Resultados de la investigación.**

En este Capítulo, proporcionamos una descripción detallada de las estadísticas descriptivas obtenidas de la investigación, junto con un análisis integral de cómo estas

estadísticas descriptivas se cruzan con otras variables. Esto incluye explorar varias medidas estadísticas descriptivas y sus implicaciones cuando se analizan junto con otras variables pertinentes.

**10) Conclusiones.**

En el Capítulo 10, presentamos las conclusiones extraídas de la investigación, enfatizando su innovación y contribuciones originales al campo. Además, abordamos las limitaciones encontradas durante el proceso de investigación. Además, discutimos la ética de la investigación observada a lo largo del estudio, destacando las consideraciones éticas y los protocolos seguidos.

Al final del documento encontrará el apéndice que incluye el cuestionario utilizado en el estudio. Este apéndice proporciona una descripción detallada del instrumento de encuesta utilizado para recopilar datos para la investigación.

A continuación, se presenta una breve referencia a los capítulos de investigación de la tesis con énfasis en los Finalidad y objetivos de la investigación - Medios de recogida de datos, la muestra de investigación, método de análisis estadístico de los datos, confiabilidad-validez de la investigación, resultados de la investigación, conclusiones

**Finalidad y objetivos de la investigación - Medios de recogida de datos**

La investigación fue diseñada para explorar dos aspectos principales. En primer lugar, evaluar el conocimiento de los profesores sobre la enseñanza multisensorial y, en segundo lugar, examinar sus actitudes y percepciones sobre su eficacia en las escuelas griegas, particularmente en el contexto de la prefectura de Heraklion. Al mismo tiempo, el estudio tuvo como objetivo identificar posibles obstáculos y debilidades en la implementación de prácticas multisensoriales en las escuelas primarias de la prefectura de Heraklion. Además, la investigación profundizó en las actitudes y percepciones de los docentes respecto a la inclusión de estudiantes con dislexia. Comprender las creencias de los docentes es crucial para comprender sus intenciones y acciones en el aula. Un paso esencial para lograr el cambio es identificar las creencias profundamente arraigadas de los docentes sobre el papel de la tecnología en la enseñanza y el aprendizaje (Bice & Tang, 2022).

Esta investigación emplea un enfoque cuantitativo para explorar conexiones y relaciones entre varios factores. La investigación cuantitativa implica el examen

sistemático de fenómenos mediante métodos estadísticos y análisis de datos numéricos. En la investigación cuantitativa, uno de los instrumentos estructurados comúnmente empleados para la recolección de datos es el cuestionario (Zafeiropoulos, 2015).

Más específicamente, el objetivo de esta investigación es evaluar las perspectivas de los profesores de educación generaleducación general y especial y de los profesores de jardín de infantes en la prefectura de Heraklion en Grecia, con respecto a la educación multisensorial y su implementación en las aulas de estudiantes disléxicos y de educación estándar.

Los principales objetivos de la investigación, el número de pregunta del cuestionario y el tipo de pregunta se presentan en la siguiente tabla.

| Objetivos | Número de pregunta del cuestionario | Tipo de pregunta |
|---|---|---|
| 1. Describir el conocimiento de los docentes sobre métodos/programas de enseñanza multisensorial, así como identificar la frecuencia de uso según la materia. | 1 | pregunta de opción múltiple (se permitieron múltiples respuestas) |
| | 4, 5, 9, 10, 11, 12, 14, 15, 17, 21, 22, 23, 28, 29, 43 | pregunta de escala de cinco puntos (se permitía una respuesta) |
| | 24 | pregunta de opción múltiple (se permitía una respuesta) |
| | 26, 27 | matrix multiple-choice question with a four-point scale (one answer per row was allowed) |
| 2. Identificar las barreras al uso de prácticas multisensoriales y los factores que influyen en la elección de un método/programa multisensorial, en la elección de un método/programa multisensorial específico o no. | 6, 13, 14, 15, 17, 20, 21, 22, 23, 24 | pregunta de escala de cinco puntos (se permitía una respuesta) |
| | 25, 31 | matrix multiple-choice question with a four-point scale (one answer per row was allowed) |
| 3. Identificar la efectividad del uso de métodos/programas de enseñanza multisensorial para estudiantes con dislexia y estudiantes no | 2, 3, 7, 8, 17, 18, 19, 20, 30, 34, 35, 36, 37, 38 | pregunta de escala de cinco puntos (se permitía una respuesta) |

| | | |
|---|---|---|
| disléxicos, dependiendo del tipo de escuela (guardería, escuela primaria), la especialización en educación especial, el número de estudiantes y estudiantes con dislexia. | 16 | pregunta de opción múltiple (se permitía una respuesta) |
| 4. Identificar el interés del profesorado por recibir formación y sus creencias sobre la necesidad de una formación específica para implementar métodos/programas de enseñanza multisensorial. | 17, 33, 40, 41, 42 | pregunta de escala de cinco puntos (se permitía una respuesta) |
| 5. Identificar los puntos de vista de los educadores sobre la inclusión de estudiantes con dislexia a través de métodos/programas de enseñanza multisensoriales. | 6, 36, 37, 38, 39 | pregunta de escala de cinco puntos (se permitía una respuesta) |

Con base en estos objetivos, en este estudio se indagan las siguientes preguntas de investigación, según las opiniones de docentes y maestras de jardín de infantes -tanto de educación general como especial- de la prefectura de Heraklion:

- ¿Con qué frecuencia se utiliza un método/programa de enseñanza multisensorial?
- ¿Qué método/programa multisensorial se elige con mayor frecuencia?
- ¿Qué factores contribuyen a la selección de un método/programa de enseñanza multisensorial?
- Cuando un docente elige enseñar multisensorial, ¿elige un método particular o no?
- ¿Cuáles son las barreras al uso de la enseñanza multisensorial?
- Cuando un docente elige enseñar multisensorial, ¿elige un método particular o no?
- ¿Difieren los puntos de vista de los docentes sobre la efectividad y frecuencia del uso de la enseñanza multisensorial en estudiantes con dislexia según la materia?
- ¿Difieren los puntos de vista de los profesores sobre la eficacia del uso de la enseñanza multisensorial en estudiantes con dislexia?

- ¿Los puntos de vista de los docentes sobre la efectividad del uso de la enseñanza multisensorial difieren según el tipo de escuela (jardín de infantes, primaria) y la especialidad del educador?
- ¿Difieren los puntos de vista de los profesores sobre la eficacia, frecuencia y facilidad de uso de la enseñanza multisensorial según el número de estudiantes enseñados por hora?
- ¿Difieren los puntos de vista de los profesores sobre su deseo de recibir formación en métodos de enseñanza multisensoriales?
- ¿El costo afecta la disposición de los docentes a recibir capacitación en métodos de enseñanza multisensoriales?
- ¿Creen los profesores que la enseñanza multisensorial contribuye a la igualdad de oportunidades educativas para los estudiantes con dislexia?
- ¿Difieren los puntos de vista de los docentes sobre la eficacia, la facilidad de uso, la frecuencia de la enseñanza y la formación multisensorial necesaria según estén especializados en educación especial?
- ¿Tienen los docentes una comprensión clara de qué es la enseñanza multisensorial, cómo implementarla efectivamente y quién es el docente apropiado para implementarla?

El cuestionario sirvió como herramienta principal para recopilar datos de investigación, y representa un método fundamental ampliamente empleado en la investigación en ciencias sociales (Pappas, 2002). Los criterios de selección para el cuestionario también incluyeron su idoneidad para ser administrado a una muestra amplia de sujetos, ofreciendo diversidad en términos de factores como género, edad, años de servicio previo y más. La selección de preguntas ha sido diseñada ad-hoc para lograr los objetivos de esta investigación. El cuestionario se divide en dos secciones. La primera sección cubre características individuales y demográficas, incluida la edad, el género, la educación y más.

La segunda sección consta de 43 preguntas cerradas específicas que sondean las opiniones de los profesores relacionadas con el tema del estudio. La formulación de estas preguntas tomó en consideración la literatura relevante, alineándose con los objetivos e investigaciones de la investigación, como se detalla en el subcapítulo siguiente. Todas las preguntas del cuestionario eran obligatorias.

Respecto al tipo de preguntas utilizadas en el cuestionario:

- Las preguntas relacionadas con datos individuales y demográficos están diseñadas como preguntas cerradas, que ofrecen opciones dicotómicas u opciones de opción múltiple con respuestas únicas y múltiples.

- Las preguntas especiales son exclusivamente de carácter cerrado. Estas incluyen preguntas dicotómicas, preguntas de opción múltiple con respuestas de opción única y una pregunta de opción múltiple que permite la selección de múltiples opciones/respuestas.

Previo a la distribución oficial del cuestionario, se realizó una prueba piloto con una muestra de 20 docentes para evaluar diversos aspectos, entre ellos la claridad de las preguntas, su exhaustividad en términos de abordar posibles respuestas, el atractivo general, la extensión y el tiempo. requerido para su finalización (Cohen et al., 2008). Tras las revisiones y ajustes necesarios, se formuló y administró la versión final del cuestionario; por ejemplo, en algunas preguntas el término profesor fue sustituido por el término educador, que es más general en Grecia.

La distribución de los cuestionarios se produjo durante el año escolar 2022-2023, desde enero de 2022 hasta junio de 2023. Se eligió este período de tiempo porque permitió a los maestros obtener una comprensión más integral de las necesidades de sus estudiantes y desarrollar métodos y programas de enseñanza en consecuencia. Las preguntas se adaptaron a este año escolar específico y a la escuela particular donde trabajaban los maestros. Este enfoque fue necesario para establecer un marco enfocado para el estudio y la observación.

Los cuestionarios se distribuyeron entre profesores de educación primaria de la prefectura de Heraklion, incluidos profesores de educación general y especial, así como de jardín de infancia. Las preguntas fueron diseñadas para captar las opiniones formadas de los profesores.

Para garantizar una muestra representativa y mitigar el sesgo, los cuestionarios se distribuyeron en línea a todas las escuelas primarias y de jardín de infantes de la prefectura de Heraklion. Heraklion es una prefectura grande y diversa en Grecia, caracterizada por una heterogeneidad tanto geográfica como cultural. El objetivo era obtener opiniones de profesores que cubrían un amplio espectro de la prefectura de Heraklion.

Es importante señalar que las respuestas al cuestionario se recopilaron de forma anónima por razones éticas, hecho que se enfatizó para informar a los docentes participantes. El método de distribución en línea garantizó que incluso los profesores de escuelas remotas tuvieran la oportunidad de responder, proporcionándoles una

mayor sensación de anonimato en comparación con los cuestionarios tradicionales en papel.

Las preguntas del cuestionario fueron diseñadas y formuladas de manera que se pudieran obtener resultados respecto a las preguntas de investigación.

Al inicio del cuestionario, los participantes recibieron información sobre los objetivos de la investigación, junto con una declaración de confidencialidad y anonimato por parte del investigador. Las preguntas del cuestionario fueron diseñadas estratégicamente para abordar las preguntas de investigación planteadas. En algunos casos, ciertas preguntas se diseñaron para proporcionar información sobre múltiples preguntas de investigación.

**La muestra de investigación.**

La investigación se centró en la prefectura de Heraklion, ya que se ubica como la cuarta prefectura más poblada de Grecia, con 302.405 habitantes según el censo de población de 2021. Estos datos demográficos subrayan la presencia de una importante población estudiantil, numerosas instituciones educativas y, en consecuencia, un número sustancial de docentes. Además, la variada geomorfología de Creta, particularmente dentro de Heraklion, que presenta tanto terreno montañoso como llanuras fértiles, ha alentado a los residentes a dedicarse a actividades agrícolas. Como resultado, los docentes empleados en la prefectura de Heraklion provienen de diversos orígenes geográficos de toda Grecia, en lugar de ser predominantemente locales.

Un total de 285 docentes participaron en la cumplimentación del cuestionario, siendo 38 hombres y 247 mujeres. Los docentes encuestados pertenecían exclusivamente a los campos de la educación estándar y especial, ya sea como maestros de escuela primaria o de jardín de infantes.

Para determinar el tamaño de la muestra, dada la imposibilidad de determinar con precisión el número total de docentes de la prefectura dentro del período de investigación, se realizó un cálculo aproximado basado en la organización de cada escuela. El número de docentes en activo puede fluctuar: algunos se toman licencias de larga duración durante el año y son reemplazados cuando el Ministerio realiza nuevas contrataciones. Para lograr una muestra representativa, se estimó que deberían participar más de 270 educadores, entre maestros y maestros de jardín de infantes, lo

que corresponde aproximadamente a aproximadamente el 10% de la población educativa relevante para esta investigación.

**Método de análisis estadístico de los datos.**

El análisis estadístico de los datos es tanto descriptivo como inductivo. Al presentar los resultados de la investigación, proporcionamos una visión general de la distribución de las frecuencias absolutas y relativas de las respuestas de los profesores de la muestra a las diversas preguntas.

Los datos recopilados de la encuesta fueron analizados utilizando el programa de software SPSS 29. Se emplearon análisis descriptivos y medidas de correlación para determinar la naturaleza y la fuerza de las relaciones entre las variables investigadas. El objetivo era determinar si las relaciones observadas eran aplicables únicamente a la muestra de 285 encuestados o si podían generalizarse a la población más amplia (Gnardellis, 2022). Para lograr esto, se utilizó la prueba de Chi-Cuadrado para las matrices de correlación $r$ x $c$.

La prueba de Pearson Chi-Cuadrado es un método deductivo empleado para explorar la relación entre dos variables categóricas dentro de una matriz de correlación. Pone a prueba la hipótesis de que las dos variables son independientes entre sí, lo que indica que no hay influencia mutua. Cuando dos variables se consideran independientes, las frecuencias esperadas para las celdas de la tabla se calculan multiplicando los rangos de frecuencia respectivos de cada celda y luego dividiendo por el número total de observaciones en la tabla.

En este análisis, se probaron sistemáticamente pares de variables entre sí para investigar relaciones potenciales. Los resultados se presentan en dos tablas. La primera es una tabla de correlación que organiza las observaciones de forma biaxial en función de las dos variables que se examinan. La segunda tabla proporciona los resultados de la prueba Chi-Cuadrado y procedimientos relacionados.

La primera fila de la tabla muestra los resultados de la prueba Chi-cuadrado de Pearson, junto con el valor p correspondiente (Asymp. Sig. 2-laterales). Es importante tener en cuenta que SPSS redondea el valor p a tres decimales, por lo que un valor p que en realidad es inferior a 0,0005 se muestra como <0,001.

Hacia el final de las tablas de las pruebas de chi-cuadrado, se presenta el número y porcentaje de celdas con frecuencias esperadas inferiores a 5, así como la frecuencia esperada más baja en la tabla (Gnardellis, 2022).

En este estudio se definió significación estadística cuando a≤0,05. Todas las preguntas se analizaron cuantitativamente, excepto la pregunta 1 (Cuando escucho la frase enseñanza multisensorial pienso…), para la cual se realizó un análisis cualitativo. En esta pregunta, los encuestados podían elegir más de una respuesta para explorar el alcance de sus conocimientos sobre la enseñanza multisensorial.

**Confiabilidad-validez de la investigación**

La confiabilidad de la investigación se refiere a la fidelidad de la medición del tema en estudio. Hay tres tipos básicos de confiabilidad, estabilidad, confiabilidad interna y consistencia entre evaluadores (Cohen et al., 2008).

Para la confiabilidad de la investigación se realizaron las preguntas de la escala de cinco puntos con el fin de comprender si todas las preguntas de este cuestionario miden de manera confiable el alfa de Cronbach. Un valor alfa de Cronbach superior a 0,7 se considera generalmente aceptable para la mayoría de los fines de la investigación, indicador también adoptado en la investigación actual. En este punto cabe señalar que la prueba no se realizó para las preguntas demográficas porque no se consideró necesaria para la pregunta 1 "Cuando escucho la frase enseñanza multisensorial pienso…" ya que la pregunta estaba en formato de cadena. De la evaluación del índice de Cronbach se desprende que para la presente investigación el valor del índice es muy alto, lo que hace que la herramienta sea confiable.

Para las preguntas 2-43 (Aunque eran 42 preguntas, aparece un total de N=84, debido a que algunas preguntas tenían más de una variable al ser en forma de grilla y tener subpreguntas) la prueba alfa de Cronbach es ,840. El coeficiente alfa de Cronbach de 0,840 sugiere un alto nivel de consistencia interna para la escala utilizada en el presente estudio con la muestra específica. Esto indica que los ítems dentro de la escala miden de manera confiable el mismo constructo o concepto subyacente, y las respuestas de los maestros y maestros de jardín de infantes -tanto en educación general como especial- de la prefectura de Heraklion son consistentes en su evaluación de ese constructo.

Se utilizaron los siguientes criterios para examinar la validez de la investigación:

a) Objetividad: la realización de la investigación y el análisis e interpretación de sus datos no deben verse influenciados por la personalidad del investigador.
b) Metodología/Enfoque Sistemático: La investigación se realiza de manera sistemática, siguiendo un plan predeterminado, empleando métodos y técnicas apropiados y con el objetivo de recopilar los datos necesarios para comprender y abordar el tema bajo investigación.
c) Reproducibilidad: toda la información esencial se presenta de forma transparente, lo que permite a otros investigadores replicar el estudio.
d) d) Empirismo: Implica que el tema de investigación es observable y mensurable, y que los términos se definen con claridad y precisión en todos sus aspectos.
e) Accesibilidad Pública: Se otorga acceso al diseño y resultados de la investigación (Vamvoukas, 2010).

En base a los criterios mencionados, se asegura su validez:

- La recopilación, el análisis y la interpretación de los datos de la investigación no dependen de los prejuicios personales del investigador, sino que se basan en la literatura relevante, lo que garantiza la objetividad de la investigación.
- La investigación se llevó a cabo meticulosamente con un plan bien definido y metodologías y técnicas apropiadas seleccionadas después de una revisión exhaustiva de la literatura pertinente, garantizando así la metodología de la investigación.
- Esta investigación proporciona descripciones integrales y transparentes de todos sus aspectos, lo que permite que otro investigador la replique, asegurando la repetibilidad de la investigación.
- El estudio aclara conceptos y marcos teóricos pertinentes sobre la educación multisensorial, subrayando su naturaleza empírica.
- Tanto el diseño de la investigación como sus hallazgos son de libre acceso para cualquier persona interesada, lo que garantiza la transparencia de la investigación y el acceso público.

**Resultados de la investigación**

Como se mencionó anteriormente, en el capítulo 9 se proporciona una descripción detallada de las estadísticas descriptivas obtenidas de la investigación, junto con un análisis integral de cómo estas estadísticas descriptivas se cruzan con otras variables.

Inicialmente, las respuestas de los encuestados a todas las preguntas se presentan en tablas y gráficos. Luego se presentan detalladamente la variable de análisis estadístico descriptivo cruzando otra variable. Cada tabla de tabulación cruzada va acompañada de la correspondiente tabla de prueba de Chi-Cuadrado para garantizar el cumplimiento de los protocolos y la validez de los resultados. Todas las tablas se describieron meticulosamente mediante la presentación y análisis de los datos en forma escrita. Debido al volumen de tablas, no todas las tablas se pueden presentar con todo detalle. Sin embargo, para ilustrar el proceso, se presenta la siguiente tabla como ejemplo. Se tomaron medidas similares para analizar todas las tablas del estudio.

Se realizó una prueba de independencia de chi-cuadrado para examinar la relación entre "Utilizo actividades/métodos de enseñanza multisensoriales en materias relacionadas con el lenguaje" y "Especialización en educación especial" (tabla 9.2.47.). La relación entre estas variables fue significativa, $x^2(4)=14.883$, $p=0.005<0.05$.

De la lectura del contenido de la tabla 9.2.46., se desprende que, en general, los profesores y los maestros de jardín de infantes en la prefectura de Heraklion, tanto en educación especial como típica, utilizan actividades/métodos de enseñanza multisensoriales en materias relacionadas con el lenguaje. Sin embargo, cabe destacar que el número de personas especializadas en educación especial que incorporan la enseñanza multisensorial diariamente es más del doble que aquellos que la integran en su enseñanza diaria pero carecen de experiencia en educación especial. Esta observación puede atribuirse al hecho de que quienes se especializan en educación especial probablemente sean más conscientes de las ventajas de la enseñanza multisensorial y hagan un esfuerzo consciente para implementarla en sus prácticas docentes diarias.

**Tabla 9.2.46.**

*Tabulación cruzada: Utilizo actividades/métodos de enseñanza multisensoriales en materias relacionadas con el lenguaje * Especialización en educación especial*

| | | **Especialización en educación especial** | | |
|---|---|---|---|---|
| **Tabulación cruzada** | | No | Sí | Total |
| **Utilizo actividades/métodos de enseñanza multisensoriales en** | Nunca | 18 | 18 | 36 |
| | Casi nunca | 37 | 21 | 58 |
| | Ocasionalmente | 33 | 38 | 71 |

| | | | | |
|---|---|---|---|---|
| **materias relacionadas con el lenguaje.** | A menudo | 42 | 38 | 80 |
| | A diario | 10 | 30 | 40 |
| **Total** | | 140 | 145 | 285 |

**Tabla 9.2.47.**

*Pruebas Chi-Cuadrado para variables: Utilizo actividades/métodos de enseñanza multisensoriales en materias relacionadas con el lenguaje * Especialización en educación especials*

| **Pruebas de Chi-Cuadrado** | **Valorizar** | **df** | **Significado asintótico (bilateral)** |
|---|---|---|---|
| **Pearson Chi-Cuadrado** | 14.883[a] | 4 | .005 |
| **Índice de probabilidad** | 15.401 | 4 | .004 |
| **Asociación lineal por lineal** | 6.018 | 1 | .014 |
| **N de casos válidos** | 285 | | |

a. 0 celdas (0,0%) tienen un recuento esperado inferior a 5. El recuento mínimo esperado es 17,68.

## Discusión y conclusiones

Respecto al 1er objetivo científico, se encuentran los siguientes hallazgos.

Los hallazgos de esta investigación arrojan luz sobre la conciencia de los docentes sobre la enseñanza multisensorial, su aplicación y quién es el más adecuado para implementarla. En respuesta a la pregunta "Cuando escucho la frase enseñanza multisensorial pienso…", las respuestas de la encuesta se sometieron a un análisis cualitativo descriptivo, lo que arrojó varias conclusiones notables. Parece que una parte importante de los educadores, cuando se enfrentan al término "enseñanza multisensorial", lo asocian inmediatamente con la participación simultánea de múltiples sentidos. Las siguientes asociaciones más comunes incluyeron términos como "atractivo", "rica infraestructura logística" y "ayudas visuales". Esto sugiere que, a los ojos de los docentes, la enseñanza multisensorial está estrechamente vinculada a los métodos de enseñanza interactivos y a la disponibilidad de diversos materiales y apoyo tecnológico. Curiosamente, la frase "estudiantes de educación especial" surgió como una asociación algo distante, lo que indica que es posible que los docentes no conecten fácilmente la educación multisensorial con este grupo particular de estudiantes. Por

último, las respuestas menos frecuentes incluyeron “un método de enseñanza específico” y “un plan de estudios”. La investigación realizada por Alwaqassi (2017) ha demostrado que los profesores tienen diferentes interpretaciones del enfoque multisensorial de la enseñanza y emplean diversos métodos en su aplicación. Sin embargo, según los hallazgos proporcionados, parece que tanto los maestros de educación general como los de educación especial y los maestros de jardín de infantes en la prefectura de Heraklion tienen conocimientos sobre educación multisensorial.

En cuanto a si los profesores y los profesores de jardín de infancia de la prefectura de Heraklion saben cómo enseñar con un enfoque multisensorial, hay opiniones divididas. Sin embargo, es evidente que los individuos con posgrado y especialización en educación especial tienen más probabilidades de estar de acuerdo o totalmente de acuerdo en que poseen los conocimientos necesarios para enseñar a los estudiantes utilizando métodos multisensoriales. De manera similar, aquellos con una maestría tienden a expresar un mayor grado de acuerdo o un fuerte acuerdo cuando se trata de tener confianza profesional en el empleo de la enseñanza multisensorial, en comparación con aquellos que solo tienen una licenciatura.

Además, se han identificado hallazgos estadísticamente significativos sobre si los profesores tienen el conocimiento y la confianza profesional necesarios para implementar la enseñanza multisensorial, y la frecuencia de su uso en cursos relacionados con el lenguaje y las ciencias. En concreto, en materias relacionadas con el lenguaje, quienes creen tener los conocimientos necesarios para enseñar multisensorialmente son más proclives a utilizar con frecuencia métodos de enseñanza multisensorial. Por el contrario, los profesores sin la formación adecuada tienden a utilizar este enfoque rara vez o nunca. En general, la mayoría de los profesores y profesores de jardín de infantes de la prefectura de Heraklion, tanto de educación general como especial, coinciden en que tienen la confianza profesional para enseñar a los estudiantes de forma multisensorial. Esta confianza se refleja en una mayor frecuencia de enseñanza multisensorial en cursos relacionados con el idioma. Además, existe una tendencia creciente a utilizar la enseñanza multisensorial en cursos de idiomas entre quienes afirman tener total confianza profesional.

En el contexto de las materias relacionadas con las ciencias, existe un patrón notable entre los educadores que no están de acuerdo en poseer el conocimiento necesario para

enseñar utilizando métodos multisensoriales. Estas personas tienden a no elegir la enseñanza multisensorial y quienes la eligen rara vez la utilizan. Por el contrario, un número importante de educadores que se sienten bien cualificados en esta área incorporan la enseñanza multisensorial en su enseñanza diaria. En general, los profesores y profesores de jardín de infancia de la prefectura de Heraklion, tanto de educación general como especial, expresan confianza profesional en su capacidad para enseñar utilizando técnicas multisensoriales. En particular, una parte considerable de quienes se sienten seguros de sus habilidades emplean con frecuencia la enseñanza multisensorial en cursos relacionados con las ciencias.

Estos hallazgos indican que, si bien la mayoría de los docentes conocen la educación multisensorial, un porcentaje menor realmente la utiliza en su enseñanza. Esto se ve respaldado aún más por sus respuestas sobre si les gustaría familiarizarse más con los métodos/programas multisensoriales antes de implementarlos con sus estudiantes, y la mayoría expresó una inclinación positiva. Además, los profesores en entornos educativos típicos tienden a tener una respuesta más favorable a esta pregunta, y existe una correlación positiva entre la afirmación "Tengo el conocimiento necesario para enseñar a mis alumnos de forma multisensorial" y el deseo de una mayor familiaridad con los métodos multisensoriales.

Además, se observó que menos educadores que nunca utilizan la enseñanza multisensorial conocen los programas de enseñanza multisensorial disponibles en el idioma griego, en comparación con aquellos que emplean la enseñanza multisensorial a diario. Dado que la enseñanza multisensorial se reconoce comúnmente como una mejor práctica, se espera que capacitar a los docentes en este enfoque conduzca a un mayor uso de métodos multisensoriales en el aula. En consecuencia, los hallazgos de investigaciones anteriores se alinean indirectamente con los resultados del presente estudio.

Es evidente que los profesores y maestros de jardín de infancia de la prefectura de Heraklion, ya sea de educación general o especial, no creen que la enseñanza multisensorial sólo pueda ser implementada eficazmente por educadores especiales. A partir de un examen de la literatura existente sobre el tema más amplio de la implementación de prácticas multisensoriales en el aula, resulta evidente que numerosos estudios se han centrado en profesores de educación especial (p. ej.,

Alwaqassi, 2017; Nijakowska, 2018), así como en profesores de educación general. Sin embargo, ninguno de estos estudios ha abordado específicamente las opiniones de los profesores sobre quién creen que está mejor calificado para enseñar técnicas multisensoriales. Esto revela una brecha notable en la literatura, lo que destaca la necesidad de realizar más investigaciones en esta área.

Los porcentajes de maestros de educación general y especial, así como de maestros de jardín de infantes, que utilizan un método o programa multisensorial específico son relativamente bajos. Sin embargo, existe una correlación positiva entre tener los conocimientos necesarios para enseñar técnicas multisensoriales y el uso de un método o programa multisensorial específico. La utilización de los 16 programas multisensoriales reportados es generalmente mínima, observándose sólo ligeras variaciones, particularmente en el caso del programa Dyslexia Box, que parece usarse con más frecuencia. Estos hallazgos se alinean con la información proporcionada por Gaitanidi et al. (2023), indicando que en Grecia existen programas estructurados limitados para la dislexia en lengua griega, aparte del Dyslexia Box, que puede implementarse sin una formación exhaustiva de la persona que lo administra a los estudiantes. Es importante señalar que no se ha identificado ninguna investigación previa que permita una comparación directa de estos resultados con respecto al uso de métodos o programas multisensoriales específicos.

En cuanto a la selección de métodos de enseñanza multisensoriales, la investigación no aportó hallazgos sustanciales debido a ciertas limitaciones. De los 16 métodos y programas enumerados en el cuestionario sobre el uso de métodos de enseñanza multisensoriales, sólo se obtuvieron datos estadísticamente significativos para uno. La razón de esto fue que, de los 16 programas, sólo uno fue diseñado originalmente en idioma griego. Los 15 métodos y programas restantes utilizan predominantemente el inglés como idioma principal, lo que los hace menos accesibles y utilizables dentro del contexto educativo griego. Algunos profesores que indicaron utilizar ciertos programas en inglés pueden haber recurrido a adaptarlos o modificarlos para adaptarlos al idioma y al plan de estudios griego.

El programa griego que arrojó datos estadísticamente significativos es “Dyslexia Box”. Sin embargo, a pesar de estar disponible en griego, parece que la mayoría de los maestros y maestros de jardín de infantes en la prefectura de Heraklion, incluidos

aquellos en entornos de educación general y especial, usan con poca frecuencia o rara vez usan Dyslexia Box. Sin embargo, el uso de este programa es casi el doble entre quienes se especializan en educación especial.

La frecuencia del uso de métodos de enseñanza multisensoriales parece variar según la materia que se enseña. Según las respuestas de los profesores de educación general y especial, así como de los profesores de jardín de infantes en la prefectura de Heraklion, los métodos de enseñanza multisensoriales se emplean con mayor frecuencia en materias relacionadas con el lenguaje en comparación con materias relacionadas con las ciencias. En términos de la frecuencia del uso de métodos de enseñanza multisensoriales, la investigación indica que los maestros y maestros de jardín de infantes en Heraklion, tanto en educación general como especial, tienden a estar de acuerdo en que cuantos más estudiantes enseñan por hora, menos usan métodos de enseñanza multisensoriales. Más profesores que profesores de jardín de infantes están de acuerdo con la afirmación anterior. Además, aquellos que están de acuerdo en que cuantos más estudiantes enseñan por hora, menos utilizan métodos de enseñanza multisensoriales también tienden a estar de acuerdo en que cuantos menos estudiantes enseñan por hora, más utilizan métodos de enseñanza multisensoriales. Esto sugiere que el número de estudiantes enseñados por hora influye en la frecuencia de los métodos de enseñanza multisensoriales utilizados por los educadores.

La investigación también revela hallazgos adicionales sobre las actitudes y opiniones de los docentes. El hecho de que aquellos que están de acuerdo o totalmente de acuerdo con que cuantos más estudiantes enseñan por hora, menos utilizan métodos de enseñanza multisensoriales también tienden a estar de acuerdo o totalmente de acuerdo con que el número de estudiantes es un obstáculo para la aplicación de métodos de enseñanza multisensoriales. Además, existe una correlación positiva entre aquellos que están de acuerdo en que cuantos menos estudiantes enseñan por hora, más utilizan métodos de enseñanza multisensorial y aquellos que están totalmente de acuerdo en que la barrera para utilizar la enseñanza multisensorial es el tiempo limitado de enseñanza. Vale la pena señalar que aquellos que no están de acuerdo y están totalmente en desacuerdo con que la enseñanza multisensorial se implemente fácilmente de forma individualizada también están en total desacuerdo con que cuantos menos estudiantes enseñan por hora, más utilizan métodos de enseñanza multisensorial. Se observa diferenciación en cuanto a la especialidad de los docentes y sus opiniones sobre la

facilidad para implementar prácticas multisensoriales en grupos pequeños de estudiantes y en toda la clase, siendo más los docentes que los de jardín de infantes en el primer caso. En el segundo caso, las respuestas negativas de los profesores son estadísticamente significativamente mayores que las de los profesores de jardín de infancia.

Cabe señalar que no se encontraron investigaciones específicas que estudien las opiniones de los docentes en relación al número de estudiantes por clase respecto a la enseñanza multisensorial, las investigaciones que se mencionan a continuación abordan generalmente el tema de la enseñanza en toda la clase. Tradicionalmente, la pedagogía de toda la clase ha estado fuertemente asociada con la enseñanza directa del mismo contenido curricular para todos los alumnos y se ha caracterizado por enfoques estructurados y dirigidos por los docentes (Alexander, 2017). Sin embargo, más recientemente ha surgido un reconocimiento del potencial de las pedagogías altamente interactivas y centradas en el alumno para integrarse con éxito en la práctica de toda la clase (Willemsen et al., 2020; Hardman, 2020). Es más, en general parece que la mayoría de los profesores de educación general y especial y de guardería de la prefectura de Heraklion no están familiarizados con Dyslexia Box. Sin embargo, se observa que hay más docentes que declaran conocerlo que los docentes de educación infantil. Esto no es sorprendente, ya que según la investigación de Gaitanidi et al. (2023), esta herramienta está dirigida principalmente a estudiantes de educación primaria. Las pruebas de independencia chi-cuadrado se realizaron al “Tipo de colegio en el que trabaja el presente año escolar” cruzando con otras variables, no arrojaron resultados estadísticamente significativos ni respecto al objetivo del presente estudio.

Las opiniones de los profesores de educación general y especial y de los profesores de jardín de infantes en la prefectura de Heraklion parecen variar bastante según la asignatura y la frecuencia de uso de métodos de enseñanza multisensoriales. En concreto, según las respuestas de los participantes, la enseñanza multisensorial se utiliza con más frecuencia en materias relacionadas con el lenguaje que en materias relacionadas con las ciencias. Aunque no existe una diferencia significativa entre las opiniones de los docentes respecto al uso de métodos de enseñanza multisensorial en materias relacionadas con el lenguaje y su especialización en educación especial, llama la atención que el número de profesores especializados en educación especial que incorporan diariamente la enseñanza multisensorial es más del doble que aquellos que

la integran en su enseñanza diaria, pero carecen de experiencia en educación especial. Además, se observa que quienes tienen especialización en educación especial tienden a utilizar con mayor frecuencia métodos de enseñanza multisensoriales que quienes no tienen especialización en general e independientemente de la materia de enseñanza. Otra diferencia en las opiniones de los docentes se identificó en función de su especialidad; concretamente, parece que, en general, los docentes y los maestros de jardín de infantes en la prefectura de Heraklion, tanto en la educación general como en la especial, están divididos en cuanto al uso de actividades multisensoriales y los métodos de enseñanza en materias relacionadas con las ciencias, de modo que hay una mayoría significativa de docentes que nunca o rara vez utilizan la enseñanza multisensorial en materias de ciencias, especialmente en comparación con los docentes de jardín de infantes que afirmaron que nunca o rara vez la usan.

La mayoría de los maestros y maestros de jardín de infantes de educación especial y general en la prefectura de Heraklion utilizan métodos/programas de enseñanza multisensoriales frecuente o diariamente, sin embargo, aquellos que tienen formación en educación especial, duplican su uso. Respecto al nivel de estudios, los profesores que cuentan con un Máster, además del Grado, usan métodos multisensoriales con mayor frecuencia que los que sólo han cursado un Grado.

Hay una escasez de estudios específicos que examinen las opiniones de los profesores sobre la frecuencia de aplicación de métodos de enseñanza multisensoriales. Si bien existe una amplia investigación sobre la eficacia de la educación multisensorial en diferentes tipos de cursos, pocos estudios han explorado las perspectivas de los docentes al respecto. La frecuencia del uso de métodos de enseñanza multisensoriales sigue siendo un vacío en la literatura existente. Sin embargo, la investigación sobre la frecuencia de uso de herramientas de enseñanza más generales puede arrojar luz indirectamente sobre los hallazgos de la presente investigación. Por ejemplo, Heafner et al. (2014) informaron que, a pesar de las referencias curriculares a la enseñanza dinámica, esta no se asoció con un uso más frecuente en la enseñanza. En su estudio, la mitad de los participantes mencionaron que no consideraban la frecuencia de uso de un método de enseñanza como un factor significativo.

Respecto al segundo objetivo, los hallazgos de la presente investigación llevan a las siguientes conclusiones.

A partir de las respuestas brindadas respecto a los siguientes factores: objetivos, tiempo de enseñanza disponible, inclusión de todos los estudiantes, infraestructura logística, conocimientos sobre técnicas multisensoriales y número de estudiantes por hora y lección, se evidencia que una proporción significativa de los docentes considera que todos ellos influyen en la elección de una enseñanza multisensorial. Si bien, no se pidió explícitamente a los participantes que los clasificaran en orden de importancia para determinar cuál era el factor más crítico, de sus respuestas se desprende claramente que todos los encuestados consideran que estos factores son al menos muy importantes, con un fuerte consenso entre los maestros de primaria y de jardín de infantes. Tras un examen más detenido, resulta evidente que aquellos que no consideran importantes estos factores para seleccionar métodos de enseñanza multisensoriales, tienden a abstenerse de utilizar dichos métodos en materias relacionadas con el lenguaje. Por otro lado, el profesorado que considera la materia como un factor muy importante a la hora de elegir la enseñanza multisensorial a menudo incorpora técnicas multisensoriales en su instrucción, especialmente cuando se enseña materias relacionadas con las ciencias.

El objetivo docente destaca como un factor significativo en la selección de la enseñanza multisensorial, influyendo considerablemente en los docentes. En concreto, quienes consideran que el objetivo docente es un factor muy importante o incluso esencial en su decisión de optar por la enseñanza multisensorial suelen utilizar métodos multisensoriales en los cursos de idiomas, a menudo o a diario.

La mayoría de los profesores y educadores de jardines de infancia de la prefectura de Heraklion, tanto de educación general como especial, perciben el tiempo de enseñanza limitado como un impedimento importante para la adopción de métodos de enseñanza multisensoriales. Es de destacar que la mayoría de los profesores y profesores de jardín de infancia de la prefectura de Heraklion, ya sean en educación general o especial, consideran que el tiempo del que disponen es muy importante o incluso esencial a la hora de decidir emplear la enseñanza multisensorial. Además, el grado de acuerdo es mayor entre docentes de Primaria que entre los de jardín de infantes, lo que indica la importancia de la gestión del tiempo en sus elecciones de instrucción en esta etapa. Estos hallazgos subrayan el importante papel que desempeñan las limitaciones de tiempo como obstáculo percibido para la implementación efectiva de métodos de enseñanza multisensoriales.

Otro hallazgo digno de mención es que la mayoría de los maestros y maestros de jardín de infantes en la prefectura de Heraklion, incluidos los de educación general y especial, perciben el plan de estudios como un impedimento importante para la implementación de la enseñanza multisensorial. Además, existe una correlación positiva entre aquellos que encuentran el programa de estudios muy o extremadamente estresante y aquellos que expresan falta de tiempo para implementar actividades multisensoriales, así como aquellos que están de acuerdo o totalmente de acuerdo en que el programa de estudios actúa como una barrera para la enseñanza multisensorial. Vale la pena señalar que una mayor proporción de docentes, tanto de educación general como especial en la prefectura de Heraklion, tienden a estar de acuerdo o totalmente de acuerdo en que el plan de estudios obstaculiza el uso de la enseñanza multisensorial en comparación con los educadores de jardín de infantes. Además, los profesores, en comparación con los educadores de jardín de infancia, tienden a demostrar un mayor grado de acuerdo o un fuerte acuerdo con esta afirmación. Esta investigación también revela que, en general, los docentes y los maestros de jardín de infantes en la prefectura de Heraklion, que abarca tanto la educación general como la especial, consideran que el programa de estudios es un impedimento para la enseñanza, y los docentes expresan este sentimiento con especial fuerza. Además, los hallazgos sugieren que la mayoría de los profesores que no están de acuerdo con que el programa de estudios sea una barrera para implementar la instrucción multisensorial tampoco están de acuerdo con que el tiempo de enseñanza limitado sea una barrera. Por el contrario, quienes están de acuerdo en que el programa de estudios es un obstáculo también tienden a estar de acuerdo en que el tiempo limitado de enseñanza es un obstáculo. La adherencia al plan de estudios puede vincularse a la evaluación y eficacia docente, corroborando hallazgos de investigaciones anteriores al respecto.

Además, es evidente que una parte significativa de los maestros de educación general y especial, así como de los educadores de jardín de infantes en la prefectura de Heraklion, expresan su acuerdo con la noción de que el "número de estudiantes" constituye una barrera para la adopción de la enseñanza multisensorial. En particular, un número considerable del profesorado que tiene una opinión contraria sobre la eficacia de la enseñanza multisensorial en entornos de clase completa también está totalmente de acuerdo en que el "número de estudiantes" representa un impedimento para su implementación. De manera similar, se observa que la mayoría de quienes no

están de acuerdo con respecto a la efectividad de la enseñanza multisensorial en toda la clase, también están fuertemente de acuerdo en que el número de estudiantes actúa como un obstáculo para su implementación. Esta correlación se ve reforzada por quienes están totalmente en desacuerdo con la idea de que la enseñanza multisensorial se implemente fácilmente en toda la clase y con los que están totalmente de acuerdo con que "el número de estudiantes es un obstáculo para la implementación de métodos de enseñanza multisensorial".

El factor número de estudiantes también ejerce influencia sobre los docentes, como indican los hallazgos de la presente investigación, que indica que un elevado número de estudiantes por hora se asocia con una tendencia a reducir el uso de prácticas docentes multisensoriales.

El tamaño de la clase también surge como una barrera para emplear la enseñanza multisensorial. Específicamente, es evidente que la mayoría de los maestros y maestros de jardín de infantes en la prefectura de Heraklion, tanto de educación general como especial, muestran consenso respecto a que el tamaño de la clase puede efectivamente presentar un impedimento cuando se trata de implementar técnicas de enseñanza multisensoriales.

Para ser más precisos, la mayoría de ellos coincide en que el número de estudiantes en una clase actúa como un obstáculo para la utilización de enfoques de instrucción multisensoriales. La investigación de Wright et al. (2019), mostraron que cuando hay menos estudiantes por sección, entonces aumentan las estrategias de aprendizaje activo -como las prácticas multisensoriales- y la retroalimentación, mientras que también pueden surgir prácticas inclusivas sin ser un fin en sí mismas. En la misma encuesta se reporta que los docentes tuvieron una actitud positiva hacia la reducción de estudiantes por sección.

Otra barrera importante para la enseñanza multisensorial parece ser la infraestructura logística. La mayoría de los profesores y educadores de jardines de infancia de la prefectura de Heraklion, tanto de educación general como especial, tienden a considerar el equipamiento tecnológico como un factor importante a la hora de elegir métodos de enseñanza multisensoriales. En particular, los educadores de jardín de infantes tienden a expresar un mayor acuerdo con esta afirmación en comparación con los maestros. Además, existe una correlación que indica que cuanta más importancia atribuyen los

educadores al equipamiento tecnológico, más perciben la ausencia de equipamiento adecuado como un obstáculo para utilizar la infraestructura logística. Se observa que las personas sin experiencia en educación especial tienden a estar ligeramente más inclinadas a considerar la falta de infraestructura logística como una barrera para el uso de la enseñanza multisensorial.

Otro obstáculo identificado a través de esta investigación se refiere a la falta de motivación de los educadores para utilizar la enseñanza multisensorial. Parece haber una correlación entre los años de experiencia de los profesores y su acuerdo con esta afirmación. Los educadores con menos años de experiencia tienden a no estar de acuerdo con la noción de que la falta de interés actúa como una barrera para el uso de la enseñanza multisensorial, mientras que aquellos con 21 años o más de servicio tienen más probabilidades de estar de acuerdo con ella. Otro hallazgo interesante es que parece haber una relación inversamente proporcional entre el deseo de los educadores de recibir formación en un método/programa multisensorial y su acuerdo con la afirmación de que la falta de interés es una barrera. Cuanto más desean una formación relevante, más en desacuerdo están con considerar su falta de interés como una barrera para utilizar la enseñanza multisensorial.

Otro factor crucial para implementar la enseñanza multisensorial, como destacan los hallazgos de la investigación actual, es la inclusión de los estudiantes. Cabe señalar que hay diez veces más profesores que consideran este factor de poca importancia en comparación con los profesores de jardín de infancia. Esta discrepancia no implica necesariamente indiferencia por parte de los docentes, ya que la mayoría de ellos reconoce la importancia de incluir a los estudiantes con dislexia. La explicación probable de esta diferencia radica en las limitaciones materiales y de tiempo que enfrentan los docentes. Tienen la tarea constante de tomar decisiones que impactan el bienestar de todos los estudiantes y es posible que no puedan darse el lujo de dedicar mucho tiempo a abordar la inclusión de los estudiantes disléxicos. Cuando los profesores tienen más tiempo y flexibilidad, pueden adoptar prácticas innovadoras, constructivas y respaldadas por la investigación (Yeager & van Hover, 2006). Estas prácticas pueden adaptarse mejor a las diversas necesidades de los estudiantes, incluidos aquellos con dislexia, en un entorno de aula inclusivo.

Si bien no se identificaron estudios específicos centrados en los factores que influyen en la enseñanza multisensorial, existe un amplio conjunto de investigaciones que exploran los factores que influyen en las prácticas docentes, incluido el uso de nuevas tecnologías en la educación; en particular, las investigaciones realizadas hasta 2020 demuestran un importante interés en esta área. También merece señalar que no se han identificado estudios que se centren en las barreras específicas para la implementación de la enseñanza multisensorial en la educación primaria. Sin embargo, se encontraron investigaciones relacionadas con un tema similar. En la revisión de la literatura se identificaron seis categorías o tipos de barreras que afectan la adopción de la tecnología por parte de los docentes, tales como: recursos humanos, tiempo y recursos tecnológicos; conocimientos y habilidades tecnológicas, pedagogía y gestión del aula; liderazgo, estructuras o diseño escolar; creencias o actitudes tecnológicas; entornos de prueba de alto riesgo y las prácticas institucionales establecidas o la "gramática de la escolarización" (Selwyn, 2011).

Ampliando la investigación realizada por Yang et al. (2022) sobre las creencias de los docentes sobre la integración de la literatura infantil en la enseñanza y el aprendizaje de las matemáticas, el estudio identificó varios obstáculos, incluidas limitaciones de tiempo, falta de conocimiento pedagógico y confianza en uno mismo, recursos limitados, dudas sobre el resultado esperado e inhibiciones de normas sociales. Estos hallazgos se alinean con las conclusiones de la presente investigación, destacando los desafíos compartidos en el entorno de enseñanza y aprendizaje.

La cuestión de la infraestructura insuficiente como obstáculo para la implementación de herramientas y programas se ve respaldada además por la investigación realizada por Hébert et al. (2021), que destaca que esta limitación no sólo obstaculiza el desarrollo cognitivo y la variedad de la instrucción, sino que también socava el desarrollo más amplio de las habilidades del siglo XXI. Además, como menciona Thompson (2019), cuando la política educativa de un país genera clases más grandes, puede impactar negativamente la futura adopción de nuevas tecnologías y programas en las prácticas docentes. Estos conocimientos subrayan colectivamente la importancia de abordar los desafíos de infraestructura y se alinean con los hallazgos de la presente investigación sobre las barreras a la enseñanza multisensorial.

Los hallazgos sobre infraestructura están de acuerdo con la literatura internacional. La infraestructura parece ser un factor importante en las decisiones de los profesores con respecto a la enseñanza multisensorial, cuanto más valoran los equipos tecnológicos, más perciben la ausencia de equipos adecuados como una barrera. Vale la pena señalar que, si bien ha habido un aumento constante en la disponibilidad de tecnología en las escuelas durante las últimas dos décadas, la adopción de usos de nivel superior no ha seguido el ritmo. Muchos profesores siguen enfrentando desafíos a la hora de integrar eficazmente la tecnología en sus aulas (Bice & Tang, 2022).

En cuanto a la influencia de la infraestructura y los conocimientos previos de los docentes en la selección y el uso de los sistemas de apoyo educativo, Akinde & Adetimirin (2019) encontraron que cuando los docentes carecen de la experiencia y la infraestructura necesarias, su uso de la tecnología disminuye. Por el contrario, cuando tanto el conocimiento como la infraestructura están disponibles, el uso de la tecnología aumenta. La investigación de Khlaif (2018) también respalda esta idea al sugerir que el apoyo técnico, la asistencia educativa y la infraestructura afectan las actitudes de los docentes hacia el uso de la tecnología móvil.

La investigación de Spiteri & Rundgren (2020) sobre los factores que influyen en el uso de la tecnología digital subraya la importancia de los conocimientos previos de los docentes como factor clave en la adopción de la tecnología. Además, Wu et al. (2008) enfatizaron que para que los docentes de escuelas más grandes integren nuevas tecnologías en su enseñanza, el plan de estudios debería brindarles flexibilidad. En conjunto, los hallazgos de esta investigación se alinean indirectamente con las conclusiones alcanzadas en la presente investigación, enfatizando el papel fundamental del conocimiento de los docentes y la disponibilidad de la infraestructura necesaria para dar forma a las prácticas docentes innovadoras, entre las que pueden incluirse los métodos multisensoriales.

Contrariamente a los hallazgos de la presente investigación, donde los profesores de la prefectura de Heraklion afirman claramente que les resulta difícil implementar prácticas multisensoriales en toda la clase, la investigación de Tyk (2014) sostiene que es más fácil para el profesor enseñar toda la clase y gestionar el tiempo de forma más eficaz. Por otro lado, puede resultar difícil lograr un equilibrio entre el apoyo diferenciado, la exposición adecuada y el ritmo de la enseñanza y el aprendizaje de toda la clase, al

mismo tiempo que se fomenta la participación activa de todos los estudiantes (O'Connor et al., 2017). En la misma dirección, como se menciona en la investigación de Slater & Chambers (2022) sobre las opiniones de los docentes, los principales desafíos estadísticamente significativos percibidos por los participantes estaban relacionados en gran medida con la cuestión de la enseñanza adaptativa, en particular con garantizar la provisión de apoyo diferenciado que involucre, desafíe y responda efectivamente a las necesidades holísticas de todos los estudiantes (O'Connor et al., 2017). De acuerdo con lo anterior, los resultados de la mayoría de las investigaciones, aunque traten sobre un campo más amplio de la educación, convergen con los resultados de la presente investigación. Hay que señalar que no se identificó literatura existente sobre si existe una diferencia entre las opiniones de los maestros y los maestros de jardín de infantes con respecto a la enseñanza de toda la clase utilizando prácticas multisensoriales. De hecho, la tecnología de asistencia desempeña un papel crucial a la hora de reducir la brecha entre los estudiantes con dificultades de aprendizaje y sus compañeros de desarrollo típico en la educación general. Sin embargo, la implementación efectiva de tecnología de asistencia requiere que los docentes estén bien capacitados y sean competentes en su uso, como se destaca en el estudio de Atanga et al. (2019).

Vale la pena señalar que los métodos de enseñanza multisensoriales pueden considerarse una forma de tecnología de asistencia, ya que proporcionan herramientas y técnicas valiosas para mejorar la enseñanza, tanto digital como no digital. Los enfoques multisensoriales pueden satisfacer diversas necesidades de aprendizaje, lo que los convierten en un componente valioso del conjunto de herramientas del educador cuando apoya a estudiantes con diversas dificultades y discapacidades de aprendizaje en aulas inclusivas.

Respecto al tercer objetivo científico, los resultados de la investigación llevaron a las siguientes conclusiones:

La investigación revela variaciones en las opiniones de profesores y profesores de jardín de infantes en la prefectura de Heraklion con respecto a la efectividad de la enseñanza multisensorial para estudiantes con dislexia en función del número de estudiantes a los que enseñan por hora. Específicamente, los profesores que enseñan a un estudiante por hora tienen más probabilidades de creer que los estudiantes con dislexia pueden mejorar suficientemente sus habilidades de lectura a través de

actividades multisensoriales en comparación con aquellos que enseñan a grupos más grandes con ocho estudiantes o más por hora. Esto implica que el tamaño de las clases y la proporción de alumnos por maestro pueden afectar las percepciones de los maestros sobre la efectividad de la enseñanza multisensorial, y los tamaños de clases más pequeños se asocian con opiniones más positivas sobre este enfoque para los estudiantes con dislexia.

La mayoría de los profesores y educadores de jardín de infantes, tanto de educación general, como especial, en Heraklion, están de acuerdo o totalmente de acuerdo en que la enseñanza multisensorial es beneficiosa para los estudiantes con dislexia cuando se trata de lograr sus objetivos de aprendizaje en materias relacionadas con el lenguaje. Es de destacar que quienes tienen un Máster tienden a expresar niveles más altos de acuerdo en comparación con aquellos que solo tienen una licenciatura. Además, se observa en general que los profesores y maestros de jardín de infantes en Heraklion que están de acuerdo en que la enseñanza multisensorial es efectiva para los estudiantes con dislexia en materias relacionadas con el lenguaje, también tienden a estar de acuerdo en que es efectiva en materias relacionadas con las ciencias. Muchos profesores que están totalmente de acuerdo con la primera afirmación también expresan total acuerdo con la segunda afirmación. Además, aquellos que expresan un acuerdo o un fuerte acuerdo en que la enseñanza multisensorial beneficia a los estudiantes con dislexia en materias relacionadas con el lenguaje también tienden a estar de acuerdo en que brinda a estos estudiantes las mismas oportunidades educativas que a sus compañeros de clase general. Existe una notable correlación positiva entre estas dos opiniones. Otro hallazgo estadísticamente significativo que se identificó se refiere a la correlación positiva entre su creencia en la eficacia de la enseñanza multisensorial para ayudar a los estudiantes con dislexia a alcanzar objetivos de aprendizaje en materias relacionadas con el lenguaje y su frecuencia de uso de actividades multisensoriales o métodos de enseñanza en esas materias. Es de destacar que, en general, hay más educadores que están de acuerdo o muy de acuerdo con que la enseñanza multisensorial ayuda a los estudiantes con dislexia a alcanzar objetivos de aprendizaje en materias relacionadas con el lenguaje y utilizan la enseñanza multisensorial con frecuencia o a diario.

En cuanto a las opiniones de los profesores sobre la eficacia de la enseñanza multisensorial para los estudiantes con dislexia, las conclusiones de la investigación indican que la mayoría de los profesores y profesores de jardín de infantes en la

prefectura de Heraklion, tanto en educación general, como especial, están de acuerdo o totalmente de acuerdo en que la enseñanza multisensorial es beneficiosa para todos los estudiantes, incluidos aquellos con dislexia, a comprender mejor los objetivos de enseñanza. Esta creencia parece consistente entre docentes con diferentes niveles de educación y especialización en educación especial. Sin embargo, los individuos con títulos de Máster y aquellos especializados en educación especial tienden a exhibir mayores niveles de acuerdo con esta afirmación.

Un hallazgo adicional, digno de mención, es que aquellos que están de acuerdo o totalmente de acuerdo en que la enseñanza multisensorial beneficia a todos los estudiantes en la comprensión de los objetivos de enseñanza, también consideran que la inclusión de todos los estudiantes es un factor muy importante o absolutamente esencial al elegir utilizar métodos de enseñanza multisensorial. Esto indica que los docentes que valoran la educación inclusiva tienden a percibir la enseñanza multisensorial como un enfoque valioso para apoyar este objetivo. Los resultados de la investigación también indican que existen diferencias en las opiniones de los docentes en función de la estructura educativa en la que trabajan. Los profesores de entornos educativos generales tienden a estar menos convencidos de que los estudiantes con dislexia puedan desarrollar adecuadamente sus habilidades de lectura a través de actividades multisensoriales, en comparación con aquellos que trabajan en entornos de educación especial. Esto sugiere que el contexto en el que trabajan los profesores puede influir en sus percepciones sobre la eficacia de la enseñanza multisensorial para los estudiantes con dislexia. Parece que una mayoría significativa de docentes y maestros de jardín de infantes en la prefectura de Heraklion, incluidos los de educación general y especial, tienden a estar de acuerdo o totalmente de acuerdo en que el uso de la enseñanza multisensorial es eficaz para los estudiantes de jardín de infantes (de 3 a 5 años). Sin embargo, el profesorado de educación Primaria está más convencido de su eficacia que los de jardín de infantes, para estudiantes de 3 a 5 años.

En lo que respecta al grupo de alumnos de 6 a 8 años, la mayoría del profesorado considera especialmente beneficiosa la enseñanza multisensorial, aunque las diferencias no sean estadísticamente significativas.

La literatura existente converge con los hallazgos anteriores, ya que, según la investigación realizada por Joshi et al. (2022), un enfoque de enseñanza multisensorial

llevó a los estudiantes de 1er grado a obtener mejores resultados que los del grupo de control. En la misma línea, Hunter-Carsch (2001) encontró que muchos niños se beneficiaban al experimentar una "variedad" de enfoques de enseñanza en el aula. Así mismo, señaló que los niños de su estudio tenían un nivel notablemente alto de alfabetización cuando había un claro énfasis en las experiencias táctiles multisensoriales. Del mismo modo, Flecker y Cogan (2000) creen que, si algo se visualiza y manipula, se recordará de manera más efectiva. Además, parece que la mayoría de los maestros y maestros de jardín de infantes en la prefectura de Heraklion están de acuerdo en que la enseñanza multisensorial funciona adecuadamente para estudiantes de 9 a 11 años. Sin embargo, se observan las siguientes peculiaridades; aunque parece haber una tendencia a creer esto entre un número ligeramente mayor de docentes que de jardín de infantes, éstos se dividen en dos categorías: los que están de acuerdo y los que no están de acuerdo con la afirmación anterior. Si bien faltan investigaciones específicas que exploren las opiniones de los docentes sobre la efectividad de la enseñanza multisensorial en relación con su especialidad y el tipo de escuela, existen investigaciones relacionadas que arrojan luz sobre el tema más amplio de la enseñanza multisensorial y sus beneficios. Por ejemplo, un estudio de Stephenson & Carter (2011), que examinó las opiniones de los profesores sobre el uso de entornos multisensoriales (MSE) en la enseñanza de estudiantes con discapacidades graves, encontró que la mayoría de los profesores de la muestra informaron que, incluso exponer a los estudiantes a dichos entornos, sin necesariamente tener objetivos didácticos específicos, tuvo un impacto positivo en su aprendizaje. Esto subraya la importancia de involucrar los sentidos en el proceso de enseñanza. Los hallazgos de Cuturi et al. (2022) respecto a los desafíos de enseñar conceptos geométricos y transformaciones mentales se alinean con los resultados de la presente investigación. Ambos estudios destacan los beneficios potenciales de los métodos de enseñanza multisensoriales, especialmente en materias que incluyen conceptos abstractos y desafiantes. El hecho de que los profesores de jardín de infancia de la prefectura de Heraklion opten por el uso frecuente de métodos de enseñanza multisensoriales en materias relacionadas con las ciencias implica su confianza en la eficacia de dichos métodos, especialmente para los estudiantes más jóvenes.

En cuanto a si las opiniones de los docentes difieren respecto a la efectividad, frecuencia y facilidad de implementar la enseñanza multisensorial en función del número de estudiantes enseñados por hora, los hallazgos de esta investigación indican lo siguiente:

Los maestros y maestros de jardín de infantes de entornos de educación general y especial están de acuerdo en que la enseñanza multisensorial se implementa de manera más efectiva y sencilla en entornos de instrucción individuales, y existe una correlación positiva entre estos dos factores. Además, es evidente que creen que la enseñanza multisensorial es eficaz y fácil de implementar en entornos de grupos pequeños. En particular, una parte sustancial de quienes están totalmente de acuerdo en que la enseñanza multisensorial es eficaz en entornos de grupos pequeños también están de acuerdo en que es fácil de implementar en dichos entornos.

Los hallazgos sugieren que las opiniones de los profesores sobre la eficacia y la facilidad de implementación de la enseñanza multisensorial en toda la clase están estrechamente relacionadas. La mayoría de quienes no están de acuerdo con la eficacia de la enseñanza multisensorial en toda la clase, también están en desacuerdo con la facilidad de implementarla en ese entorno. De manera similar, la mayoría del profesorado que está totalmente en desacuerdo con la eficacia de la enseñanza multisensorial en toda la clase tiende a creer que cuantos más estudiantes enseñan por hora, menos utilizan métodos de enseñanza multisensorial. Por el contrario, aquellos que están totalmente en desacuerdo con la eficacia de la enseñanza multisensorial en toda la clase, tampoco consideran que reducir el número de estudiantes aumente la frecuencia de uso de la enseñanza multisensorial.

Estos hallazgos resaltan el impacto del tamaño de las clases en las percepciones de los profesores sobre la efectividad de la enseñanza multisensorial, lo que sugiere que se logran mejores resultados en clases más pequeñas o en entornos de instrucción individualizados. El trabajo colaborativo en parejas o grupos pequeños puede servir como una herramienta valiosa para ayudar a los estudiantes con discapacidades de aprendizaje a desarrollar conocimientos y habilidades sociales. Los estudiantes desarrollan habilidades cooperativas y sociales cuando participan en actividades como compartir, turnarse, negociar roles, actuar como líderes y delegar tareas o responsabilidades (Cowley, 2013). El hallazgo de que los maestros y maestros de jardín de infantes en Heraklion, Creta, tienden a tener dificultades para implementar la

enseñanza multisensorial en toda la clase, independientemente de su especialidad, se alinea con la literatura existente, que sugiere que los enfoques multisensoriales a menudo se facilitan más eficazmente en pequeños grupos de intervención (Davies, 2012). Sin embargo, vale la pena señalar que un estudio empírico realizado por Joshi et al. (2002) afirma que un enfoque multisensorial puede ser eficaz en la instrucción de toda la clase, siempre que los profesores reciban la formación adecuada para su implementación. En general, los profesores y educadores de jardines de infancia en Heraklion perciben la eficacia de la enseñanza multisensorial para los estudiantes con dislexia, especialmente en materias relacionadas con el lenguaje. Esta percepción se extiende a temas relacionados con la ciencia, con niveles de acuerdo ligeramente más bajos. Además, creen que la enseñanza multisensorial promueve la igualdad de oportunidades educativas para los estudiantes con dislexia en comparación con sus compañeros sin dificultades. Las investigaciones existentes revelan una brecha notable a la hora de comprender las opiniones de los docentes sobre la efectividad de la enseñanza multisensorial en materias relacionadas con las ciencias. La mayoría de los estudios en esta área, ya que se han centrado predominantemente en la eficacia de los métodos y programas de enseñanza multisensorial, particularmente en lo que respecta a la lectura, la escritura y la conciencia fonológica. Incluso los estudios que abordan la eficacia de la enseñanza multisensorial en materias relacionadas con las ciencias a menudo carecen de la perspectiva del profesorado.

La investigación de O'Brien et al. (2021), examinó el efecto de una sola sesión de actividad física sobre la percepción multisensorial, evaluando la capacidad de fusionar adecuadamente entradas de diferentes modalidades sensoriales sobre la memoria de trabajo (verbal, visoespacial y motora) en 51 niños (de 6-8 años). Los resultados revelaron que una única sesión abierta produjo beneficios en la memoria de trabajo verbal (intervalo de dígitos) y una sesión cerrada de entrenamiento de habilidades benefició la memoria de trabajo motora (O'Brien et al., 2021). Los resultados de esta investigación convergen indirectamente con los resultados de la presente investigación en que, en general, tanto los maestros como los maestros de jardín de infantes de educación general y especial de la prefectura de Heraklion, tienden a estar de acuerdo en que la enseñanza multisensorial ayuda a los estudiantes con dislexia, siendo los especialistas en educación especial los más favorables.

También se alinea con las investigaciones realizadas por Flanagan et al. (2013) y Stoner et al. (2008), quienes enfatizaron que los docentes reconocen los beneficios de las tecnologías de asistencia para los estudiantes. En particular, incrementan su uso en el aula, cuando la capacitación en tecnología de asistencia está diseñada para ser fácil de usar y desarrollada con tiempo suficiente para que los docentes adquieran competencia en su uso (Biancarosa & Griffiths, 2012).

También la investigación de Taljaard en 2016, que examinó el uso de tecnologías multisensoriales en temas relacionados con la ciencia, arrojó resultados prometedores, encontrando que estas tecnologías mejoran el compromiso y los resultados del aprendizaje al atender a los estilos de aprendizaje preferidos por los estudiantes. Además, hacen que el aprendizaje sea más agradable y permiten a los estudiantes conectarse con situaciones de la vida real. El estudio también sugirió que las futuras herramientas de aprendizaje multisensorial tienen el potencial de mejorar aún más la participación de los estudiantes y sus resultados de aprendizaje. Además, una investigación de Volpe y Gori en 2019 enfatizó la importancia de la enseñanza multisensorial en los cursos de ciencias, ya que se considera adecuada para transmitir conceptos científicos complejos. estos autores abogan por el desarrollo de un paradigma de aprendizaje multisensorial, integrado y activo, junto con un ecosistema de enseñanza que promueva la inclusión, asegurando que, tanto los estudiantes con desarrollo típico como los que presentan alguna discapacidad, tengan igualdad de acceso a oportunidades, rompiéndose barreras entre ellos.

Estos hallazgos resaltan colectivamente los beneficios potenciales de la enseñanza multisensorial en materias relacionadas con las ciencias, aunque se necesita más investigación, especialmente desde la perspectiva de los docentes, para obtener una comprensión integral de su efectividad e implicaciones en este dominio específico.

La investigación realizada por Fazmina et al. (2020) sobre estudiantes de Sri Lanka, destacó la eficacia de las estrategias de enseñanza multisensoriales en la enseñanza de estudiantes con dislexia, particularmente en las clases de ciencias. Los hallazgos sugieren que estos métodos mejoran significativamente el rendimiento de los estudiantes, especialmente de aquellos con dislexia de sexto curso, mostrando que estas estrategias eran particularmente útiles para transmitir conceptos científicos abstractos y complejos, como los relacionados con la energía y la materia. Del mismo modo, se

observó que ayudan a los estudiantes con dislexia a reducir los errores comunes y los problemas de comprensión al leer materiales educativos.

Respecto al cuarto objetivo, los resultados de la investigación llevaron a las siguientes conclusiones:

En general, parece que la mayoría de los maestros y maestros de jardín de infantes en la prefectura de Heraklion, tanto en educación general como especial, expresan un fuerte deseo de aprender algún método de enseñanza multisensorial, especialmente los que tienen menos de 15 años de experiencia. Esta tendencia podría explicarse por la creencia de que los docentes con menos años de experiencia están más proclives a buscar oportunidades de mejora y desarrollo profesional a través de la formación, incluso en métodos de enseñanza multisensoriales. Es más, todo el profesorado de Heraklion intenta reeducarse para seguir las nuevas tendencias educativas. Sin embargo, existe una tendencia mayor entre quienes reciben formación en educación especial a proseguir más su formación.

No obstante, se observa que una gran parte de los participantes optaron por valores medios, lo que indica que no tienen una opinión sólida (O'Muircheartaigh et al., 1999) o no dedicaron el esfuerzo cognitivo necesario para decidir sobre una respuesta clara y, por lo tanto, eligieron el centro de la escala. (Saris & Gallhofer, 2007). Independientemente de la explicación, las puntuaciones medias de los docentes arrojan luz sobre las decisiones de los profesionales y los responsables de las políticas sobre la educación inclusiva. En cuanto a la diferenciación en relación a la edad, los presentes hallazgos son confirmados por los resultados de la investigación de Serafini (2018), donde, entre otras cosas, mostraron que, en Italia, los profesores mayores de 50 años mostraban menos deseo de formarse y tenían un nivel educativo más bajo. La investigación, además, indica que los docentes con especialización en educación especial tienden a utilizar métodos de enseñanza multisensoriales con mayor frecuencia, independientemente de la materia que estén enseñando, en comparación con aquellos sin experiencia en educación especial. Esto sugiere que la formación especializada en educación especial puede contribuir al uso más frecuente de métodos de enseñanza multisensoriales en diversas materias.

Desde hace tiempo existe un consenso ampliamente reconocido que considera que mejorar las oportunidades de aprendizaje de los estudiantes depende de la educación y

el desarrollo profesional de los docentes (Krainer, 2011). La instrucción eficaz para estudiantes con dislexia requiere una preparación docente integral y una planificación especializada dentro del ámbito de la educación especial (Tsakiridou & Polyzopoulou, 2014). En los últimos años, a nivel internacional, se ha prestado una mayor atención sobre el contenido y la estructura de la formación docente inicial y continua.; los defensores de la reforma educativa en los Estados Unidos y en todo el mundo han enfatizado constantemente la importancia del desarrollo profesional de alta calidad como un medio para que los docentes mejoren sus técnicas de instrucción con el fin de optimizar el aprendizaje de los estudiantes (Kennedy, 2016). La noción de que el desarrollo profesional puede fomentar mejoras en la enseñanza está ampliamente aceptada (Kennedy, 2016), sin embargo, la implementación real del desarrollo profesional puede variar significativamente entre países y dentro de un mismo país, al igual que la investigación relacionada con el desarrollo profesional (Bautista et al., 2015).

A la luz de diversos estudios que reflejan la evolución demográfica, la población que envejece, no solo vive más, sino que también se reduce, lo que enfatiza la importancia del aprendizaje permanente (Figel, 2016). Para seguir siendo una parte indispensable de la fuerza laboral, las personas deben profundizar y ampliar continuamente sus conocimientos y habilidades (Frk, 2014). Este concepto se extiende a los docentes, quienes también deben invertir en su propio desarrollo para contribuir eficazmente al bienestar y al progreso de la escuela. Por lo tanto, la especialización se considera muy importante, ya que probablemente pueda mejorar su eficiencia. Los hallazgos del presente estudio demuestran que la especialización en educación especial influye en las opiniones de los maestros y maestros de jardín de infantes en Heraklion. En concreto, se observó que aquellos con especialización en educación especial, que afirman poseer los conocimientos necesarios para enseñar técnicas multisensoriales, son el doble que aquellos sin esta especialización, destacando el valor de la formación y el conocimiento especializados para promover una enseñanza eficaz.

La afinidad entre los hallazgos de la investigación y la literatura más amplia es evidente, ya que se ha descubierto que la especialización en educación especial y la obtención de un título de Máster contribuyen significativamente al desarrollo profesional docente. La evidencia existente respalda la eficacia del desarrollo profesional específico caracterizado por la sostenibilidad, enfocado en el contenido, la participación activa, la

colaboración, la continuidad, la alineación con los estándares escolares y curriculares, y centrado en mejorar el pensamiento y las experiencias de aprendizaje de los estudiantes. Este enfoque integral del desarrollo profesional también subraya el valor de la orientación educativa y la retroalimentación específica (Sun et al., 2013).

Además, los contenidos de los programas de desarrollo profesional de alta calidad enfatizan sobre las teorías del aprendizaje de adultos y la utilización de estrategias de aprendizaje apropiadas (Darling-Hammond et al., 2009). Estos hallazgos subrayan la importancia del desarrollo profesional estructurado y continuo para los educadores, particularmente en el contexto de la educación especializada.

Armstrong (2009) destacó que comprender y adaptarse a diversos estilos de aprendizaje es crucial para una enseñanza eficaz. Para ser el instructor más eficaz para todos los estudiantes, los profesores deben estar equipados con una amplia gama de técnicas y enfoques. La enseñanza multisensorial, considerada parte de la tecnología de asistencia, desempeña un papel importante a la hora de cerrar la brecha entre los estudiantes con dificultades de aprendizaje y sus compañeros en la educación general. Sin embargo, esto subraya la necesidad de que los docentes reciban una formación integral y desarrollen competencias en el uso de dichas tecnologías (Atanga et al., 2019). Cabe destacar que en la misma encuesta se reveló que el 83% de los participantes sentían que su carrera inicial no los preparaba adecuadamente con los recursos necesarios para este tipo de enseñanza.

En cuanto a si el costo impacta la disposición de los docentes a recibir capacitación en métodos/programas de enseñanza multisensorial, según los hallazgos de esta investigación, en general, la mayoría de los maestros y maestros de jardín de infantes en la prefectura de Heraklion, tanto en educación general como especial, están interesados en capacitarse en algún método o programa multisensorial. Sin embargo, se observa que sus opiniones difieren según su nivel de estudios y específicamente, hay más personas que tienen un Máster que desean ampliar su educación, en comparación con quienes poseen una licenciatura. También se observa que la mayoría de los que están completamente en desacuerdo con que el Estado proporcione gratuitamente el aprendizaje de un método de enseñanza multisensorial, están completamente de acuerdo en que pagarían su formación si así lo decidieran.

La investigación realizada por Stephenson y Carter (2011) se alinea con los hallazgos de la presente investigación, destacando que las unidades escolares a menudo no ofrecen un apoyo sustancial en términos de oportunidades de aprendizaje profesional relacionadas con los métodos de enseñanza multisensoriales. Incluso cuando hay herramientas multisensoriales disponibles dentro de una unidad escolar, es posible que los maestros aún carezcan de la capacitación necesaria para utilizarlas de manera efectiva. Esta observación subraya la falta de capacitación gratuita por parte del estado sobre métodos de enseñanza multisensoriales y sugiere que los maestros que deseen recibir capacitación adicional para hacer uso de las herramientas multisensoriales disponibles pueden tener que asumir ellos mismos los gastos. Los estudios anteriores subrayan los desafíos que los maestros de preescolar y primaria a menudo enfrentan cuando se trata de sentirse adecuadamente preparados para enseñar a estudiantes con discapacidades, particularmente en aulas inclusivas. Estos maestros han informado de una falta de conocimientos y habilidades específicos necesarios para instruir eficazmente a estudiantes con discapacidades en aulas inclusivas, del mismo modo que los participantes de este estudio.

La financiación adicional y los programas de formación para docentes pueden desempeñar un papel crucial a la hora de dotarlos del apoyo que necesitan para implementar enfoques de enseñanza multisensoriales de forma eficaz, como sugiere Alwaqassi (2017). Las filosofías y actitudes profesionales positivas son esenciales para los docentes cuando trabajan con estudiantes con discapacidades. Esto se alinea con la idea de que los docentes deben tener respuestas constructivas a las diversas necesidades de aprendizaje de sus estudiantes, como enfatizan Shute y Rahimi (2017).

Los hallazgos de la investigación actual indican que los maestros de jardín de infantes tienden a estar más familiarizados con las prácticas multisensoriales en comparación con los maestros de grados superiores. Esta diferencia podría atribuirse al hecho de que los maestros de jardín de infantes a menudo tienen más experiencia en el uso de tecnología de asistencia (TA) y han aceptado o aprendido filosofías específicas que guían la selección e integración de la TA en sus entornos de aprendizaje (Koch, 2017).

Los programas de capacitación para maestros de educación especial son fundamentales para prepararlos para crear experiencias de aprendizaje valiosas para los estudiantes con discapacidades. Estos programas familiarizan a los maestros de educación especial

con las características integradas de AT, permitiéndoles brindar instrucción y apoyo adecuados a todos los niños en sus aulas (Erdem, 2017). La participación activa de profesores de educación especial capacitados en el proceso de aprendizaje es particularmente importante, dada la sensibilidad y la naturaleza especializada de sus funciones (Holstein et al., 2017).

La investigación realizada por Boardman (2020) sugiere que los docentes que reconocen los beneficios de la enseñanza multisensorial para todos los estudiantes tienen más probabilidades de continuar con su educación y desarrollo profesional. Este hallazgo respalda nuestra investigación, que ha evidenciado que los profesores que expresan un deseo de formación en un método multisensorial ya están utilizando técnicas multisensoriales tanto en materias relacionadas con el lenguaje como con las ciencias.

Respecto al quinto objetivo, se encontraron las siguientes conclusiones:

Los profesores y maestros de jardín de infantes en la prefectura de Heraklion ya sean en educación especial o general, tienden a estar más dispuestos a aplicar actividades multisensoriales y métodos de enseñanza en materias relacionadas con las ciencias, cuando perciben que la enseñanza multisensorial ayuda a los estudiantes con dislexia a lograr sus objetivos de aprendizaje en estas materias. Esta observación resalta el potencial de los métodos de enseñanza multisensoriales para mejorar las experiencias de aprendizaje de los estudiantes, particularmente en materias relacionadas con las ciencias.

En el contexto del jardín de infancia griego, se introducen muchos conceptos matemáticos y prematemáticos, y algunos de estos conceptos pueden resultar particularmente desafiantes para los estudiantes jóvenes. La alineación entre estos hallazgos subraya la importancia de incorporar enfoques multisensoriales para mejorar la comprensión y el compromiso entre los estudiantes cuando se enfrentan a conceptos matemáticos y geométricos complejos. Este enfoque puede facilitar una experiencia de aprendizaje más integral y efectiva, especialmente en las primeras etapas de la educación.

Los estudiantes de escuela primaria a menudo enfrentan desafíos al adquirir habilidades matemáticas, posiblemente debido a los métodos de enseñanza predominantes que se basan principalmente en lecciones formales con una

incorporación limitada de actividades multisensoriales dentro del aula (Cuturi et al., 2022). Al reconocer el valor de los enfoques multisensoriales, los educadores pueden ofrecer experiencias de aprendizaje más atractivas y efectivas, especialmente en materias que tradicionalmente requieren una comprensión abstracta y conceptual, como las matemáticas y las ciencias. De manera más general, parece que la mayoría de los profesores y profesores de jardín de infancia de la prefectura de Heraklion consideran que la elección de la enseñanza multisensorial es muy importante o absolutamente esencial para la inclusión de todos los estudiantes, aunque esta opinión está más apoyada por los docentes de jardín de infantes de educación general.

Se observan diferencia de opiniones de los docentes en función de su nivel de estudio, siendo más importante la selección de un método/programa multisensorial para la inclusión de estudiantes con dislexia para el profesorado que ha cursado un Máster, en comparación con aquellos que no tienen. Además, aunque la mayoría de los docentes creen que al utilizar prácticas multisensoriales ofrecen igualdad de oportunidades de aprendizaje a todos los estudiantes sin excepción, aquellos que tienen un Máster puntúan más alto. Además, se observa que, tanto los maestros como los maestros de jardín de infantes en educación general y especial en la prefectura de Heraklion tienden a estar de acuerdo o muy de acuerdo en que la participación de los estudiantes con dislexia en la lección aumenta cuando utilizan actividades multisensoriales. Sin embargo, los profesores que han cursado un Máster muestran mayor acuerdo que los que no.

Del mismo modo, quienes consideran la inclusión de los estudiantes como un factor muy importante o absolutamente esencial en su elección de la enseñanza multisensorial, están de acuerdo o completamente de acuerdo con que la enseñanza multisensorial ayuda a todos los estudiantes a comprender mejor el objetivo de la enseñanza. Además, en general parece que cuanto mayor acuerdo existe respecto a esta afirmación, mayores oportunidades brindan a los estudiantes con dislexia, aumentando así su participación. Esta correlación sugiere que estos educadores reconocen los beneficios de las actividades multisensoriales para promover la igualdad de oportunidades educativas para los estudiantes con dislexia y aumentar su participación en las lecciones. Parece que los profesores y profesores de educación infantil de educación general y especial de la prefectura de Heraklion, estén o no especializados en educación especial, tienden a estar de acuerdo en que la enseñanza multisensorial ayuda a los estudiantes con

dislexia. Sin embargo, casi el doble del profesorado de educación especial está totalmente de acuerdo con esta afirmación. Especializados o no en educación especial, los profesores y profesores de jardín de infancia de la prefectura de Heraklion, tienden a estar de acuerdo en que la enseñanza multisensorial ayuda a todos los estudiantes a comprender mejor el objetivo de la enseñanza, aunque el profesorado especializado en educación especial representa el doble.

En el presente estudio se encontró que los maestros y maestros de jardín de infantes de la prefectura de Heraklion, que tienen experiencia en educación especial, tienden a estar de acuerdo en que la enseñanza multisensorial ayuda a los estudiantes con dislexia a lograr objetivos de aprendizaje en materias relacionadas con la ciencia y el lenguaje, en comparación con aquellos que no la tienen. Además, se encontró que hay más profesorado que tiene los conocimientos necesarios para la enseñanza multisensorial y están especializados en educación especial que quienes no los tienen. Desafortunadamente, a diferencia de las investigaciones sobre educadores típicos, los estudios sobre los puntos de vista de los educadores especiales son raros (Huang et al., 2022). Sin embargo, se podría decir que los hallazgos anteriores convergen indirectamente con la literatura existente, ya que se informa que, en comparación con los educadores típicos, los profesores de educación especial pueden tener un conocimiento más amplio de los estudiantes con diferencias de aprendizaje, utilizar diferentes estructuras de conocimiento profesional, utilizar métodos más multimodales y prácticas de evaluación para interpretar eventos del aula, resolver problemas educativos, monitorear el progreso y responder a los estudiantes (Blanton et al., 1994; Byrd & Alexander, 2020; Stough & Palmer, 2003). Además, la investigación de Puspitaloka y Syarif (2020) ha destacado específicamente la idoneidad de la educación multisensorial para enseñar a estudiantes disléxicos. Sus hallazgos indican beneficios significativos en la mejora de las habilidades de lectura de los estudiantes disléxicos mediante la implementación de prácticas de enseñanza multisensoriales. Estos conocimientos subrayan colectivamente la eficacia de los métodos multisensoriales, especialmente para ayudar a los estudiantes con dislexia en su desarrollo lector.

Los enfoques multisensoriales se utilizan comúnmente en intervenciones para estudiantes con dislexia, ya que pueden abordar los diversos desafíos cognitivos asociados con esta condición. Sin embargo, la eficacia de las intervenciones multisensoriales puede variar según diferentes estudios. Por ejemplo, Schlesinger y

Gray (2017) encontraron que las intervenciones multisensoriales no necesariamente proporcionaban una ventaja sobre las intervenciones estructuradas para estudiantes con desarrollo típico o dislexia. Sin embargo, ambos tipos de intervenciones produjeron efectos generales positivos del tratamiento para los participantes.

Por otro lado, la investigación de Boardman (2020), que se centró en las opiniones de los docentes, indicó que la enseñanza con un enfoque multisensorial es muy valiosa para los alumnos individualmente y la instrucción de toda la clase. Además, el desarrollo positivo del lenguaje, particularmente en las habilidades de vocabulario expresivo, se ha asociado con programas de narración multisensorial, como respaldan publicaciones e investigaciones previas, de Caldwell (2007) y Hettiarachchi et al. (2022). Hettiarachchi et al. (2022) demostraron que un enfoque multisensorial, que incluye estímulos visuales, auditivos, táctiles y cinestésicos, tiene el potencial de facilitar el aprendizaje de vocabulario en niños con discapacidades. Estos estudios enfatizan colectivamente la importancia de los enfoques multisensoriales para mejorar las experiencias y resultados de aprendizaje de los estudiantes con diversas necesidades.

Otros estudios también han destacado que los profesores de preescolar y primaria no se sienten preparados para enseñar a estudiantes con discapacidad. Informaron que había una falta de conocimientos y habilidades específicos para la enseñanza en aulas inclusivas (Ruppar et al., 2016), lo que se confirma indirectamente en este estudio. Además, la financiación adicional y los programas de formación para los docentes les brindarían el apoyo que necesitan para aplicar adecuadamente enfoques multisensoriales en sus aulas (Alwaqassi, 2017).

Si los estudiantes con discapacidades graves sólo pueden beneficiarse de la exposición a entornos multicurriculares, no sería exagerado afirmar que los estudiantes con discapacidades especiales de aprendizaje o incluso los estudiantes típicos podrían beneficiarse enormemente de actividades y pruebas específicas. Se identificó un gran vacío bibliográfico sobre la efectividad de la educación multisensorial en relación con la especialidad del docente y el tipo de escuela, las materias relacionadas con las ciencias (escuela general o de educación especial) y la frecuencia de uso de la enseñanza multisensorial. Además, se identificó una brecha en cuanto a los factores que influyen en la frecuencia de uso de prácticas multisensoriales, las barreras para la implementación de estas prácticas en el jardín de infantes y la escuela primaria, y

finalmente en cuanto a quién es el maestro más adecuado para enseñar con metodología multisensorial.

Del mismo modo, se encontró un vacío en la literatura con respecto a los puntos de vista de los educadores sobre quién es el más adecuado para enseñar a un niño con dislexia, lo que resalta la necesidad de realizar más investigaciones en esta área. Además, se podrían realizar investigaciones para sopesar dos herramientas, una de las cuales sería sobre ortografía superficial y la otra sobre ortografía opaca, de modo que puedan traducirse a diferentes idiomas y la investigación posterior pueda producir resultados más generalizables y contribuir a mejorar o modificar estas herramientas. Además, se considera necesario que los docentes entren en contacto con las técnicas multisensoriales a través de los programas de estudio de las universidades y también en su posterior trayectoria como docentes en activo. La financiación adicional y los programas de formación para los docentes les brindarían el apoyo que necesitan para aplicar adecuadamente enfoques multisensoriales en sus aulas (Alwaqassi, 2017).

Como educadores, es nuestra responsabilidad explorar y adoptar continuamente enfoques de enseñanza exitosos, respaldados por teorías y estrategias de aprendizaje relevantes (Yin et al., 2017). Un ejemplo digno de mención es el sistema educativo finlandés, de renombre internacional, que pone un fuerte énfasis en el enfoque multisensorial del aprendizaje. Este enfoque en el aprendizaje multisensorial ha contribuido al alto rendimiento constante de Finlandia en evaluaciones internacionales como las pruebas PISA (Puustinen et al., 2018). El aprendizaje multisensorial se considera un catalizador para el cambio a largo plazo (Mackay, 2012). Este enfoque se alinea con la teoría de Vygotsky, que destaca que lo que los niños pueden hacer hoy con el apoyo de un adulto, lo podrán lograr de forma independiente mañana. En un enfoque multisensorial, los niños son agentes activos de su propio aprendizaje y desarrollo (Wood, 2010). La investigación de Boardman (2019) respalda la idea de que un enfoque creativo y multisensorial es la forma más eficaz e inclusiva de enseñar e involucrar a todos los estudiantes. Esto se confirma con los hallazgos de Melhuish (2014) y Finnegan (2016), quienes sostienen que el cerebro aprende mejor cuando se expone a entornos y actividades ricos, complejos y multisensoriales. Comprender las creencias de los docentes es esencial para comprender sus intenciones y acciones en el aula. Identificar las creencias profundamente arraigadas de los docentes sobre el papel de la

tecnología en la enseñanza y el aprendizaje es un paso crucial para impulsar un cambio significativo en las prácticas educativas (Bice y Tang, 2022).

**Importancia e innovación de la investigación**

En esta investigación, se examinan las opiniones de los maestros y maestras de jardín de infantes de educación general y especial en la prefectura de Heraklion, como se detalla en subsecciones anteriores. Examinar las opiniones de los docentes es particularmente importante porque son los órganos docentes oficiales/formales del estado griego. Las exigencias de la Unión Europea y las recomendaciones de la OCDE para desarrollar prácticas inclusivas son un hecho y la opinión de los docentes es la que capta si hemos pasado de la teoría a su aplicación práctica para una escuela que brinde igualdad de oportunidades educativas a todos los estudiantes sin excepción.

El papel de los educadores es crucial, no sólo porque lideran el proceso de enseñanza, sino también porque ellos, junto con los estudiantes, sienten la dinámica de la experiencia de aprendizaje. Pueden mejorarlo, ajustarlo, enriquecerlo, transformarlo o adaptarlo para garantizar su eficacia y el logro de los objetivos educativos.

Las perspectivas de los docentes sobre la eficacia de la enseñanza han sido un tema de investigación en el escenario global. En Grecia, numerosos estudios han investigado la eficacia de la enseñanza en general; sin embargo, ninguna investigación identificada ha explorado específicamente los puntos de vista de los docentes sobre la enseñanza multisensorial. Las ideas proporcionadas por las opiniones de los profesores tienen especial importancia ya que arrojan luz sobre cómo comprenden e implementan la enseñanza multisensorial. Además, esta investigación profundiza en las opiniones de los docentes en relación con variables como el género, los años de experiencia y el nivel educativo, que, o no se han explorado sistemáticamente en Grecia, o se han examinado esporádicamente.

Creta es la isla más grande y poblada de Grecia, ubicándose como la quinta más grande del Mediterráneo tanto en términos de tamaño como de población, con 623.065 residentes. La región de Creta, que abarca 8.336 kilómetros cuadrados, ocupa el quinto lugar en tamaño de población entre las regiones griegas. Su capital y ciudad más grande, Heraklion, sirve como sede regional y abarca islas e islotes adyacentes. La prefectura de Heraklion, una parte constituyente de la región, se ubica como la cuarta prefectura más poblada de Grecia y alberga a 302.405 habitantes según el censo de población de

2021. Estos datos demográficos subrayan la presencia de una importante población estudiantil, numerosas instituciones educativas y, en consecuencia, un número sustancial de docentes.

Además, la variada geomorfología de Creta, particularmente dentro de Heraklion, que presenta tanto terreno montañoso como llanuras fértiles, ha alentado a los residentes a dedicarse a actividades agrícolas. Como resultado, los docentes empleados en la prefectura de Heraklion provienen de diversos orígenes geográficos de toda Grecia, en lugar de ser predominantemente locales.

Además, la crisis económica de Grecia, que persiste desde 2008, ha provocado la suspensión de los nombramientos docentes permanentes, lo que ha hecho necesarios contratos estacionales para cada año académico. Muchos de los educadores de este sistema eran sustitutos y rotaban anualmente a diferentes lugares y escuelas. La inseguridad laboral resultante ha llevado a los docentes a mejorar su competitividad en el mercado laboral y adquirir habilidades especializadas. Si bien en 2020 comenzaron a restablecerse nombramientos permanentes limitados, una proporción considerable de docentes siguió sin poder trasladarse a sus ubicaciones preferidas y continuaron trabajando en su lugar de asignación inicial.

Heraklion, debido a sus numerosos puestos docentes en educación primeria y de jardín de infantes, ha atraído a educadores recién nombrados de varias partes de Grecia. Si bien los hallazgos de este estudio no pueden generalizarse a todo el país, pueden ofrecer ideas que podrían ser indicativas de tendencias más generalizadas a nivel nacional.

**Limitaciones de la investigación.**

Todo esfuerzo de investigación debe reconocer las limitaciones del mundo real, ya que opera dentro de este contexto (Robson, 2007). Por lo tanto, tanto los objetivos de la investigación como los métodos de recopilación de datos deben alinearse con las limitaciones prácticas de tiempo y recursos.

Una limitación asociada con el plazo ajustado para realizar esta investigación es la utilización de un cuestionario como herramienta de recopilación de datos. En consecuencia, la investigación hereda las limitaciones inherentes de las encuestas como instrumentos de recopilación de datos, que incluyen la incapacidad de proporcionar aclaraciones o hacer preguntas de seguimiento, la ausencia de opciones adicionales de

recopilación de datos, la falta de control sobre la honestidad de los encuestados y otros problemas potenciales (Bryman, 2016).

Además, la extensión del cuestionario y el tiempo necesario para completarlo representan limitaciones prácticas que deben tenerse en cuenta. Si bien se podrían haber incluido preguntas adicionales para investigar cómo los profesores definen la eficacia y la facilidad de la enseñanza multisensorial, esto habría ampliado el cuestionario y potencialmente disuadido a los encuestados de completarlo (Vamvoukas, 2010). Además, se podrían incluir algunas preguntas abiertas para permitir que los participantes agreguen lo que ellos mismos quieran y no haya sido previsto por el investigador. Estas debilidades podrían aliviarse hasta cierto punto utilizando un segundo medio de recopilación de datos, como la entrevista. Pero esto no se pudo hacer porque después del COVID-19, en los servicios públicos y en las escuelas en particular, se siguieron estrictos protocolos sanitarios. Además, debido a la falta de márgenes de tiempo, las entrevistas retrasarían significativamente la finalización de esta investigación.

**Ética de la investigación**

La ética de la investigación se refiere a la aplicación de principios éticos fundamentales a diversos aspectos de la investigación científica. Estos principios guían a los investigadores en áreas como el diseño de la investigación, su implementación, el manejo de datos, la prevención del plagio, la evitación de la falsificación de datos y la garantía de la dignidad y los derechos de los participantes en la investigación. La ética de la investigación desempeña un papel crucial en el mantenimiento de la integridad, la credibilidad y la conducta responsable de los esfuerzos de investigación.

En el presente trabajo se tuvieron en cuenta los siguientes principios:

- Respetar la personalidad de los entrevistados y no causar ningún daño.
- El anonimato de los encuestados y su no trazabilidad.
- Participación voluntaria, consentimiento informado y capacidad de los encuestados de retirarse de la investigación.
- Confidencialidad de la información.
- Información sobre el propósito de la investigación, etc. (Cohen et al., 2008).

Todo lo anterior quedó asegurado mediante una carta pertinente que acompañaba al cuestionario. En particular, la carta menciona: El propósito de la investigación, el anonimato, el tiempo para completar el cuestionario y la participación voluntaria.

**Referencias**


Akamatsu, N. (1999). The effects of first language orthographic features on word recognition processing in English as a second language. *Reading and Writing, 11*(4), 381–403. Doi: 10.1023/A:1008053520326

Akinde, T. A. & Adetimirin, A. E. (2019). Administrative and infrastructural factors affecting library and information science educators' actual use of educational support systems for teaching in Nigerian universities. *Journal of Librarianship and Information Science, 51*(1), 180-195. Doi:10.1177/0961000618773140

Alexander, R. J. (2017). *Towards Dialogic Teaching: Rethinking Classroom Talk*. Diálogos.

Alwaqassi, S. A. (2017). *The use of multisensory in schools today* (Doctoral dissertation, [Bloomington, Ind.]: Indiana University).

Armstrong, T. (2009). *Multiple Intelligences in the Classroom* (3rd ed.). Association for Supervision & Curriculum Development.

Atanga, C., Jones, B. A., Krueger, L. E. & Lu, S. (2020). Teachers of Students With Learning Disabilities: Assistive Technology Knowledge, Perceptions, Interests, and Barriers. *Journal of Special Education Technology, 35*(4), 236-248. Doi:10.1177/0162643419864858

Baron, N. S. (2001). Commas and canaries: The role of punctuation in speech and writing. *Language Sciences*, *23*, 15-67. Doi: 10.1016/S0388-0001(00)00027-9

Bautista, A., Wong, J. & Gopinathan, S. (2015). Teacher professional development in Singapore: Depicting the landscape. Psychology, *Society and Education, 7*(3), 311–326.

Biancarosa, G. & Griffiths, G. G. (2012). Technology tools to support reading in the digital age. *The Future of Children, 22*, 139–160. Doi:10.1353/foc.2012.0014

Bice, H. & Tang, H. (2022). Teachers' beliefs and practices of technology integration at a school for students with dyslexia: A mixed methods study. *Educ Inf Technol 27*, 10179–10205. Doi:10.1007/s10639-022-11044-1

Boardman, K. (2020). An exploration of teachers' perceptions and the value of multisensory teaching and learning: a perspective on the influence of Specialist Dyslexia Training in England, *Education 3-13, 48*(7), 795-806. Doi: 10.1080/03004279.2019.1653349

Brown, A. L., Palinscar, A. S. & Purcell, L. (1986). Poor Readers: Teach, Don't Label. In U. Neisser (Eds.), *The School Achievement of Minority Children New Perspectives.* Routledge.

Bryman, A. (2016). *Methods of social research*. Gutenberg.

Caldwell, J. E. (2007). *Clickers in the Large Classroom: Current Research and Best-Practice Tips. CBE-Life Sciences Education, 6*, 9-20. Doi:10.1187/cbe.06-12-0205

Caravolas, M., Volín, J. & Hulme, C. (2005). Phoneme awareness is a key component of alphabetic literacy skills in consistent and inconsistent orthographies: Evidence from Czech and English children. *Journal of Experimental Child Psychology*, *92*(2), 107-139. Doi: 10.1016/j.jecp.2005.04.003

Cohen, L., Manion, L. & Morisson, K. (2008). *Educational research methodology.* Metaichmio.

Coltheart, M. (2005). Modelling reading: The dual-route approach. In M. J. Snowling & C. Hulme (Eds.), *The Science of Reading: A handbook* (pp. 6–23). Blackwell.

Cowley, S. (2013). *The Seven R's of Great Group Work*. Sue Coley books.

Cuturi, L. F., Cappagli, G., Yiannoutsou, N., Price, C. & Gori, M. (2022). Informing the design of a multisensory learning environment for elementary mathematics learning. *J Multimodal User Interfaces 16*, 155–171. Doi:10.1007/s12193-021-00382-y

Darling-Hammond, L., Wei, R. C., Andree, A., Richardson, N. & Orphanos, S. (2009). *Professional learning in the learning profession: A status report on teacher development in the United States and abroad*. National Staff Development Council.

Davies, C. (2012). *Creating Multisensory Environments*. Routledge.

Degani, T., Yagev, B. D., O. & Levy, A. L. (2023). Does brief exposure to a written text affect spelling performance in a second language?. *Read Writ* 36, 1901–1935. Doi:10.1007/s11145-022-10349-4

Devaney, A. A., Begeny, J. C., Haskett, M. E. & Ginns, D. S. (2019). Effects of a Reading Fluency Intervention on Middle School Students Attending a Residential Treatment Center for Youth with Emotional and Behavioral Disorders. *Contemp School Psychol*, *23*, 367–378. Doi:10.1007/s40688-018-0184-z

Erdem R. (2017). Students with special educational needs and assistive technologies: A literature review. *Turkish Online Journal of Educational Technology: TOJET*, 16(1), 128–146.

Ernst, M. O. & Banks, M. S. (2002). Humans integrate visual and haptic information in a statistically optimal fashion. *Nature, 415*, 429–433. Doi:10.1038/415429a

Ernst, M. O. & Bülthoff, H. H. (2004). Merging the senses into a robust percept. *Trends in Cognitive Sciences, 8*(4), 162–169. Doi:10.1016/j.tics.2004.02.002

Fazmina, A. F., Jazeet, A. M. & Saravanakumar, A. R. (2020). Enhancing the Attainment of Students with Dyslexia in Science through Multisensory Instructional Strategies. *J. Xidian Univ*, *14*(6), 1812-1818.

Finnegan, J. (2016). *Lighting up Young Brains. How Parents, Carers and Nurseries Support Children's Brain Development in the First Five Years*. Save the Children.

Flanagan, S., Bouck, E. C. & Richardson, J. (2013). Middle school special education teachers' perceptions and use of assistive technology in literacy instruction. *Assistive Technology, 25*, 24–30. Doi:10.1080/10400435.2012.682697

Flecker, M. & Cogan, J. (2000). The Learning Skills. In *Dyslexia in Practice: A Guide for Teachers*. In J. Townend & M. Turner (Eds.), 209–249. Kluwer Academic/Plenium Publishers.

Frk, V. (2014). Zmeny, očakávania a výzvy profesijného vzdelávania zamestnancov, Vzdelávanie asociálna stratifikácia, University of Prešov, pp. 50-71. https://tinyurl.com/yc248nt2

Gaitanidi, L.-A., Corujo-Vélez, C. & Vega-Gea, E. (2023). The Impact of Dyslexia Box: A Case Study on Students in an Integration Class in Greece. *Education Sciences*, *13*(5), 486. MDPI AG. Doi:10.3390/educsci13050486

Gillingham, A. & Stillman, B. (1956). *Remedial Training for Children with Specific Disability in Reading, Spelling and Penmanship* (5th ed). Educators Publishing Service.

Gnardellis, Ch. (2022). *Data analysis with the IBM SPSS Statistics 28*. Papazisi.

Gonzalez, M. T. D., Phillips-Silver, J., Maurno, N. G., Fernández García, L. & Ruiz-Castañeda, P. (2023). Improving phonological skills and reading comprehension in deaf children: A new multisensory approach, *Scientific Studies of Reading*, *27*(2), 119-135. Doi:10.1080/10888438.2022.2095280

Goswami, U. (2015). *Children's Cognitive Development and Learning*. Cambridge Review Trust.

Harari, Y. N. (2015). Sapiens: *A brief history of humankind*. Alexandreia.

Harlen, W. (2007). *Assessment of Learning*. SAGE Publications.

Heafner, T. L., Lipscomb, G. B. & Fitchett, P. G. (2014). Instructional Practices of Elementary Social Studies Teachers in North and South Carolina. *The Journal of Social Studies Research, 38*(1), 15-31. Doi:10.1016/j.jssr.2013.12.002

Hébert, C., Jenson, J. & Terzopoulos, T. (2021). Access to technology is the major challenge: Teacher perspectives on barriers to DGBL in K-12 classrooms. *E-Learning and Digital Media, 18*(3), 307-324. Doi:10.1177/2042753021995315

Holmes, V. M. & Carruthers, J. (1998). The relation between reading and spelling is skilled adult readers. *Journal of Memory and Language, 39*(2), 264–289.

Holstein, K., McLaren, B. M. & Aleven, V. (2017, March). Intelligent tutors as teachers' aides: exploring teacher needs for real-time analytics in blended classrooms. In Proceedings of the seventh international learning analytics & knowledge conference (pp. 257–266). ACM.

Huang, J., Liu, J., Tian, R., Liu, K., Zhuang, P., Sherman, H. T., Budjan, C., Fong, M., Jeong, M.-S. & Kong, X. -J. (2022). Correction: Huang et al. A Next Generation Sequencing-Based Protocol for Screening of Variants of Concern in Autism Spectrum Disorder. *Cells* 2022, *11*(20), *Cells*. Doi:10.3390/cells11203276

Hunter-Carsch, M. 2001. *Dyslexia; A Psychosocial Perspective*. Whurr.

Joshi, M. R., Dahlgren, M. & Boulware-Gooden, R. (2002). Teaching reading in an inner city school through a multisensory teaching approach. *Annals of Dyslexia, 52*, 229–242.

Joshi, M. R., Dahlgren, M. & Boulware-Gooden, R. (2002). Teaching reading in an inner city school through a multisensory teaching approach. *Annals of Dyslexia, 52*, 229–242.

Kelly, K. & S. Phillips. (2016). *Teaching Literacy to Learners with Dyslexia A Multisensory Approach*. 2nd ed. Sage.

Kennedy, M. M. (2016). How does professional development improve teaching? *Review of Educational Research, 86*(4), 945–980. Doi:10.3102/0034654315626800

Khlaif, Z. (2018). Teachers' Perceptions of Factors Affecting Their Adoption and Acceptance of Mobile Technology in K-12 Settings, *Computers in the Schools, 35*(1), 49-67. Doi: 10.1080/07380569.2018.1428001

Koch, K. (2017). Stay in the box! Embedded assistive technology improves access for students with disabilities. *Education Sciences, 7*(4), 82.

Krainer, K. (2011). Teachers as stakeholders in mathematics education research. In: B. Ubuz (Ed), *Proceedings of the 35th conference of the International Group for the Psychology of Mathematics Education,* 1, 47–62).

Loizou, F. (2016). Changes in teaching in order to help students with learning difficulties improve in Cypriot primary classes, International Journal of Primary, *Elementary and Early Years Education, 44*(4), 371-390. Doi:10.1080/03004279.2014.948031

Mackay, N. (2012). *Removing Dyslexia as a Barrier to Achievement: The Dyslexia Friendly Toolkit (3rd Edition).* Wakefield: SEN Books.

Mccaskill, M. (2001). Grammar, Punctuation, and Capitalization - A Handbook for Technical Writers and Editors. *Research gate*. https://tinyurl.com/mumyme4e

Melhuish, E. C. (2014). *The Impact of Early Childhood Education and Care on Improved Wellbeing in "If you Could do one Thing…" Nine Local Actions to Reduce Health Inequalities*. The British Academy.

Minogue, J. & Jones, M. G. (2006). Haptics in education: Exploring an untapped sensory modality. *Review of Educational Research, 76*(3), 317–348. Doi:10.3102/00346543076003317

Mpastea, A. (2014). *An intervention for Specific Learning Disorder-Dyslexia through the development of Multisensory Teaching Method.* (Doctoral thesis). Aristotle University, Thessaloniki.

Nijakowska, J. (2008). An experiment with direct multisensory instruction in teaching word reading and spelling to Polish dyslexic learners of English. *Language learners with special needs: An international perspective*, 130-157.

O'Brien, J., Ottoboni, G., Tessari, A. & Setti, A. (2021). Multisensory Perception, Verbal, Visuo-spatial and Motor Working Memory Modulation After a Single Open- or Closed-Skill Exercise Session in Children. *J Cogn Enhanc,* 5, 141–154. Doi:10.1007/s41465-020-00189-x

O'Connor, C., Michaels, S. Chapin, S. & Harbaugh, A. G. (2017). The Silent and the Vocal: Participation and Learning in Whole-Class Discussion. *Learning and Instruction, 48*, 5–13. Doi:10.1016/j.learninstruc.2016.11.003

O'Muircheartaigh, C., Krosnick, J. & Helic, A. (1999). *Middle Alternatives, Acquiescence, and the Quality of Questionnaire Data, Working Papers 0103*, Harris School of Public Policy Studies, University of Chicago.

Orton, S. T. (1937). *Reading, writing and speech problems in children.* W W Norton & Co.

Pappas, T. (2002). *The Methodology of Scientific Research in the Humanities*. Kardamitsa Publications.

Porpodas, K. D. (2002). *The reading*. Hellenika Grammata.

Puspitaloka, N. & Syarif, H. E. (2021). Teacher's Perception on How Multisensory Approach in Teaching Reading for EYL with Dyslexia, *Advances in Social Science, Education and Humanities Research, 539, Proceedings of the Ninth International Conference on Language and Arts (ICLA 2020).* Atlantis Press.

Robson, C. (2007). *Real World Research*. Gutenberg.

Roulstone, S., Wren, Y., Bakopoulou, I. & Lindsay. G. (2012). Interventions for Children with Speech, Language and Communication Needs: An Exploration of Current Practice. *Child Language Teaching and Therapy, 28*(3), 325–341.

Ruppar A. L., Neeper L. S. & Dalsen J. (2016). Special education teachers' perceptions of preparedness to teach students with severe disabilities. *Research and Practice*

*for Persons With Severe Disabilities*, *41*(4), 273–286. Doi:10.1177/1540796916672843

Saris, W. E. & Gallhofer, I. N. (2007). *Design, evaluation, and analysis of questionnaires for survey research.* Wiley-Interscience. Doi:10.1002/9780470165195

Schlesinger, N. W. & Gray, S. (2017). The impact of multisensory instruction on learning letter names and sounds, word reading, and spelling. *Ann. of Dyslexia* 67, 219–258. Doi:10.1007/s11881-017-0140-z

Selwyn, N. (2011). *Education and Technology: Key Issues and Debates*. Continuum International Publishing Group.

Serafini, M. (2018). The professional development of VET teachers in Italy: participation, needs and barriers. Statistical quantifications and benchmarking in an international perspective. *Empirical Res Voc Ed Train, 10*(3). Doi:10.1186/s40461-018-0064-9

Slater, Z. & Chambers, G. (2022). Primary teachers' perceptions of whole-class teaching and learning in English primary schools: an exploratory study of perceived benefits, challenges and effective practice, *Education 3*(13). Doi: 10.1080/03004279.2022.2110603

Spiteri, M., Chang Rundgren, S.-N. (2020). Literature Review on the Factors Affecting Primary Teachers' Use of Digital Technology. *Tech Know Learn,* 25, 115–128. Doi:10.1007/s10758-018-9376-x

Stanovich, K. E. (1986). Matthew effects in reading: Some consequences of individual differences in the acquisition of literacy. *Reading Research Quarterly, 21*(4), 360–407. Doi:10.1598/RRQ.21.4.1

Stephenson, J. & Carter, M. (2011). The Use of Multisensory Environments in Schools for Students with Severe Disabilities: Perceptions from Teachers. *Journal of Developmental and Physical Disabilities*, *23*(4), 339-357. Doi: 10.1007/s10882-011-9232-6

Stoner, J. B., Parette, H. P., Watts, E. H., Wojcik, B. W. & Fogal, T. (2008). Preschool teacher perceptions of assistive technology and professional development responses. *Education and Training in Developmental Disabilities, 43,* 77–91.

Sun, M., Penuel, W. R., Frank, K. A., Gallagher, H. A. & Youngs, P. (2013). Shaping professional development to promote the diffusion of instructional expertise among teachers. *Educational Evaluation and Policy Analysis, 35*(3), 344–369. Doi:10.3102/01623737134822763

Syahputri, D. (2019). The Effect of Multisensory Teaching Method on The Students' Reading Achievement, *Budapest International Research and Critics in*

*Linguistics and Education (BirLE) Journal, 2*(1), 124-131, Doi:10.33258/birle.v2i1.192

Thompson, N. (2019). Ontario school board projects $28.7M shortfall due to provincial cuts', *CTV news*. https://tinyurl.com/e42z7ey7

Toste, J. R., Didion, L., Peng, P., Filderman, M. J. & McClelland, A. M. (2020). A meta-analytic review of the relations between motivation and reading achievement for K–12 students. *Review of Educational Research, 90*(3), 420–456. Doi:10.3102/0034654320919352

Tsakiridou, H. & K. Polyzopoulou (2014). Greek Teachers' Attitudes toward the Inclusion of Students with Special Educational Needs. *American Journal of Educational Research, 2*(4), 208-218. Doi:10.12691/education-2-4-6

Tyk, I. (2014). Whole Class Teaching: A Paper for the Campaign for Real Education. Halland: The Campaign for Real Education. https://www.cre.org.uk/docs/CRE-Whole-Class-Teaching.pdf.

Vamvoukas, M. (2010). *Introduction to psychopedagogical research and methodology*. Grigoris.

Volpe, G. & Gori, M. (2019). Multisensory interactive technologies for primary education: from science to technology. *Front Psychol*, *10*, 1076.

Wood, E. (2010). Cross Curricular Teaching to Support Child-Initiated Learning in EYFS and KS1. In T. Kerry (Ed), *Cross Curricular Teaching in the Primary School* (pp. 34–58). Routledge.

Wright, M. C., Bergom, I. & Bartholomew, T. (2019). Decreased class size, increased active learning? Intended and enacted teaching strategies in smaller classes. *Active Learning in Higher Education, 20*(1), 51-62. Doi:10.1177/1469787417735607

Wu, H. K., Hsu, Y. S. & Hwang, F. K. (2008). Factors Affecting Teachers' Adoption of Technology in Classrooms: Does School Size Matter?. *Int J of Sci and Math Educ 6*, 63–85. Doi:10.1007/s10763-006-9061-8

Yeager, E. A. & Hover, S. V. (2006). Virginia vs. Florida: Two Beginning History Teachers' Perceptions of the Influence of High-Stakes Tests on Their Instructional Decision-Making, *Social Studies Research and Practice, 1*(3), 340-358. Doi:10.1108/SSRP-03-2006-B0005

Yin, H., Han, J. & Lu. G. (2017). Chinese Tertiary Teachers' Goal Orientations for Teaching and Teaching Approaches: the Mediation of Teacher Engagement. *Teaching in Higher Education, 22*(7), 766–784. Doi: 10.1080/13562517.2017.1301905.

Zafeiropoulos, K. (2015). *How Is A Scientific Work Done? Scientific Research And Paper Writing.* Kritiki.

# TABLE CONTENT

# EXPRESSIONS OF GRATITUDE: ACKNOWLEDGEMENTS FOR SUPPORT AND GUIDANCE

I would like to express my heartfelt gratitude to all those who have supported me throughout my doctoral journey.

First and foremost, I am deeply thankful to my supervisors, María del Carmen Corujo and Esther Vega Gea, for their unwavering guidance, encouragement, and invaluable insights. Their expertise and dedication have been instrumental in shaping this research and in my personal and academic growth.

I am indebted to my family for their unconditional love, encouragement, and understanding throughout this journey. Their unwavering support has been my pillar of strength.

Furthermore, I would like to thank my friend Sotiris Papaoikonomou who contributed with his medical knowledge to the development of the theoretical framework of my dissertation.

Last but not least, if it weren't for Evangelos Pompodakis, encouraging me, supporting me, loving me, and believing in my abilities, I might not have completed my dissertation.

This dissertation would not have been possible without the generosity, guidance, and support of each and every one of you. Thank you from the bottom of my heart.

To my beloved friend Sotiris Papaoikonomou…

Your untimely departure left a void in my heart. This doctoral dissertation is dedicated to your memory, a tribute to your brilliance, kindness, and enduring friendship. Your absence is deeply felt, but your spirit will continue to inspire me forever.

# ABSTRACT

The aim of this study was to investigate the perspectives of typical and special education teachers and kindergarten teachers in the prefecture of Heraklion concerning multisensory education and its implementation in the classroom for students with dyslexia and/or those in typical education.

More specifically, based on the international literature, teaching based on the multisensory approach has proven positive results for students with dyslexia. This is because it simultaneously uses more sensory pathways, such as vision, hearing and kinesthetics, connecting different areas of the brain to the object being taught. In this way, potential problems arising from processing information through only one sense, such as hearing or vision, are addressed. This teaching allows the simultaneous participation of multiple senses, such as touch, movement, hearing and sight, in the learning process. Through this approach, children develop different forms of memories, such as tactile, visual, auditory or kinesthetic, enabling each child to tap into their potential for effective learning (Loizou, 2016). However, it is worth noting that, in practice, the predominant mode of instruction in schools still relies primarily on visual or auditory methods (Syahputri, 2019).

Hence, the research was designed to explore two main aspects. Firstly, to assess teachers' knowledge regarding multisensory teaching, and secondly, to examine their attitudes and perceptions regarding its effectiveness in Greek schools, particularly within the context of Heraklion Prefecture. Simultaneously, the study aimed to identify potential obstacles and weaknesses in implementing multisensory practices within primary schools in Heraklion prefecture. Additionally, the research delved into teachers' attitudes and perceptions concerning the inclusion of students with dyslexia. Understanding teachers' beliefs is crucial for comprehending their intentions and actions in the classroom. An essential step in bringing about change is identifying teachers' deeply rooted beliefs about the role of technology in teaching and learning (Bice & Tang, 2022).

The research focused on the prefecture of Heraklion as it ranks as the fourth most populous prefecture in Greece, housing 302,405 inhabitants according to the 2021 population census. This demographic data underscores the presence of a significant

student population, numerous educational institutions, and consequently, a substantial number of teachers. Moreover, Crete's varied geomorphology, particularly within Heraklion, which features both mountainous terrain and fertile plains, has encouraged residents to engage in agricultural pursuits. As a result, teachers employed in the Heraklion prefecture hail from diverse geographical origins across Greece, rather than being predominantly local.

The multisensory teaching approach involves an educational methodology where students engage all their sensory faculties—comprising hearing, smell, touch, sight, taste, and feel—in learning environments (Suryaratri et al., 2019). These hands-on strategies emulate the natural learning process observed in infants and toddlers, who, through touch and taste, explore and comprehend the world (Sarudin, et al. 2019). The goal of the multisensory approach in education is to enhance children's learning by employing multiple senses simultaneously. This addresses potential challenges associated with processing information through a single sense, such as hearing or vision, by allowing for the concurrent engagement of various senses, including touch, movement, hearing, and vision, during the learning process. Consequently, this approach enables children to develop diverse forms of memories—tactile, visual, auditory, or kinesthetic—empowering each child to harness their potential for effective learning (Loizou, 2016).

A total of 285 teachers took part in the research, with 38 being men and 247 being women. The interviewed teachers exclusively represented the specialization of either typical or special education teachers, including kindergarten teachers.

The research findings indicate a general consensus among all teachers and kindergarten teachers that students with disabilities benefit from the multisensory approach to teaching. However, there is a need for further investigation into the multisensory method and effective teaching tools. A significant gap in the existing literature pertains to the effectiveness of multisensory education in relation to the teacher's specialization, the type of school, subjects (specifically in science for typical or special education schools), and the frequency of implementing multisensory teaching. Furthermore, there is an identified gap in understanding the factors influencing the frequency of employing multisensory practices, the barriers to their implementation in kindergarten and

elementary schools, and the ideal qualifications of a teacher for effective multisensory instruction.

**Keywords**: multisensory teaching, dyslexia, specific learning disorder, inclusion

## Introducción

El lenguaje es una de las herramientas más importantes que las personas han utilizado para su supervivencia y evolución. Desde la antigüedad hasta la actualidad, ha desempeñado un papel crucial en la transmisión del conocimiento, la comunicación y el desarrollo de la sociedad humana.

El avance de sociedades complejas exigió al hombre gestionar una gran cantidad de información, la cual no podía retener en su memoria. Surgió entonces como una necesidad natural la comunicación de una manera que pudiera preservar esta información, algo que no era posible a través del discurso oral. Así, el hombre inventó la escritura, abriendo nuevos horizontes en el desarrollo del conocimiento y la ciencia. La escritura permitió almacenar, transmitir y procesar una gran cantidad de información, superando los límites de la memoria humana finita y permitiendo la transferencia de información independientemente del tiempo y el espacio (Porpodas, 2002; Harari, 2015). Además, la aparición de la escritura destacó nuevas formas de organización social y del conocimiento, al posibilitar la difusión de información a un gran número de personas durante períodos prolongados (Harari, 2015).

Además, el habla oral incluye algunos elementos no lingüísticos, como movimientos corporales y gestos, que añaden significado adicional y expresión emocional a la comunicación. El uso de tales elementos no lingüísticos puede incluso cambiar por completo el significado de una oración. Esto se puede entender considerando el siguiente diálogo común entre las personas A y B: A: '¿Cómo estás?' B: 'Estoy bien'. La manera en que se emite la respuesta, junto con todos los elementos de comunicación no lingüística, puede alterar por completo su significado. Por ejemplo, aunque la persona B diga que está bien, ¿qué pensaríamos si lo dijera con los ojos llorosos? ¿O si evitara el contacto visual? ¿O si su rostro estuviera enrojecido? En el lenguaje hablado, los estímulos enviados por el emisor y la forma en que el receptor los interpreta crean una variedad de significados diferentes.

Por otro lado, el lenguaje escrito se refiere a la comunicación a través de la escritura y la lectura, utilizando medios como textos, artículos, correos electrónicos, mensajes en redes sociales y otros. Se basa en el uso de letras, símbolos y reglas sintácticas para expresar ideas y pensamientos. El lenguaje escrito permite al emisor organizar sus pensamientos y seleccionar las palabras adecuadas para expresarlos. Al mismo tiempo,

permite al receptor leer y comprender el contenido a su propio ritmo y tiempo. Además, la palabra escrita es importante porque permite preservar la información en el tiempo y registrar pensamientos y opiniones específicos. También es un método eficaz de comunicación para transmitir información a lugares distantes e intercambiar ideas entre personas que no se encuentran en el mismo lugar.

Surge entonces la pregunta: ¿cómo podría transferirse la transmisión de mensajes complejos de la palabra hablada, que a menudo se realiza incluso de forma espontánea o no intencionada, sin perder parte del significado esencial para la comunicación? En la escritura, el uso correcto de la gramática, la sintaxis, la ortografía y la puntuación es vital para comprender y transmitir mensajes de manera eficaz. Los signos de puntuación sirven para separar los elementos de una oración, distinguir cláusulas continuas, cláusulas dependientes y cláusulas entre paréntesis, así como para marcar énfasis, acentuación y pausas en una oración (Mccaskill, 2001). Al mismo tiempo, clarifican el significado (Jackson, 2005; Barón, 2001; McCaskill, 2001).

La cuestión de la necesaria existencia de los signos de puntuación ha persistido desde la antigüedad hasta nuestros días, manifestándose en una frase proverbial asociada a la ambigüedad. Esta frase en particular proviene de la profecía de Pythia en el oráculo de Delfos y constituye un engaño inteligente

"*Ἥξεις ἀφήξεις οὐκ ἐν πολέμῳ θνήξεις"*

La profecía era oral y podía ser interpretada subjetivamente por el receptor. Si esta frase se trasladara a la palabra escrita, seguramente tendría comas, pero esto en este caso particular cambiaría completamente el significado

"Ἥξεις, ἀφήξεις, οὐκ ἐν πολέμῳ θνήξεις." La frase sin comas podría traducirse como "irás, volverás, no morirás en la guerra" mientras que con comas como "irás, no volverás, en la guerra morirás". Así, independientemente del resultado del destino de la persona, el oráculo se atribuyó el mérito.

Toda la complejidad de la palabra hablada transmitida a través del código escrito a menudo dificulta las cosas a los estudiantes. La lectura y la escritura, como capacidades mentales superiores, requieren funciones abstractas y coordinación de mecanismos cognitivos complejos (Porpodas, 2002). El acto de leer provoca la activación de las correspondientes representaciones mentales de las palabras escritas, incluida

información como la semántica, la ortografía, la fonología y la morfología (Akamatsu, 1999). Específicamente, las mismas representaciones lingüísticas mentales también están involucradas durante el proceso de ortografía, por lo que para escribir con precisión una palabra, uno debe tener acceso a estos diversos tipos de información (Russak & Kahn-Horwitz, 2015). Como resultado, la capacidad de ortografía correcta puede funcionar como un vistazo a las representaciones lingüísticas cognitivas que sustituyen el acto de leer. Además, considerando la superposición dentro de estas representaciones subyacentes (Holmes & Carruthers, 1998), la lectura y la ortografía están estrechamente vinculadas, por lo que las mejoras en un proceso pueden resultar en avances en el otro (Degani et al., 2023).

Las ideas centrales sobre los desafíos en la adquisición de habilidades lectoras se centran principalmente en el desarrollo del reconocimiento de los sonidos de las palabras. Como se describe en el modelo de doble vía para la lectura (Coltheart, 2005), la capacidad de transformar símbolos escritos en sus correspondientes sonidos del habla juega un papel vital en el proceso de lectura. Este mecanismo favorece especialmente la ruta fonológica o subléxica, que es una de las dos rutas de lectura definidas por el modelo. Cuando esta ruta se activa durante la lectura, tras un examen visual inicial de una palabra, se hace necesaria una conversión de las letras (grafemas) a sus sonidos asociados (fonemas) para crear la representación auditiva de esa palabra (González et al., 2023).

Durante el proceso de lectura y escritura se activa una función cognitiva compleja que implica la integración de habilidades visuales, auditivas y táctiles-cinestésicas (Minogue & Jones, 2006). Cuando un individuo no logra adquirir habilidades lectoras, esto afecta negativamente su actitud hacia cualquier actividad que implique lectura (Stanovich, 1986). Como resultado, existe un vocabulario limitado en comparación con el grupo de pares y una capacidad restringida para emplear estrategias metacognitivas para comprender textos escritos (Brown et al., 1986). En la misma línea, la comprensión lectora, además de los procesos cognitivos y metacognitivos, también está ligada a la motivación del lector, es decir, al impulso interno del individuo que proviene de un conjunto de objetivos, creencias y actitudes del individuo hacia la lectura (Toste et al., 2020)

Las dificultades en el proceso de aprendizaje pueden deberse al hecho de que los enfoques educativos a menudo no consideran adecuadamente las percepciones sensoriales. Específicamente, teniendo en cuenta que la mayor parte de la información se transmite a través de medios visuales como libros de texto y presentaciones (Volpe & Gori, 2019), es razonable suponer que la visión tiene un papel predominante dentro del aula. Sin embargo, los individuos poseen sistemas multisensoriales para percibir e interactuar con su entorno (Cuturi et al., 2021). Los estudios sobre percepción multisensorial han demostrado cómo la integración de diversas modalidades sensoriales mejora el procesamiento de los atributos de los objetos, como su altura (Ernst & Banks, 2002) o su forma (Helbig & Ernst, 2007). Este mecanismo se reconoce como integración sensorial y tiene lugar cuando el cerebro armoniza diferentes metodologías sensoriales (Ernst & Bülthoff, 2004).

Si las dificultades de lectura no se abordan en los primeros años escolares, entonces en los grados superiores, donde los textos son más largos, el estudiante no leerá para comprender el significado, sino como práctica en el proceso mismo de lectura (Stanovich, 1986). Se entiende fácilmente a través de las siguientes condiciones hipotéticas, imaginemos: A. escuchar un texto silábicamente, con pausas y muchos errores de lectura y B. escuchar un texto del mismo nivel de dificultad que el primero a un ritmo de lectura normal. ¿Cuándo sería mejor la comprensión del contenido del texto? Es seguro que en el segundo caso la comprensión auditiva sería mucho mejor. Lo mismo podría decirse de la comprensión lectora. Los estudiantes que tienen dificultades en la lectura y especialmente aquellos que han recibido un diagnóstico de una discapacidad de aprendizaje específica, sin lugar a dudas, deben tener una intervención docente temprana en lectura y escritura que satisfaga sus necesidades, ya que es la única manera de abordar sus dificultades de aprendizaje (Caravolas, et al., 2005; Harlen, 2007). Otra razón de la necesidad de seguir un programa de enseñanza especializado para estudiantes que no han desarrollado habilidades lectoras tempranas es el hecho de que tienen mayor riesgo de abandonar la escuela (Reschly, 2010) y desarrollar trastornos emocionales en el futuro (Devaney et al., 2018)

Kelly y Phillips (2016) definen el término “multisensorial” como la presentación de información a través de formas visuales, auditivas, cinestésicas y táctiles, con orientación destinada a proporcionar tantas de estas experiencias como sea posible. En consecuencia, el aprendizaje multisensorial depende en gran medida de todos los

sentidos utilizados como método fundamental de retención de información, en contraste con las prácticas más comunes de enseñanza utilizando únicamente la vista y el oído (Boardman, 2020). La investigación realizada por Goswami (2015) y Roulstone et al. (2012) ha revelado que cuando se trata de niños que experimentan dificultades para adquirir habilidades de lectura, el método de enseñanza que incorpora múltiples sentidos, conocido como enfoque multisensorial, tiende a producir los resultados más exitosos en términos de efectividad de la instrucción.

En la misma línea, existen numerosos estudios internacionales que confirman los beneficios de la enseñanza multisensorial para estudiantes con y sin dificultades específicas de aprendizaje (Gaitanidi, et al., 2023; Sadoski et al., 2013), algunos de ellos centrados en las habilidades de decodificación y otros sobre el dominio de la ortografía. Los enfoques de enseñanza que emplean métodos sensoriales se basan en descubrimientos científicos que revelan que durante todo el proceso de aprendizaje, el cerebro absorbe información y mensajes utilizando toda la gama de órganos sensoriales disponibles (Mpastea, 2014). Esto resulta especialmente significativo cuando una vía sensorial particular puede no estar tan desarrollada como otras. En tales casos, resulta imperativo compensar esta deficiencia aprovechando vías sensoriales alternativas (Orton, 1937; Gillingham et al., 1956;).

El objetivo de este estudio fue investigar las perspectivas de los maestros de educación general y especial y de los maestros de jardín de infantes en la prefectura de Heraklion con respecto a la educación multisensorial y su implementación en el aula para estudiantes con dislexia y/o aquellos en educación general.

Más específicamente, según la literatura internacional, la enseñanza basada en el enfoque multisensorial ha demostrado resultados positivos para los estudiantes con dislexia. Esto se debe a que utiliza simultáneamente más vías sensoriales, como la visión, la audición y la cinestésica, conectando diferentes áreas del cerebro con el objeto que se enseña. De esta forma se abordan posibles problemas derivados del procesamiento de información a través de un solo sentido, como el oído o la visión. Esta forma de enseñar permite la participación simultánea de múltiples sentidos, como el tacto, el movimiento, el oído y la vista, en el proceso de aprendizaje. A través de este enfoque, los niños desarrollan diferentes formas de recuerdos, como táctiles, visuales, auditivos o cinestésicos, lo que permite a cada niño aprovechar su potencial para un

aprendizaje eficaz (Loizou, 2016). Sin embargo, vale la pena señalar que, en la práctica, el modo de instrucción predominante en las escuelas todavía se basa principalmente en métodos visuales o auditivos (Syahputri, 2019).

La presente tesis doctoral se estructura en dos partes principales: 1) la parte teórica, que comprende una revisión de la literatura relevante y consta de siete capítulos, y 2) la parte de investigación, que incluye la metodología de la investigación, los resultados y las conclusiones.

A continuación, se presentan brevemente todos los capítulos con su temática.

La parte teórica consta de los siguientes capítulos:

**11) Dificultades de aprendizaje y trastornos específicos del aprendizaje.**

En este Capítulo, primero aclaramos los términos tal como se utilizan en este trabajo. Luego discutimos la prevalencia, indicaciones y desarrollo de los Trastornos Específicos del Aprendizaje (SLD), junto con los criterios de diagnóstico correspondientes según el DSM-5 y la CIE-10. Además, nos esforzamos por definir el término "dislexia" y mencionar sus subtipos, así como discutir las teorías dominantes al respecto y cómo podría diagnosticarse en todo el mundo y en Grecia.

**12) Marco legal y leyes sobre educación especial en Grecia.**

En el Capítulo dos, delineamos quiénes califican como estudiantes con discapacidades y necesidades educativas especiales según la legislación griega. También discutimos los tipos de escuelas que brindan apoyo a estudiantes con necesidades educativas especiales, junto con los mecanismos para financiar las necesidades operativas de las escuelas en Grecia.

**13) Los sentidos humanos y su importancia en el aprendizaje.**

En el Capítulo 3 profundizamos en los sentidos humanos y su importancia en el proceso de aprendizaje. Específicamente, exploramos la percepción sensorial, la interacción entre los sentidos y el cerebro, y la relación entre las experiencias sensoriales y el aprendizaje.

**14) Memoria y aprendizaje.**

En el Capítulo 4, examinamos la interfaz entre la memoria y el aprendizaje. Comenzamos dilucidando el concepto de memoria, discutiendo su integración con el

aprendizaje. Además, exploramos aspectos como la memoria a corto y largo plazo, las estrategias mnemotécnicas y la correlación entre memoria y lectura.

**15) Enfoque multisensorial.**

En el Capítulo 5, nos centramos en el enfoque multisensorial. Después de una aclaración de los términos relevantes, exploramos la contribución significativa del enfoque multisensorial a la educación, particularmente su impacto en los estudiantes con dificultades de aprendizaje. Por último, discutimos el diseño y los beneficios de los entornos de aprendizaje multisensorial.

**16) Intervenciones-estrategias en dislexia.**

En el Capítulo 6, exploramos intervenciones y estrategias para la dislexia. Esto incluye una descripción histórica del método de enseñanza multisensorial pionero de Orton-Gillingham, un examen de varios programas basados en este enfoque y una discusión de intervenciones que aplican principios similares sin estar explícitamente basados en Orton-Gillingham. Además, destacamos otras prácticas de enseñanza efectivas diseñadas para estudiantes con dislexia.

**17) Educación inclusiva.**

En el Capítulo 7 profundizamos en la educación inclusiva. Comenzamos aclarando los términos relevantes e identificando los factores inhibidores de la inclusión. Posteriormente, exploramos métodos para implementar la educación inclusiva y discutimos el papel fundamental del docente dentro de estos métodos. Finalmente, examinamos varios modelos inclusivos, dilucidamos sus beneficios de aprendizaje y discutimos sus implicaciones.

La parte de investigación consta de los siguientes capítulos:

**18) Metodología de la investigación.**

En el Capítulo 8 presentamos la metodología de investigación. Esto incluye delinear el propósito y los objetivos de la investigación, dilucidar los medios de recolección de datos, describir la muestra de la investigación, discutir el método de análisis estadístico empleado y abordar la validez y confiabilidad de la investigación.

**19) Resultados de la investigación.**

En este Capítulo, proporcionamos una descripción detallada de las estadísticas descriptivas obtenidas de la investigación, junto con un análisis integral de cómo estas

estadísticas descriptivas se cruzan con otras variables. Esto incluye explorar varias medidas estadísticas descriptivas y sus implicaciones cuando se analizan junto con otras variables pertinentes.

**20) Conclusiones.**

En el Capítulo 10, presentamos las conclusiones extraídas de la investigación, enfatizando su innovación y contribuciones originales al campo. Además, abordamos las limitaciones encontradas durante el proceso de investigación. Además, discutimos la ética de la investigación observada a lo largo del estudio, destacando las consideraciones éticas y los protocolos seguidos.

Al final del documento encontrará el apéndice que incluye el cuestionario utilizado en el estudio. Este apéndice proporciona una descripción detallada del instrumento de encuesta utilizado para recopilar datos para la investigación.

A continuación, se presenta una breve referencia a los capítulos de investigación de la tesis con énfasis en los Finalidad y objetivos de la investigación - Medios de recogida de datos, la muestra de investigación, método de análisis estadístico de los datos, confiabilidad-validez de la investigación, resultados de la investigación, conclusiones

**Finalidad y objetivos de la investigación - Medios de recogida de datos**

La investigación fue diseñada para explorar dos aspectos principales. En primer lugar, evaluar el conocimiento de los profesores sobre la enseñanza multisensorial y, en segundo lugar, examinar sus actitudes y percepciones sobre su eficacia en las escuelas griegas, particularmente en el contexto de la prefectura de Heraklion. Al mismo tiempo, el estudio tuvo como objetivo identificar posibles obstáculos y debilidades en la implementación de prácticas multisensoriales en las escuelas primarias de la prefectura de Heraklion. Además, la investigación profundizó en las actitudes y percepciones de los docentes respecto a la inclusión de estudiantes con dislexia. Comprender las creencias de los docentes es crucial para comprender sus intenciones y acciones en el aula. Un paso esencial para lograr el cambio es identificar las creencias profundamente arraigadas de los docentes sobre el papel de la tecnología en la enseñanza y el aprendizaje (Bice & Tang, 2022).

Esta investigación emplea un enfoque cuantitativo para explorar conexiones y relaciones entre varios factores. La investigación cuantitativa implica el examen

sistemático de fenómenos mediante métodos estadísticos y análisis de datos numéricos. En la investigación cuantitativa, uno de los instrumentos estructurados comúnmente empleados para la recolección de datos es el cuestionario (Zafeiropoulos, 2015).

Más específicamente, el objetivo de esta investigación es evaluar las perspectivas de los profesores de educación generaleducación general y especial y de los profesores de jardín de infantes en la prefectura de Heraklion en Grecia, con respecto a la educación multisensorial y su implementación en las aulas de estudiantes disléxicos y de educación estándar.

Los principales objetivos de la investigación, el número de pregunta del cuestionario y el tipo de pregunta se presentan en la siguiente tabla.

| Objetivos | Número de pregunta del cuestionario | Tipo de pregunta |
|---|---|---|
| 1. Describir el conocimiento de los docentes sobre métodos/programas de enseñanza multisensorial, así como identificar la frecuencia de uso según la materia. | 1 | pregunta de opción múltiple (se permitieron múltiples respuestas) |
| | 4, 5, 9, 10, 11, 12, 14, 15, 17, 21, 22, 23, 28, 29, 43 | pregunta de escala de cinco puntos (se permitía una respuesta) |
| | 24 | pregunta de opción múltiple (se permitía una respuesta) |
| | 26, 27 | matrix multiple-choice question with a four-point scale (one answer per row was allowed) |
| 2. Identificar las barreras al uso de prácticas multisensoriales y los factores que influyen en la elección de un método/programa multisensorial, en la elección de un método/programa multisensorial específico o no. | 6, 13, 14, 15, 17, 20, 21, 22, 23, 24 | pregunta de escala de cinco puntos (se permitía una respuesta) |
| | 25, 31 | matrix multiple-choice question with a four-point scale (one answer per row was allowed) |
| 3. Identificar la efectividad del uso de métodos/programas de enseñanza multisensorial para estudiantes con dislexia y estudiantes no | 2, 3, 7, 8, 17, 18, 19, 20, 30, 34, 35, 36, 37, 38 | pregunta de escala de cinco puntos (se permitía una respuesta) |

| | | |
|---|---|---|
| disléxicos, dependiendo del tipo de escuela (guardería, escuela primaria), la especialización en educación especial, el número de estudiantes y estudiantes con dislexia. | 16 | pregunta de opción múltiple (se permitía una respuesta) |
| 4. Identificar el interés del profesorado por recibir formación y sus creencias sobre la necesidad de una formación específica para implementar métodos/programas de enseñanza multisensorial. | 17, 33, 40, 41, 42 | pregunta de escala de cinco puntos (se permitía una respuesta) |
| 5. Identificar los puntos de vista de los educadores sobre la inclusión de estudiantes con dislexia a través de métodos/programas de enseñanza multisensoriales. | 6, 36, 37, 38, 39 | pregunta de escala de cinco puntos (se permitía una respuesta) |

Con base en estos objetivos, en este estudio se indagan las siguientes preguntas de investigación, según las opiniones de docentes y maestras de jardín de infantes -tanto de educación general como especial- de la prefectura de Heraklion:

- ¿Con qué frecuencia se utiliza un método/programa de enseñanza multisensorial?
- ¿Qué método/programa multisensorial se elige con mayor frecuencia?
- ¿Qué factores contribuyen a la selección de un método/programa de enseñanza multisensorial?
- Cuando un docente elige enseñar multisensorial, ¿elige un método particular o no?
- ¿Cuáles son las barreras al uso de la enseñanza multisensorial?
- Cuando un docente elige enseñar multisensorial, ¿elige un método particular o no?
- ¿Difieren los puntos de vista de los docentes sobre la efectividad y frecuencia del uso de la enseñanza multisensorial en estudiantes con dislexia según la materia?
- ¿Difieren los puntos de vista de los profesores sobre la eficacia del uso de la enseñanza multisensorial en estudiantes con dislexia?

- ¿Los puntos de vista de los docentes sobre la efectividad del uso de la enseñanza multisensorial difieren según el tipo de escuela (jardín de infantes, primaria) y la especialidad del educador?
- ¿Difieren los puntos de vista de los profesores sobre la eficacia, frecuencia y facilidad de uso de la enseñanza multisensorial según el número de estudiantes enseñados por hora?
- ¿Difieren los puntos de vista de los profesores sobre su deseo de recibir formación en métodos de enseñanza multisensoriales?
- ¿El costo afecta la disposición de los docentes a recibir capacitación en métodos de enseñanza multisensoriales?
- ¿Creen los profesores que la enseñanza multisensorial contribuye a la igualdad de oportunidades educativas para los estudiantes con dislexia?
- ¿Difieren los puntos de vista de los docentes sobre la eficacia, la facilidad de uso, la frecuencia de la enseñanza y la formación multisensorial necesaria según estén especializados en educación especial?
- ¿Tienen los docentes una comprensión clara de qué es la enseñanza multisensorial, cómo implementarla efectivamente y quién es el docente apropiado para implementarla?

El cuestionario sirvió como herramienta principal para recopilar datos de investigación, y representa un método fundamental ampliamente empleado en la investigación en ciencias sociales (Pappas, 2002). Los criterios de selección para el cuestionario también incluyeron su idoneidad para ser administrado a una muestra amplia de sujetos, ofreciendo diversidad en términos de factores como género, edad, años de servicio previo y más. La selección de preguntas ha sido diseñada ad-hoc para lograr los objetivos de esta investigación. El cuestionario se divide en dos secciones. La primera sección cubre características individuales y demográficas, incluida la edad, el género, la educación y más.

La segunda sección consta de 43 preguntas cerradas específicas que sondean las opiniones de los profesores relacionadas con el tema del estudio. La formulación de estas preguntas tomó en consideración la literatura relevante, alineándose con los objetivos e investigaciones de la investigación, como se detalla en el subcapítulo siguiente. Todas las preguntas del cuestionario eran obligatorias.

Respecto al tipo de preguntas utilizadas en el cuestionario:

- Las preguntas relacionadas con datos individuales y demográficos están diseñadas como preguntas cerradas, que ofrecen opciones dicotómicas u opciones de opción múltiple con respuestas únicas y múltiples.

- Las preguntas especiales son exclusivamente de carácter cerrado. Estas incluyen preguntas dicotómicas, preguntas de opción múltiple con respuestas de opción única y una pregunta de opción múltiple que permite la selección de múltiples opciones/respuestas.

Previo a la distribución oficial del cuestionario, se realizó una prueba piloto con una muestra de 20 docentes para evaluar diversos aspectos, entre ellos la claridad de las preguntas, su exhaustividad en términos de abordar posibles respuestas, el atractivo general, la extensión y el tiempo. requerido para su finalización (Cohen et al., 2008). Tras las revisiones y ajustes necesarios, se formuló y administró la versión final del cuestionario; por ejemplo, en algunas preguntas el término profesor fue sustituido por el término educador, que es más general en Grecia.

La distribución de los cuestionarios se produjo durante el año escolar 2022-2023, desde enero de 2022 hasta junio de 2023. Se eligió este período de tiempo porque permitió a los maestros obtener una comprensión más integral de las necesidades de sus estudiantes y desarrollar métodos y programas de enseñanza en consecuencia. Las preguntas se adaptaron a este año escolar específico y a la escuela particular donde trabajaban los maestros. Este enfoque fue necesario para establecer un marco enfocado para el estudio y la observación.

Los cuestionarios se distribuyeron entre profesores de educación primaria de la prefectura de Heraklion, incluidos profesores de educación general y especial, así como de jardín de infancia. Las preguntas fueron diseñadas para captar las opiniones formadas de los profesores.

Para garantizar una muestra representativa y mitigar el sesgo, los cuestionarios se distribuyeron en línea a todas las escuelas primarias y de jardín de infantes de la prefectura de Heraklion. Heraklion es una prefectura grande y diversa en Grecia, caracterizada por una heterogeneidad tanto geográfica como cultural. El objetivo era obtener opiniones de profesores que cubrían un amplio espectro de la prefectura de Heraklion.

Es importante señalar que las respuestas al cuestionario se recopilaron de forma anónima por razones éticas, hecho que se enfatizó para informar a los docentes participantes. El método de distribución en línea garantizó que incluso los profesores de escuelas remotas tuvieran la oportunidad de responder, proporcionándoles una

mayor sensación de anonimato en comparación con los cuestionarios tradicionales en papel.

Las preguntas del cuestionario fueron diseñadas y formuladas de manera que se pudieran obtener resultados respecto a las preguntas de investigación.

Al inicio del cuestionario, los participantes recibieron información sobre los objetivos de la investigación, junto con una declaración de confidencialidad y anonimato por parte del investigador. Las preguntas del cuestionario fueron diseñadas estratégicamente para abordar las preguntas de investigación planteadas. En algunos casos, ciertas preguntas se diseñaron para proporcionar información sobre múltiples preguntas de investigación.

**La muestra de investigación.**

La investigación se centró en la prefectura de Heraklion, ya que se ubica como la cuarta prefectura más poblada de Grecia, con 302.405 habitantes según el censo de población de 2021. Estos datos demográficos subrayan la presencia de una importante población estudiantil, numerosas instituciones educativas y, en consecuencia, un número sustancial de docentes. Además, la variada geomorfología de Creta, particularmente dentro de Heraklion, que presenta tanto terreno montañoso como llanuras fértiles, ha alentado a los residentes a dedicarse a actividades agrícolas. Como resultado, los docentes empleados en la prefectura de Heraklion provienen de diversos orígenes geográficos de toda Grecia, en lugar de ser predominantemente locales.

Un total de 285 docentes participaron en la cumplimentación del cuestionario, siendo 38 hombres y 247 mujeres. Los docentes encuestados pertenecían exclusivamente a los campos de la educación estándar y especial, ya sea como maestros de escuela primaria o de jardín de infantes.

Para determinar el tamaño de la muestra, dada la imposibilidad de determinar con precisión el número total de docentes de la prefectura dentro del período de investigación, se realizó un cálculo aproximado basado en la organización de cada escuela. El número de docentes en activo puede fluctuar: algunos se toman licencias de larga duración durante el año y son reemplazados cuando el Ministerio realiza nuevas contrataciones. Para lograr una muestra representativa, se estimó que deberían participar más de 270 educadores, entre maestros y maestros de jardín de infantes, lo

que corresponde aproximadamente a aproximadamente el 10% de la población educativa relevante para esta investigación.

**Método de análisis estadístico de los datos.**

El análisis estadístico de los datos es tanto descriptivo como inductivo. Al presentar los resultados de la investigación, proporcionamos una visión general de la distribución de las frecuencias absolutas y relativas de las respuestas de los profesores de la muestra a las diversas preguntas.

Los datos recopilados de la encuesta fueron analizados utilizando el programa de software SPSS 29. Se emplearon análisis descriptivos y medidas de correlación para determinar la naturaleza y la fuerza de las relaciones entre las variables investigadas. El objetivo era determinar si las relaciones observadas eran aplicables únicamente a la muestra de 285 encuestados o si podían generalizarse a la población más amplia (Gnardellis, 2022). Para lograr esto, se utilizó la prueba de Chi-Cuadrado para las matrices de correlación $r$ x $c$.

La prueba de Pearson Chi-Cuadrado es un método deductivo empleado para explorar la relación entre dos variables categóricas dentro de una matriz de correlación. Pone a prueba la hipótesis de que las dos variables son independientes entre sí, lo que indica que no hay influencia mutua. Cuando dos variables se consideran independientes, las frecuencias esperadas para las celdas de la tabla se calculan multiplicando los rangos de frecuencia respectivos de cada celda y luego dividiendo por el número total de observaciones en la tabla.

En este análisis, se probaron sistemáticamente pares de variables entre sí para investigar relaciones potenciales. Los resultados se presentan en dos tablas. La primera es una tabla de correlación que organiza las observaciones de forma biaxial en función de las dos variables que se examinan. La segunda tabla proporciona los resultados de la prueba Chi-Cuadrado y procedimientos relacionados.

La primera fila de la tabla muestra los resultados de la prueba Chi-cuadrado de Pearson, junto con el valor p correspondiente (Asymp. Sig. 2-laterales). Es importante tener en cuenta que SPSS redondea el valor p a tres decimales, por lo que un valor p que en realidad es inferior a 0,0005 se muestra como <0,001.

Hacia el final de las tablas de las pruebas de chi-cuadrado, se presenta el número y porcentaje de celdas con frecuencias esperadas inferiores a 5, así como la frecuencia esperada más baja en la tabla (Gnardellis, 2022).

En este estudio se definió significación estadística cuando a≤0,05. Todas las preguntas se analizaron cuantitativamente, excepto la pregunta 1 (Cuando escucho la frase enseñanza multisensorial pienso…), para la cual se realizó un análisis cualitativo. En esta pregunta, los encuestados podían elegir más de una respuesta para explorar el alcance de sus conocimientos sobre la enseñanza multisensorial.

**Confiabilidad-validez de la investigación**

La confiabilidad de la investigación se refiere a la fidelidad de la medición del tema en estudio. Hay tres tipos básicos de confiabilidad, estabilidad, confiabilidad interna y consistencia entre evaluadores (Cohen et al., 2008).

Para la confiabilidad de la investigación se realizaron las preguntas de la escala de cinco puntos con el fin de comprender si todas las preguntas de este cuestionario miden de manera confiable el alfa de Cronbach. Un valor alfa de Cronbach superior a 0,7 se considera generalmente aceptable para la mayoría de los fines de la investigación, indicador también adoptado en la investigación actual. En este punto cabe señalar que la prueba no se realizó para las preguntas demográficas porque no se consideró necesaria para la pregunta 1 "Cuando escucho la frase enseñanza multisensorial pienso…" ya que la pregunta estaba en formato de cadena. De la evaluación del índice de Cronbach se desprende que para la presente investigación el valor del índice es muy alto, lo que hace que la herramienta sea confiable.

Para las preguntas 2-43 (Aunque eran 42 preguntas, aparece un total de N=84, debido a que algunas preguntas tenían más de una variable al ser en forma de grilla y tener subpreguntas) la prueba alfa de Cronbach es ,840. El coeficiente alfa de Cronbach de 0,840 sugiere un alto nivel de consistencia interna para la escala utilizada en el presente estudio con la muestra específica. Esto indica que los ítems dentro de la escala miden de manera confiable el mismo constructo o concepto subyacente, y las respuestas de los maestros y maestros de jardín de infantes -tanto en educación general como especial- de la prefectura de Heraklion son consistentes en su evaluación de ese constructo.

Se utilizaron los siguientes criterios para examinar la validez de la investigación:

f) Objetividad: la realización de la investigación y el análisis e interpretación de sus datos no deben verse influenciados por la personalidad del investigador.
g) Metodología/Enfoque Sistemático: La investigación se realiza de manera sistemática, siguiendo un plan predeterminado, empleando métodos y técnicas apropiados y con el objetivo de recopilar los datos necesarios para comprender y abordar el tema bajo investigación.
h) Reproducibilidad: toda la información esencial se presenta de forma transparente, lo que permite a otros investigadores replicar el estudio.
i) d) Empirismo: Implica que el tema de investigación es observable y mensurable, y que los términos se definen con claridad y precisión en todos sus aspectos.
j) Accesibilidad Pública: Se otorga acceso al diseño y resultados de la investigación (Vamvoukas, 2010).

En base a los criterios mencionados, se asegura su validez:

- La recopilación, el análisis y la interpretación de los datos de la investigación no dependen de los prejuicios personales del investigador, sino que se basan en la literatura relevante, lo que garantiza la objetividad de la investigación.
- La investigación se llevó a cabo meticulosamente con un plan bien definido y metodologías y técnicas apropiadas seleccionadas después de una revisión exhaustiva de la literatura pertinente, garantizando así la metodología de la investigación.
- Esta investigación proporciona descripciones integrales y transparentes de todos sus aspectos, lo que permite que otro investigador la replique, asegurando la repetibilidad de la investigación.
- El estudio aclara conceptos y marcos teóricos pertinentes sobre la educación multisensorial, subrayando su naturaleza empírica.
- Tanto el diseño de la investigación como sus hallazgos son de libre acceso para cualquier persona interesada, lo que garantiza la transparencia de la investigación y el acceso público.

**Resultados de la investigación**

Como se mencionó anteriormente, en el capítulo 9 se proporciona una descripción detallada de las estadísticas descriptivas obtenidas de la investigación, junto con un análisis integral de cómo estas estadísticas descriptivas se cruzan con otras variables.

Inicialmente, las respuestas de los encuestados a todas las preguntas se presentan en tablas y gráficos. Luego se presentan detalladamente la variable de análisis estadístico descriptivo cruzando otra variable. Cada tabla de tabulación cruzada va acompañada de la correspondiente tabla de prueba de Chi-Cuadrado para garantizar el cumplimiento de los protocolos y la validez de los resultados. Todas las tablas se describieron meticulosamente mediante la presentación y análisis de los datos en forma escrita. Debido al volumen de tablas, no todas las tablas se pueden presentar con todo detalle. Sin embargo, para ilustrar el proceso, se presenta la siguiente tabla como ejemplo. Se tomaron medidas similares para analizar todas las tablas del estudio.

Se realizó una prueba de independencia de chi-cuadrado para examinar la relación entre "Utilizo actividades/métodos de enseñanza multisensoriales en materias relacionadas con el lenguaje" y "Especialización en educación especial" (tabla 9.2.47.). La relación entre estas variables fue significativa, $x^2(4)=14.883$, $p=0.005<0.05$.

De la lectura del contenido de la tabla 9.2.46., se desprende que, en general, los profesores y los maestros de jardín de infantes en la prefectura de Heraklion, tanto en educación especial como típica, utilizan actividades/métodos de enseñanza multisensoriales en materias relacionadas con el lenguaje. Sin embargo, cabe destacar que el número de personas especializadas en educación especial que incorporan la enseñanza multisensorial diariamente es más del doble que aquellos que la integran en su enseñanza diaria pero carecen de experiencia en educación especial. Esta observación puede atribuirse al hecho de que quienes se especializan en educación especial probablemente sean más conscientes de las ventajas de la enseñanza multisensorial y hagan un esfuerzo consciente para implementarla en sus prácticas docentes diarias.

**Tabla 9.2.46.**

*Tabulación cruzada: Utilizo actividades/métodos de enseñanza multisensoriales en materias relacionadas con el lenguaje * Especialización en educación especial*

| | | **Especialización en educación especial** | | |
|---|---|---|---|---|
| **Tabulación cruzada** | | No | Sí | Total |
| **Utilizo actividades/métodos de enseñanza multisensoriales en** | Nunca | 18 | 18 | 36 |
| | Casi nunca | 37 | 21 | 58 |
| | Ocasionalmente | 33 | 38 | 71 |

| | | | | |
|---|---|---|---|---|
| **materias relacionadas con el lenguaje.** | A menudo | 42 | 38 | 80 |
| | A diario | 10 | 30 | 40 |
| **Total** | | 140 | 145 | 285 |

**Tabla 9.2.47.**

*Pruebas Chi-Cuadrado para variables: Utilizo actividades/métodos de enseñanza multisensoriales en materias relacionadas con el lenguaje * Especialización en educación especials*

| Pruebas de Chi-Cuadrado | Valorizar | df | Significado asintótico (bilateral) |
|---|---|---|---|
| **Pearson Chi-Cuadrado** | 14.883[a] | 4 | .005 |
| **Índice de probabilidad** | 15.401 | 4 | .004 |
| **Asociación lineal por lineal** | 6.018 | 1 | .014 |
| **N de casos válidos** | 285 | | |

a. 0 celdas (0,0%) tienen un recuento esperado inferior a 5. El recuento mínimo esperado es 17,68.

## Discusión y conclusiones

Respecto al 1er objetivo científico, se encuentran los siguientes hallazgos.

Los hallazgos de esta investigación arrojan luz sobre la conciencia de los docentes sobre la enseñanza multisensorial, su aplicación y quién es el más adecuado para implementarla. En respuesta a la pregunta "Cuando escucho la frase enseñanza multisensorial pienso…", las respuestas de la encuesta se sometieron a un análisis cualitativo descriptivo, lo que arrojó varias conclusiones notables. Parece que una parte importante de los educadores, cuando se enfrentan al término "enseñanza multisensorial", lo asocian inmediatamente con la participación simultánea de múltiples sentidos. Las siguientes asociaciones más comunes incluyeron términos como "atractivo", "rica infraestructura logística" y "ayudas visuales". Esto sugiere que, a los ojos de los docentes, la enseñanza multisensorial está estrechamente vinculada a los métodos de enseñanza interactivos y a la disponibilidad de diversos materiales y apoyo tecnológico. Curiosamente, la frase "estudiantes de educación especial" surgió como una asociación algo distante, lo que indica que es posible que los docentes no conecten fácilmente la educación multisensorial con este grupo particular de estudiantes. Por

último, las respuestas menos frecuentes incluyeron “un método de enseñanza específico” y “un plan de estudios”. La investigación realizada por Alwaqassi (2017) ha demostrado que los profesores tienen diferentes interpretaciones del enfoque multisensorial de la enseñanza y emplean diversos métodos en su aplicación. Sin embargo, según los hallazgos proporcionados, parece que tanto los maestros de educación general como los de educación especial y los maestros de jardín de infantes en la prefectura de Heraklion tienen conocimientos sobre educación multisensorial.

En cuanto a si los profesores y los profesores de jardín de infancia de la prefectura de Heraklion saben cómo enseñar con un enfoque multisensorial, hay opiniones divididas. Sin embargo, es evidente que los individuos con posgrado y especialización en educación especial tienen más probabilidades de estar de acuerdo o totalmente de acuerdo en que poseen los conocimientos necesarios para enseñar a los estudiantes utilizando métodos multisensoriales. De manera similar, aquellos con una maestría tienden a expresar un mayor grado de acuerdo o un fuerte acuerdo cuando se trata de tener confianza profesional en el empleo de la enseñanza multisensorial, en comparación con aquellos que solo tienen una licenciatura.

Además, se han identificado hallazgos estadísticamente significativos sobre si los profesores tienen el conocimiento y la confianza profesional necesarios para implementar la enseñanza multisensorial, y la frecuencia de su uso en cursos relacionados con el lenguaje y las ciencias. En concreto, en materias relacionadas con el lenguaje, quienes creen tener los conocimientos necesarios para enseñar multisensorialmente son más proclives a utilizar con frecuencia métodos de enseñanza multisensorial. Por el contrario, los profesores sin la formación adecuada tienden a utilizar este enfoque rara vez o nunca. En general, la mayoría de los profesores y profesores de jardín de infantes de la prefectura de Heraklion, tanto de educación general como especial, coinciden en que tienen la confianza profesional para enseñar a los estudiantes de forma multisensorial. Esta confianza se refleja en una mayor frecuencia de enseñanza multisensorial en cursos relacionados con el idioma. Además, existe una tendencia creciente a utilizar la enseñanza multisensorial en cursos de idiomas entre quienes afirman tener total confianza profesional.

En el contexto de las materias relacionadas con las ciencias, existe un patrón notable entre los educadores que no están de acuerdo en poseer el conocimiento necesario para

enseñar utilizando métodos multisensoriales. Estas personas tienden a no elegir la enseñanza multisensorial y quienes la eligen rara vez la utilizan. Por el contrario, un número importante de educadores que se sienten bien cualificados en esta área incorporan la enseñanza multisensorial en su enseñanza diaria. En general, los profesores y profesores de jardín de infancia de la prefectura de Heraklion, tanto de educación general como especial, expresan confianza profesional en su capacidad para enseñar utilizando técnicas multisensoriales. En particular, una parte considerable de quienes se sienten seguros de sus habilidades emplean con frecuencia la enseñanza multisensorial en cursos relacionados con las ciencias.

Estos hallazgos indican que, si bien la mayoría de los docentes conocen la educación multisensorial, un porcentaje menor realmente la utiliza en su enseñanza. Esto se ve respaldado aún más por sus respuestas sobre si les gustaría familiarizarse más con los métodos/programas multisensoriales antes de implementarlos con sus estudiantes, y la mayoría expresó una inclinación positiva. Además, los profesores en entornos educativos típicos tienden a tener una respuesta más favorable a esta pregunta, y existe una correlación positiva entre la afirmación "Tengo el conocimiento necesario para enseñar a mis alumnos de forma multisensorial" y el deseo de una mayor familiaridad con los métodos multisensoriales.

Además, se observó que menos educadores que nunca utilizan la enseñanza multisensorial conocen los programas de enseñanza multisensorial disponibles en el idioma griego, en comparación con aquellos que emplean la enseñanza multisensorial a diario. Dado que la enseñanza multisensorial se reconoce comúnmente como una mejor práctica, se espera que capacitar a los docentes en este enfoque conduzca a un mayor uso de métodos multisensoriales en el aula. En consecuencia, los hallazgos de investigaciones anteriores se alinean indirectamente con los resultados del presente estudio.

Es evidente que los profesores y maestros de jardín de infancia de la prefectura de Heraklion, ya sea de educación general o especial, no creen que la enseñanza multisensorial sólo pueda ser implementada eficazmente por educadores especiales. A partir de un examen de la literatura existente sobre el tema más amplio de la implementación de prácticas multisensoriales en el aula, resulta evidente que numerosos estudios se han centrado en profesores de educación especial (p. ej.,

Alwaqassi, 2017; Nijakowska, 2018), así como en profesores de educación general. Sin embargo, ninguno de estos estudios ha abordado específicamente las opiniones de los profesores sobre quién creen que está mejor calificado para enseñar técnicas multisensoriales. Esto revela una brecha notable en la literatura, lo que destaca la necesidad de realizar más investigaciones en esta área.

Los porcentajes de maestros de educación general y especial, así como de maestros de jardín de infantes, que utilizan un método o programa multisensorial específico son relativamente bajos. Sin embargo, existe una correlación positiva entre tener los conocimientos necesarios para enseñar técnicas multisensoriales y el uso de un método o programa multisensorial específico. La utilización de los 16 programas multisensoriales reportados es generalmente mínima, observándose sólo ligeras variaciones, particularmente en el caso del programa Dyslexia Box, que parece usarse con más frecuencia. Estos hallazgos se alinean con la información proporcionada por Gaitanidi et al. (2023), indicando que en Grecia existen programas estructurados limitados para la dislexia en lengua griega, aparte del Dyslexia Box, que puede implementarse sin una formación exhaustiva de la persona que lo administra a los estudiantes. Es importante señalar que no se ha identificado ninguna investigación previa que permita una comparación directa de estos resultados con respecto al uso de métodos o programas multisensoriales específicos.

En cuanto a la selección de métodos de enseñanza multisensoriales, la investigación no aportó hallazgos sustanciales debido a ciertas limitaciones. De los 16 métodos y programas enumerados en el cuestionario sobre el uso de métodos de enseñanza multisensoriales, sólo se obtuvieron datos estadísticamente significativos para uno. La razón de esto fue que, de los 16 programas, sólo uno fue diseñado originalmente en idioma griego. Los 15 métodos y programas restantes utilizan predominantemente el inglés como idioma principal, lo que los hace menos accesibles y utilizables dentro del contexto educativo griego. Algunos profesores que indicaron utilizar ciertos programas en inglés pueden haber recurrido a adaptarlos o modificarlos para adaptarlos al idioma y al plan de estudios griego.

El programa griego que arrojó datos estadísticamente significativos es “Dyslexia Box”. Sin embargo, a pesar de estar disponible en griego, parece que la mayoría de los maestros y maestros de jardín de infantes en la prefectura de Heraklion, incluidos

aquellos en entornos de educación general y especial, usan con poca frecuencia o rara vez usan Dyslexia Box. Sin embargo, el uso de este programa es casi el doble entre quienes se especializan en educación especial.

La frecuencia del uso de métodos de enseñanza multisensoriales parece variar según la materia que se enseña. Según las respuestas de los profesores de educación general y especial, así como de los profesores de jardín de infantes en la prefectura de Heraklion, los métodos de enseñanza multisensoriales se emplean con mayor frecuencia en materias relacionadas con el lenguaje en comparación con materias relacionadas con las ciencias. En términos de la frecuencia del uso de métodos de enseñanza multisensoriales, la investigación indica que los maestros y maestros de jardín de infantes en Heraklion, tanto en educación general como especial, tienden a estar de acuerdo en que cuantos más estudiantes enseñan por hora, menos usan métodos de enseñanza multisensoriales. Más profesores que profesores de jardín de infantes están de acuerdo con la afirmación anterior. Además, aquellos que están de acuerdo en que cuantos más estudiantes enseñan por hora, menos utilizan métodos de enseñanza multisensoriales también tienden a estar de acuerdo en que cuantos menos estudiantes enseñan por hora, más utilizan métodos de enseñanza multisensoriales. Esto sugiere que el número de estudiantes enseñados por hora influye en la frecuencia de los métodos de enseñanza multisensoriales utilizados por los educadores.

La investigación también revela hallazgos adicionales sobre las actitudes y opiniones de los docentes. El hecho de que aquellos que están de acuerdo o totalmente de acuerdo con que cuantos más estudiantes enseñan por hora, menos utilizan métodos de enseñanza multisensoriales también tienden a estar de acuerdo o totalmente de acuerdo con que el número de estudiantes es un obstáculo para la aplicación de métodos de enseñanza multisensoriales. Además, existe una correlación positiva entre aquellos que están de acuerdo en que cuantos menos estudiantes enseñan por hora, más utilizan métodos de enseñanza multisensorial y aquellos que están totalmente de acuerdo en que la barrera para utilizar la enseñanza multisensorial es el tiempo limitado de enseñanza. Vale la pena señalar que aquellos que no están de acuerdo y están totalmente en desacuerdo con que la enseñanza multisensorial se implemente fácilmente de forma individualizada también están en total desacuerdo con que cuantos menos estudiantes enseñan por hora, más utilizan métodos de enseñanza multisensorial. Se observa diferenciación en cuanto a la especialidad de los docentes y sus opiniones sobre la

facilidad para implementar prácticas multisensoriales en grupos pequeños de estudiantes y en toda la clase, siendo más los docentes que los de jardín de infantes en el primer caso. En el segundo caso, las respuestas negativas de los profesores son estadísticamente significativamente mayores que las de los profesores de jardín de infancia.

Cabe señalar que no se encontraron investigaciones específicas que estudien las opiniones de los docentes en relación al número de estudiantes por clase respecto a la enseñanza multisensorial, las investigaciones que se mencionan a continuación abordan generalmente el tema de la enseñanza en toda la clase. Tradicionalmente, la pedagogía de toda la clase ha estado fuertemente asociada con la enseñanza directa del mismo contenido curricular para todos los alumnos y se ha caracterizado por enfoques estructurados y dirigidos por los docentes (Alexander, 2017). Sin embargo, más recientemente ha surgido un reconocimiento del potencial de las pedagogías altamente interactivas y centradas en el alumno para integrarse con éxito en la práctica de toda la clase (Willemsen et al., 2020; Hardman, 2020). Es más, en general parece que la mayoría de los profesores de educación general y especial y de guardería de la prefectura de Heraklion no están familiarizados con Dyslexia Box. Sin embargo, se observa que hay más docentes que declaran conocerlo que los docentes de educación infantil. Esto no es sorprendente, ya que según la investigación de Gaitanidi et al. (2023), esta herramienta está dirigida principalmente a estudiantes de educación primaria. Las pruebas de independencia chi-cuadrado se realizaron al “Tipo de colegio en el que trabaja el presente año escolar” cruzando con otras variables, no arrojaron resultados estadísticamente significativos ni respecto al objetivo del presente estudio.

Las opiniones de los profesores de educación general y especial y de los profesores de jardín de infantes en la prefectura de Heraklion parecen variar bastante según la asignatura y la frecuencia de uso de métodos de enseñanza multisensoriales. En concreto, según las respuestas de los participantes, la enseñanza multisensorial se utiliza con más frecuencia en materias relacionadas con el lenguaje que en materias relacionadas con las ciencias. Aunque no existe una diferencia significativa entre las opiniones de los docentes respecto al uso de métodos de enseñanza multisensorial en materias relacionadas con el lenguaje y su especialización en educación especial, llama la atención que el número de profesores especializados en educación especial que incorporan diariamente la enseñanza multisensorial es más del doble que aquellos que

la integran en su enseñanza diaria, pero carecen de experiencia en educación especial. Además, se observa que quienes tienen especialización en educación especial tienden a utilizar con mayor frecuencia métodos de enseñanza multisensoriales que quienes no tienen especialización en general e independientemente de la materia de enseñanza. Otra diferencia en las opiniones de los docentes se identificó en función de su especialidad; concretamente, parece que, en general, los docentes y los maestros de jardín de infantes en la prefectura de Heraklion, tanto en la educación general como en la especial, están divididos en cuanto al uso de actividades multisensoriales y los métodos de enseñanza en materias relacionadas con las ciencias, de modo que hay una mayoría significativa de docentes que nunca o rara vez utilizan la enseñanza multisensorial en materias de ciencias, especialmente en comparación con los docentes de jardín de infantes que afirmaron que nunca o rara vez la usan.

La mayoría de los maestros y maestros de jardín de infantes de educación especial y general en la prefectura de Heraklion utilizan métodos/programas de enseñanza multisensoriales frecuente o diariamente, sin embargo, aquellos que tienen formación en educación especial, duplican su uso. Respecto al nivel de estudios, los profesores que cuentan con un Máster, además del Grado, usan métodos multisensoriales con mayor frecuencia que los que sólo han cursado un Grado.

Hay una escasez de estudios específicos que examinen las opiniones de los profesores sobre la frecuencia de aplicación de métodos de enseñanza multisensoriales. Si bien existe una amplia investigación sobre la eficacia de la educación multisensorial en diferentes tipos de cursos, pocos estudios han explorado las perspectivas de los docentes al respecto. La frecuencia del uso de métodos de enseñanza multisensoriales sigue siendo un vacío en la literatura existente. Sin embargo, la investigación sobre la frecuencia de uso de herramientas de enseñanza más generales puede arrojar luz indirectamente sobre los hallazgos de la presente investigación. Por ejemplo, Heafner et al. (2014) informaron que, a pesar de las referencias curriculares a la enseñanza dinámica, esta no se asoció con un uso más frecuente en la enseñanza. En su estudio, la mitad de los participantes mencionaron que no consideraban la frecuencia de uso de un método de enseñanza como un factor significativo.

Respecto al segundo objetivo, los hallazgos de la presente investigación llevan a las siguientes conclusiones.

A partir de las respuestas brindadas respecto a los siguientes factores: objetivos, tiempo de enseñanza disponible, inclusión de todos los estudiantes, infraestructura logística, conocimientos sobre técnicas multisensoriales y número de estudiantes por hora y lección, se evidencia que una proporción significativa de los docentes considera que todos ellos influyen en la elección de una enseñanza multisensorial. Si bien, no se pidió explícitamente a los participantes que los clasificaran en orden de importancia para determinar cuál era el factor más crítico, de sus respuestas se desprende claramente que todos los encuestados consideran que estos factores son al menos muy importantes, con un fuerte consenso entre los maestros de primaria y de jardín de infantes. Tras un examen más detenido, resulta evidente que aquellos que no consideran importantes estos factores para seleccionar métodos de enseñanza multisensoriales, tienden a abstenerse de utilizar dichos métodos en materias relacionadas con el lenguaje. Por otro lado, el profesorado que considera la materia como un factor muy importante a la hora de elegir la enseñanza multisensorial a menudo incorpora técnicas multisensoriales en su instrucción, especialmente cuando se enseña materias relacionadas con las ciencias.

El objetivo docente destaca como un factor significativo en la selección de la enseñanza multisensorial, influyendo considerablemente en los docentes. En concreto, quienes consideran que el objetivo docente es un factor muy importante o incluso esencial en su decisión de optar por la enseñanza multisensorial suelen utilizar métodos multisensoriales en los cursos de idiomas, a menudo o a diario.

La mayoría de los profesores y educadores de jardines de infancia de la prefectura de Heraklion, tanto de educación general como especial, perciben el tiempo de enseñanza limitado como un impedimento importante para la adopción de métodos de enseñanza multisensoriales. Es de destacar que la mayoría de los profesores y profesores de jardín de infancia de la prefectura de Heraklion, ya sean en educación general o especial, consideran que el tiempo del que disponen es muy importante o incluso esencial a la hora de decidir emplear la enseñanza multisensorial. Además, el grado de acuerdo es mayor entre docentes de Primaria que entre los de jardín de infantes, lo que indica la importancia de la gestión del tiempo en sus elecciones de instrucción en esta etapa. Estos hallazgos subrayan el importante papel que desempeñan las limitaciones de tiempo como obstáculo percibido para la implementación efectiva de métodos de enseñanza multisensoriales.

Otro hallazgo digno de mención es que la mayoría de los maestros y maestros de jardín de infantes en la prefectura de Heraklion, incluidos los de educación general y especial, perciben el plan de estudios como un impedimento importante para la implementación de la enseñanza multisensorial. Además, existe una correlación positiva entre aquellos que encuentran el programa de estudios muy o extremadamente estresante y aquellos que expresan falta de tiempo para implementar actividades multisensoriales, así como aquellos que están de acuerdo o totalmente de acuerdo en que el programa de estudios actúa como una barrera para la enseñanza multisensorial. Vale la pena señalar que una mayor proporción de docentes, tanto de educación general como especial en la prefectura de Heraklion, tienden a estar de acuerdo o totalmente de acuerdo en que el plan de estudios obstaculiza el uso de la enseñanza multisensorial en comparación con los educadores de jardín de infantes. Además, los profesores, en comparación con los educadores de jardín de infancia, tienden a demostrar un mayor grado de acuerdo o un fuerte acuerdo con esta afirmación. Esta investigación también revela que, en general, los docentes y los maestros de jardín de infantes en la prefectura de Heraklion, que abarca tanto la educación general como la especial, consideran que el programa de estudios es un impedimento para la enseñanza, y los docentes expresan este sentimiento con especial fuerza. Además, los hallazgos sugieren que la mayoría de los profesores que no están de acuerdo con que el programa de estudios sea una barrera para implementar la instrucción multisensorial tampoco están de acuerdo con que el tiempo de enseñanza limitado sea una barrera. Por el contrario, quienes están de acuerdo en que el programa de estudios es un obstáculo también tienden a estar de acuerdo en que el tiempo limitado de enseñanza es un obstáculo. La adherencia al plan de estudios puede vincularse a la evaluación y eficacia docente, corroborando hallazgos de investigaciones anteriores al respecto.

Además, es evidente que una parte significativa de los maestros de educación general y especial, así como de los educadores de jardín de infantes en la prefectura de Heraklion, expresan su acuerdo con la noción de que el "número de estudiantes" constituye una barrera para la adopción de la enseñanza multisensorial. En particular, un número considerable del profesorado que tiene una opinión contraria sobre la eficacia de la enseñanza multisensorial en entornos de clase completa también está totalmente de acuerdo en que el "número de estudiantes" representa un impedimento para su implementación. De manera similar, se observa que la mayoría de quienes no

están de acuerdo con respecto a la efectividad de la enseñanza multisensorial en toda la clase, también están fuertemente de acuerdo en que el número de estudiantes actúa como un obstáculo para su implementación. Esta correlación se ve reforzada por quienes están totalmente en desacuerdo con la idea de que la enseñanza multisensorial se implemente fácilmente en toda la clase y con los que están totalmente de acuerdo con que "el número de estudiantes es un obstáculo para la implementación de métodos de enseñanza multisensorial".

El factor número de estudiantes también ejerce influencia sobre los docentes, como indican los hallazgos de la presente investigación, que indica que un elevado número de estudiantes por hora se asocia con una tendencia a reducir el uso de prácticas docentes multisensoriales.

El tamaño de la clase también surge como una barrera para emplear la enseñanza multisensorial. Específicamente, es evidente que la mayoría de los maestros y maestros de jardín de infantes en la prefectura de Heraklion, tanto de educación general como especial, muestran consenso respecto a que el tamaño de la clase puede efectivamente presentar un impedimento cuando se trata de implementar técnicas de enseñanza multisensoriales.

Para ser más precisos, la mayoría de ellos coincide en que el número de estudiantes en una clase actúa como un obstáculo para la utilización de enfoques de instrucción multisensoriales. La investigación de Wright et al. (2019), mostraron que cuando hay menos estudiantes por sección, entonces aumentan las estrategias de aprendizaje activo -como las prácticas multisensoriales- y la retroalimentación, mientras que también pueden surgir prácticas inclusivas sin ser un fin en sí mismas. En la misma encuesta se reporta que los docentes tuvieron una actitud positiva hacia la reducción de estudiantes por sección.

Otra barrera importante para la enseñanza multisensorial parece ser la infraestructura logística. La mayoría de los profesores y educadores de jardines de infancia de la prefectura de Heraklion, tanto de educación general como especial, tienden a considerar el equipamiento tecnológico como un factor importante a la hora de elegir métodos de enseñanza multisensoriales. En particular, los educadores de jardín de infantes tienden a expresar un mayor acuerdo con esta afirmación en comparación con los maestros. Además, existe una correlación que indica que cuanta más importancia atribuyen los

educadores al equipamiento tecnológico, más perciben la ausencia de equipamiento adecuado como un obstáculo para utilizar la infraestructura logística. Se observa que las personas sin experiencia en educación especial tienden a estar ligeramente más inclinadas a considerar la falta de infraestructura logística como una barrera para el uso de la enseñanza multisensorial.

Otro obstáculo identificado a través de esta investigación se refiere a la falta de motivación de los educadores para utilizar la enseñanza multisensorial. Parece haber una correlación entre los años de experiencia de los profesores y su acuerdo con esta afirmación. Los educadores con menos años de experiencia tienden a no estar de acuerdo con la noción de que la falta de interés actúa como una barrera para el uso de la enseñanza multisensorial, mientras que aquellos con 21 años o más de servicio tienen más probabilidades de estar de acuerdo con ella. Otro hallazgo interesante es que parece haber una relación inversamente proporcional entre el deseo de los educadores de recibir formación en un método/programa multisensorial y su acuerdo con la afirmación de que la falta de interés es una barrera. Cuanto más desean una formación relevante, más en desacuerdo están con considerar su falta de interés como una barrera para utilizar la enseñanza multisensorial.

Otro factor crucial para implementar la enseñanza multisensorial, como destacan los hallazgos de la investigación actual, es la inclusión de los estudiantes. Cabe señalar que hay diez veces más profesores que consideran este factor de poca importancia en comparación con los profesores de jardín de infancia. Esta discrepancia no implica necesariamente indiferencia por parte de los docentes, ya que la mayoría de ellos reconoce la importancia de incluir a los estudiantes con dislexia. La explicación probable de esta diferencia radica en las limitaciones materiales y de tiempo que enfrentan los docentes. Tienen la tarea constante de tomar decisiones que impactan el bienestar de todos los estudiantes y es posible que no puedan darse el lujo de dedicar mucho tiempo a abordar la inclusión de los estudiantes disléxicos. Cuando los profesores tienen más tiempo y flexibilidad, pueden adoptar prácticas innovadoras, constructivas y respaldadas por la investigación (Yeager & van Hover, 2006). Estas prácticas pueden adaptarse mejor a las diversas necesidades de los estudiantes, incluidos aquellos con dislexia, en un entorno de aula inclusivo.

Si bien no se identificaron estudios específicos centrados en los factores que influyen en la enseñanza multisensorial, existe un amplio conjunto de investigaciones que exploran los factores que influyen en las prácticas docentes, incluido el uso de nuevas tecnologías en la educación; en particular, las investigaciones realizadas hasta 2020 demuestran un importante interés en esta área. También merece señalar que no se han identificado estudios que se centren en las barreras específicas para la implementación de la enseñanza multisensorial en la educación primaria. Sin embargo, se encontraron investigaciones relacionadas con un tema similar. En la revisión de la literatura se identificaron seis categorías o tipos de barreras que afectan la adopción de la tecnología por parte de los docentes, tales como: recursos humanos, tiempo y recursos tecnológicos; conocimientos y habilidades tecnológicas, pedagogía y gestión del aula; liderazgo, estructuras o diseño escolar; creencias o actitudes tecnológicas; entornos de prueba de alto riesgo y las prácticas institucionales establecidas o la "gramática de la escolarización" (Selwyn, 2011).

Ampliando la investigación realizada por Yang et al. (2022) sobre las creencias de los docentes sobre la integración de la literatura infantil en la enseñanza y el aprendizaje de las matemáticas, el estudio identificó varios obstáculos, incluidas limitaciones de tiempo, falta de conocimiento pedagógico y confianza en uno mismo, recursos limitados, dudas sobre el resultado esperado e inhibiciones de normas sociales. Estos hallazgos se alinean con las conclusiones de la presente investigación, destacando los desafíos compartidos en el entorno de enseñanza y aprendizaje.

La cuestión de la infraestructura insuficiente como obstáculo para la implementación de herramientas y programas se ve respaldada además por la investigación realizada por Hébert et al. (2021), que destaca que esta limitación no sólo obstaculiza el desarrollo cognitivo y la variedad de la instrucción, sino que también socava el desarrollo más amplio de las habilidades del siglo XXI. Además, como menciona Thompson (2019), cuando la política educativa de un país genera clases más grandes, puede impactar negativamente la futura adopción de nuevas tecnologías y programas en las prácticas docentes. Estos conocimientos subrayan colectivamente la importancia de abordar los desafíos de infraestructura y se alinean con los hallazgos de la presente investigación sobre las barreras a la enseñanza multisensorial.

Los hallazgos sobre infraestructura están de acuerdo con la literatura internacional. La infraestructura parece ser un factor importante en las decisiones de los profesores con respecto a la enseñanza multisensorial, cuanto más valoran los equipos tecnológicos, más perciben la ausencia de equipos adecuados como una barrera. Vale la pena señalar que, si bien ha habido un aumento constante en la disponibilidad de tecnología en las escuelas durante las últimas dos décadas, la adopción de usos de nivel superior no ha seguido el ritmo. Muchos profesores siguen enfrentando desafíos a la hora de integrar eficazmente la tecnología en sus aulas (Bice & Tang, 2022).

En cuanto a la influencia de la infraestructura y los conocimientos previos de los docentes en la selección y el uso de los sistemas de apoyo educativo, Akinde & Adetimirin (2019) encontraron que cuando los docentes carecen de la experiencia y la infraestructura necesarias, su uso de la tecnología disminuye. Por el contrario, cuando tanto el conocimiento como la infraestructura están disponibles, el uso de la tecnología aumenta. La investigación de Khlaif (2018) también respalda esta idea al sugerir que el apoyo técnico, la asistencia educativa y la infraestructura afectan las actitudes de los docentes hacia el uso de la tecnología móvil.

La investigación de Spiteri & Rundgren (2020) sobre los factores que influyen en el uso de la tecnología digital subraya la importancia de los conocimientos previos de los docentes como factor clave en la adopción de la tecnología. Además, Wu et al. (2008) enfatizaron que para que los docentes de escuelas más grandes integren nuevas tecnologías en su enseñanza, el plan de estudios debería brindarles flexibilidad. En conjunto, los hallazgos de esta investigación se alinean indirectamente con las conclusiones alcanzadas en la presente investigación, enfatizando el papel fundamental del conocimiento de los docentes y la disponibilidad de la infraestructura necesaria para dar forma a las prácticas docentes innovadoras, entre las que pueden incluirse los métodos multisensoriales.

Contrariamente a los hallazgos de la presente investigación, donde los profesores de la prefectura de Heraklion afirman claramente que les resulta difícil implementar prácticas multisensoriales en toda la clase, la investigación de Tyk (2014) sostiene que es más fácil para el profesor enseñar toda la clase y gestionar el tiempo de forma más eficaz. Por otro lado, puede resultar difícil lograr un equilibrio entre el apoyo diferenciado, la exposición adecuada y el ritmo de la enseñanza y el aprendizaje de toda la clase, al

mismo tiempo que se fomenta la participación activa de todos los estudiantes (O'Connor et al., 2017). En la misma dirección, como se menciona en la investigación de Slater & Chambers (2022) sobre las opiniones de los docentes, los principales desafíos estadísticamente significativos percibidos por los participantes estaban relacionados en gran medida con la cuestión de la enseñanza adaptativa, en particular con garantizar la provisión de apoyo diferenciado que involucre, desafíe y responda efectivamente a las necesidades holísticas de todos los estudiantes (O'Connor et al., 2017). De acuerdo con lo anterior, los resultados de la mayoría de las investigaciones, aunque traten sobre un campo más amplio de la educación, convergen con los resultados de la presente investigación. Hay que señalar que no se identificó literatura existente sobre si existe una diferencia entre las opiniones de los maestros y los maestros de jardín de infantes con respecto a la enseñanza de toda la clase utilizando prácticas multisensoriales. De hecho, la tecnología de asistencia desempeña un papel crucial a la hora de reducir la brecha entre los estudiantes con dificultades de aprendizaje y sus compañeros de desarrollo típico en la educación general. Sin embargo, la implementación efectiva de tecnología de asistencia requiere que los docentes estén bien capacitados y sean competentes en su uso, como se destaca en el estudio de Atanga et al. (2019).

Vale la pena señalar que los métodos de enseñanza multisensoriales pueden considerarse una forma de tecnología de asistencia, ya que proporcionan herramientas y técnicas valiosas para mejorar la enseñanza, tanto digital como no digital. Los enfoques multisensoriales pueden satisfacer diversas necesidades de aprendizaje, lo que los convierten en un componente valioso del conjunto de herramientas del educador cuando apoya a estudiantes con diversas dificultades y discapacidades de aprendizaje en aulas inclusivas.

Respecto al tercer objetivo científico, los resultados de la investigación llevaron a las siguientes conclusiones:

La investigación revela variaciones en las opiniones de profesores y profesores de jardín de infantes en la prefectura de Heraklion con respecto a la efectividad de la enseñanza multisensorial para estudiantes con dislexia en función del número de estudiantes a los que enseñan por hora. Específicamente, los profesores que enseñan a un estudiante por hora tienen más probabilidades de creer que los estudiantes con dislexia pueden mejorar suficientemente sus habilidades de lectura a través de

actividades multisensoriales en comparación con aquellos que enseñan a grupos más grandes con ocho estudiantes o más por hora. Esto implica que el tamaño de las clases y la proporción de alumnos por maestro pueden afectar las percepciones de los maestros sobre la efectividad de la enseñanza multisensorial, y los tamaños de clases más pequeños se asocian con opiniones más positivas sobre este enfoque para los estudiantes con dislexia.

La mayoría de los profesores y educadores de jardín de infantes, tanto de educación general, como especial, en Heraklion, están de acuerdo o totalmente de acuerdo en que la enseñanza multisensorial es beneficiosa para los estudiantes con dislexia cuando se trata de lograr sus objetivos de aprendizaje en materias relacionadas con el lenguaje. Es de destacar que quienes tienen un Máster tienden a expresar niveles más altos de acuerdo en comparación con aquellos que solo tienen una licenciatura. Además, se observa en general que los profesores y maestros de jardín de infantes en Heraklion que están de acuerdo en que la enseñanza multisensorial es efectiva para los estudiantes con dislexia en materias relacionadas con el lenguaje, también tienden a estar de acuerdo en que es efectiva en materias relacionadas con las ciencias. Muchos profesores que están totalmente de acuerdo con la primera afirmación también expresan total acuerdo con la segunda afirmación. Además, aquellos que expresan un acuerdo o un fuerte acuerdo en que la enseñanza multisensorial beneficia a los estudiantes con dislexia en materias relacionadas con el lenguaje también tienden a estar de acuerdo en que brinda a estos estudiantes las mismas oportunidades educativas que a sus compañeros de clase general. Existe una notable correlación positiva entre estas dos opiniones. Otro hallazgo estadísticamente significativo que se identificó se refiere a la correlación positiva entre su creencia en la eficacia de la enseñanza multisensorial para ayudar a los estudiantes con dislexia a alcanzar objetivos de aprendizaje en materias relacionadas con el lenguaje y su frecuencia de uso de actividades multisensoriales o métodos de enseñanza en esas materias. Es de destacar que, en general, hay más educadores que están de acuerdo o muy de acuerdo con que la enseñanza multisensorial ayuda a los estudiantes con dislexia a alcanzar objetivos de aprendizaje en materias relacionadas con el lenguaje y utilizan la enseñanza multisensorial con frecuencia o a diario.

En cuanto a las opiniones de los profesores sobre la eficacia de la enseñanza multisensorial para los estudiantes con dislexia, las conclusiones de la investigación indican que la mayoría de los profesores y profesores de jardín de infantes en la

prefectura de Heraklion, tanto en educación general, como especial, están de acuerdo o totalmente de acuerdo en que la enseñanza multisensorial es beneficiosa para todos los estudiantes, incluidos aquellos con dislexia, a comprender mejor los objetivos de enseñanza. Esta creencia parece consistente entre docentes con diferentes niveles de educación y especialización en educación especial. Sin embargo, los individuos con títulos de Máster y aquellos especializados en educación especial tienden a exhibir mayores niveles de acuerdo con esta afirmación.

Un hallazgo adicional, digno de mención, es que aquellos que están de acuerdo o totalmente de acuerdo en que la enseñanza multisensorial beneficia a todos los estudiantes en la comprensión de los objetivos de enseñanza, también consideran que la inclusión de todos los estudiantes es un factor muy importante o absolutamente esencial al elegir utilizar métodos de enseñanza multisensorial. Esto indica que los docentes que valoran la educación inclusiva tienden a percibir la enseñanza multisensorial como un enfoque valioso para apoyar este objetivo. Los resultados de la investigación también indican que existen diferencias en las opiniones de los docentes en función de la estructura educativa en la que trabajan. Los profesores de entornos educativos generales tienden a estar menos convencidos de que los estudiantes con dislexia puedan desarrollar adecuadamente sus habilidades de lectura a través de actividades multisensoriales, en comparación con aquellos que trabajan en entornos de educación especial. Esto sugiere que el contexto en el que trabajan los profesores puede influir en sus percepciones sobre la eficacia de la enseñanza multisensorial para los estudiantes con dislexia. Parece que una mayoría significativa de docentes y maestros de jardín de infantes en la prefectura de Heraklion, incluidos los de educación general y especial, tienden a estar de acuerdo o totalmente de acuerdo en que el uso de la enseñanza multisensorial es eficaz para los estudiantes de jardín de infantes (de 3 a 5 años). Sin embargo, el profesorado de educación Primaria está más convencido de su eficacia que los de jardín de infantes, para estudiantes de 3 a 5 años.

En lo que respecta al grupo de alumnos de 6 a 8 años, la mayoría del profesorado considera especialmente beneficiosa la enseñanza multisensorial, aunque las diferencias no sean estadísticamente significativas.

La literatura existente converge con los hallazgos anteriores, ya que, según la investigación realizada por Joshi et al. (2022), un enfoque de enseñanza multisensorial

llevó a los estudiantes de 1er grado a obtener mejores resultados que los del grupo de control. En la misma línea, Hunter-Carsch (2001) encontró que muchos niños se beneficiaban al experimentar una "variedad" de enfoques de enseñanza en el aula. Así mismo, señaló que los niños de su estudio tenían un nivel notablemente alto de alfabetización cuando había un claro énfasis en las experiencias táctiles multisensoriales. Del mismo modo, Flecker y Cogan (2000) creen que, si algo se visualiza y manipula, se recordará de manera más efectiva. Además, parece que la mayoría de los maestros y maestros de jardín de infantes en la prefectura de Heraklion están de acuerdo en que la enseñanza multisensorial funciona adecuadamente para estudiantes de 9 a 11 años. Sin embargo, se observan las siguientes peculiaridades; aunque parece haber una tendencia a creer esto entre un número ligeramente mayor de docentes que de jardín de infantes, éstos se dividen en dos categorías: los que están de acuerdo y los que no están de acuerdo con la afirmación anterior. Si bien faltan investigaciones específicas que exploren las opiniones de los docentes sobre la efectividad de la enseñanza multisensorial en relación con su especialidad y el tipo de escuela, existen investigaciones relacionadas que arrojan luz sobre el tema más amplio de la enseñanza multisensorial y sus beneficios. Por ejemplo, un estudio de Stephenson & Carter (2011), que examinó las opiniones de los profesores sobre el uso de entornos multisensoriales (MSE) en la enseñanza de estudiantes con discapacidades graves, encontró que la mayoría de los profesores de la muestra informaron que, incluso exponer a los estudiantes a dichos entornos, sin necesariamente tener objetivos didácticos específicos, tuvo un impacto positivo en su aprendizaje. Esto subraya la importancia de involucrar los sentidos en el proceso de enseñanza. Los hallazgos de Cuturi et al. (2022) respecto a los desafíos de enseñar conceptos geométricos y transformaciones mentales se alinean con los resultados de la presente investigación. Ambos estudios destacan los beneficios potenciales de los métodos de enseñanza multisensoriales, especialmente en materias que incluyen conceptos abstractos y desafiantes. El hecho de que los profesores de jardín de infancia de la prefectura de Heraklion opten por el uso frecuente de métodos de enseñanza multisensoriales en materias relacionadas con las ciencias implica su confianza en la eficacia de dichos métodos, especialmente para los estudiantes más jóvenes.

En cuanto a si las opiniones de los docentes difieren respecto a la efectividad, frecuencia y facilidad de implementar la enseñanza multisensorial en función del número de estudiantes enseñados por hora, los hallazgos de esta investigación indican lo siguiente:

Los maestros y maestros de jardín de infantes de entornos de educación general y especial están de acuerdo en que la enseñanza multisensorial se implementa de manera más efectiva y sencilla en entornos de instrucción individuales, y existe una correlación positiva entre estos dos factores. Además, es evidente que creen que la enseñanza multisensorial es eficaz y fácil de implementar en entornos de grupos pequeños. En particular, una parte sustancial de quienes están totalmente de acuerdo en que la enseñanza multisensorial es eficaz en entornos de grupos pequeños también están de acuerdo en que es fácil de implementar en dichos entornos.

Los hallazgos sugieren que las opiniones de los profesores sobre la eficacia y la facilidad de implementación de la enseñanza multisensorial en toda la clase están estrechamente relacionadas. La mayoría de quienes no están de acuerdo con la eficacia de la enseñanza multisensorial en toda la clase, también están en desacuerdo con la facilidad de implementarla en ese entorno. De manera similar, la mayoría del profesorado que está totalmente en desacuerdo con la eficacia de la enseñanza multisensorial en toda la clase tiende a creer que cuantos más estudiantes enseñan por hora, menos utilizan métodos de enseñanza multisensorial. Por el contrario, aquellos que están totalmente en desacuerdo con la eficacia de la enseñanza multisensorial en toda la clase, tampoco consideran que reducir el número de estudiantes aumente la frecuencia de uso de la enseñanza multisensorial.

Estos hallazgos resaltan el impacto del tamaño de las clases en las percepciones de los profesores sobre la efectividad de la enseñanza multisensorial, lo que sugiere que se logran mejores resultados en clases más pequeñas o en entornos de instrucción individualizados. El trabajo colaborativo en parejas o grupos pequeños puede servir como una herramienta valiosa para ayudar a los estudiantes con discapacidades de aprendizaje a desarrollar conocimientos y habilidades sociales. Los estudiantes desarrollan habilidades cooperativas y sociales cuando participan en actividades como compartir, turnarse, negociar roles, actuar como líderes y delegar tareas o responsabilidades (Cowley, 2013). El hallazgo de que los maestros y maestros de jardín de infantes en Heraklion, Creta, tienden a tener dificultades para implementar la

enseñanza multisensorial en toda la clase, independientemente de su especialidad, se alinea con la literatura existente, que sugiere que los enfoques multisensoriales a menudo se facilitan más eficazmente en pequeños grupos de intervención (Davies, 2012). Sin embargo, vale la pena señalar que un estudio empírico realizado por Joshi et al. (2002) afirma que un enfoque multisensorial puede ser eficaz en la instrucción de toda la clase, siempre que los profesores reciban la formación adecuada para su implementación. En general, los profesores y educadores de jardines de infancia en Heraklion perciben la eficacia de la enseñanza multisensorial para los estudiantes con dislexia, especialmente en materias relacionadas con el lenguaje. Esta percepción se extiende a temas relacionados con la ciencia, con niveles de acuerdo ligeramente más bajos. Además, creen que la enseñanza multisensorial promueve la igualdad de oportunidades educativas para los estudiantes con dislexia en comparación con sus compañeros sin dificultades. Las investigaciones existentes revelan una brecha notable a la hora de comprender las opiniones de los docentes sobre la efectividad de la enseñanza multisensorial en materias relacionadas con las ciencias. La mayoría de los estudios en esta área, ya que se han centrado predominantemente en la eficacia de los métodos y programas de enseñanza multisensorial, particularmente en lo que respecta a la lectura, la escritura y la conciencia fonológica. Incluso los estudios que abordan la eficacia de la enseñanza multisensorial en materias relacionadas con las ciencias a menudo carecen de la perspectiva del profesorado.

La investigación de O'Brien et al. (2021), examinó el efecto de una sola sesión de actividad física sobre la percepción multisensorial, evaluando la capacidad de fusionar adecuadamente entradas de diferentes modalidades sensoriales sobre la memoria de trabajo (verbal, visoespacial y motora) en 51 niños (de 6-8 años). Los resultados revelaron que una única sesión abierta produjo beneficios en la memoria de trabajo verbal (intervalo de dígitos) y una sesión cerrada de entrenamiento de habilidades benefició la memoria de trabajo motora (O'Brien et al., 2021). Los resultados de esta investigación convergen indirectamente con los resultados de la presente investigación en que, en general, tanto los maestros como los maestros de jardín de infantes de educación general y especial de la prefectura de Heraklion, tienden a estar de acuerdo en que la enseñanza multisensorial ayuda a los estudiantes con dislexia, siendo los especialistas en educación especial los más favorables.

También se alinea con las investigaciones realizadas por Flanagan et al. (2013) y Stoner et al. (2008), quienes enfatizaron que los docentes reconocen los beneficios de las tecnologías de asistencia para los estudiantes. En particular, incrementan su uso en el aula, cuando la capacitación en tecnología de asistencia está diseñada para ser fácil de usar y desarrollada con tiempo suficiente para que los docentes adquieran competencia en su uso (Biancarosa & Griffiths, 2012).

También la investigación de Taljaard en 2016, que examinó el uso de tecnologías multisensoriales en temas relacionados con la ciencia, arrojó resultados prometedores, encontrando que estas tecnologías mejoran el compromiso y los resultados del aprendizaje al atender a los estilos de aprendizaje preferidos por los estudiantes. Además, hacen que el aprendizaje sea más agradable y permiten a los estudiantes conectarse con situaciones de la vida real. El estudio también sugirió que las futuras herramientas de aprendizaje multisensorial tienen el potencial de mejorar aún más la participación de los estudiantes y sus resultados de aprendizaje. Además, una investigación de Volpe y Gori en 2019 enfatizó la importancia de la enseñanza multisensorial en los cursos de ciencias, ya que se considera adecuada para transmitir conceptos científicos complejos. estos autores abogan por el desarrollo de un paradigma de aprendizaje multisensorial, integrado y activo, junto con un ecosistema de enseñanza que promueva la inclusión, asegurando que, tanto los estudiantes con desarrollo típico como los que presentan alguna discapacidad, tengan igualdad de acceso a oportunidades, rompiéndose barreras entre ellos.

Estos hallazgos resaltan colectivamente los beneficios potenciales de la enseñanza multisensorial en materias relacionadas con las ciencias, aunque se necesita más investigación, especialmente desde la perspectiva de los docentes, para obtener una comprensión integral de su efectividad e implicaciones en este dominio específico.

La investigación realizada por Fazmina et al. (2020) sobre estudiantes de Sri Lanka, destacó la eficacia de las estrategias de enseñanza multisensoriales en la enseñanza de estudiantes con dislexia, particularmente en las clases de ciencias. Los hallazgos sugieren que estos métodos mejoran significativamente el rendimiento de los estudiantes, especialmente de aquellos con dislexia de sexto curso, mostrando que estas estrategias eran particularmente útiles para transmitir conceptos científicos abstractos y complejos, como los relacionados con la energía y la materia. Del mismo modo, se

observó que ayudan a los estudiantes con dislexia a reducir los errores comunes y los problemas de comprensión al leer materiales educativos.

Respecto al cuarto objetivo, los resultados de la investigación llevaron a las siguientes conclusiones:

En general, parece que la mayoría de los maestros y maestros de jardín de infantes en la prefectura de Heraklion, tanto en educación general como especial, expresan un fuerte deseo de aprender algún método de enseñanza multisensorial, especialmente los que tienen menos de 15 años de experiencia. Esta tendencia podría explicarse por la creencia de que los docentes con menos años de experiencia están más proclives a buscar oportunidades de mejora y desarrollo profesional a través de la formación, incluso en métodos de enseñanza multisensoriales. Es más, todo el profesorado de Heraklion intenta reeducarse para seguir las nuevas tendencias educativas. Sin embargo, existe una tendencia mayor entre quienes reciben formación en educación especial a proseguir más su formación.

No obstante, se observa que una gran parte de los participantes optaron por valores medios, lo que indica que no tienen una opinión sólida (O'Muircheartaigh et al., 1999) o no dedicaron el esfuerzo cognitivo necesario para decidir sobre una respuesta clara y, por lo tanto, eligieron el centro de la escala. (Saris & Gallhofer, 2007). Independientemente de la explicación, las puntuaciones medias de los docentes arrojan luz sobre las decisiones de los profesionales y los responsables de las políticas sobre la educación inclusiva. En cuanto a la diferenciación en relación a la edad, los presentes hallazgos son confirmados por los resultados de la investigación de Serafini (2018), donde, entre otras cosas, mostraron que, en Italia, los profesores mayores de 50 años mostraban menos deseo de formarse y tenían un nivel educativo más bajo. La investigación, además, indica que los docentes con especialización en educación especial tienden a utilizar métodos de enseñanza multisensoriales con mayor frecuencia, independientemente de la materia que estén enseñando, en comparación con aquellos sin experiencia en educación especial. Esto sugiere que la formación especializada en educación especial puede contribuir al uso más frecuente de métodos de enseñanza multisensoriales en diversas materias.

Desde hace tiempo existe un consenso ampliamente reconocido que considera que mejorar las oportunidades de aprendizaje de los estudiantes depende de la educación y

el desarrollo profesional de los docentes (Krainer, 2011). La instrucción eficaz para estudiantes con dislexia requiere una preparación docente integral y una planificación especializada dentro del ámbito de la educación especial (Tsakiridou & Polyzopoulou, 2014). En los últimos años, a nivel internacional, se ha prestado una mayor atención sobre el contenido y la estructura de la formación docente inicial y continua.; los defensores de la reforma educativa en los Estados Unidos y en todo el mundo han enfatizado constantemente la importancia del desarrollo profesional de alta calidad como un medio para que los docentes mejoren sus técnicas de instrucción con el fin de optimizar el aprendizaje de los estudiantes (Kennedy, 2016). La noción de que el desarrollo profesional puede fomentar mejoras en la enseñanza está ampliamente aceptada (Kennedy, 2016), sin embargo, la implementación real del desarrollo profesional puede variar significativamente entre países y dentro de un mismo país, al igual que la investigación relacionada con el desarrollo profesional (Bautista et al., 2015).

A la luz de diversos estudios que reflejan la evolución demográfica, la población que envejece, no solo vive más, sino que también se reduce, lo que enfatiza la importancia del aprendizaje permanente (Figel, 2016). Para seguir siendo una parte indispensable de la fuerza laboral, las personas deben profundizar y ampliar continuamente sus conocimientos y habilidades (Frk, 2014). Este concepto se extiende a los docentes, quienes también deben invertir en su propio desarrollo para contribuir eficazmente al bienestar y al progreso de la escuela. Por lo tanto, la especialización se considera muy importante, ya que probablemente pueda mejorar su eficiencia. Los hallazgos del presente estudio demuestran que la especialización en educación especial influye en las opiniones de los maestros y maestros de jardín de infantes en Heraklion. En concreto, se observó que aquellos con especialización en educación especial, que afirman poseer los conocimientos necesarios para enseñar técnicas multisensoriales, son el doble que aquellos sin esta especialización, destacando el valor de la formación y el conocimiento especializados para promover una enseñanza eficaz.

La afinidad entre los hallazgos de la investigación y la literatura más amplia es evidente, ya que se ha descubierto que la especialización en educación especial y la obtención de un título de Máster contribuyen significativamente al desarrollo profesional docente. La evidencia existente respalda la eficacia del desarrollo profesional específico caracterizado por la sostenibilidad, enfocado en el contenido, la participación activa, la

colaboración, la continuidad, la alineación con los estándares escolares y curriculares, y centrado en mejorar el pensamiento y las experiencias de aprendizaje de los estudiantes. Este enfoque integral del desarrollo profesional también subraya el valor de la orientación educativa y la retroalimentación específica (Sun et al., 2013).

Además, los contenidos de los programas de desarrollo profesional de alta calidad enfatizan sobre las teorías del aprendizaje de adultos y la utilización de estrategias de aprendizaje apropiadas (Darling-Hammond et al., 2009). Estos hallazgos subrayan la importancia del desarrollo profesional estructurado y continuo para los educadores, particularmente en el contexto de la educación especializada.

Armstrong (2009) destacó que comprender y adaptarse a diversos estilos de aprendizaje es crucial para una enseñanza eficaz. Para ser el instructor más eficaz para todos los estudiantes, los profesores deben estar equipados con una amplia gama de técnicas y enfoques. La enseñanza multisensorial, considerada parte de la tecnología de asistencia, desempeña un papel importante a la hora de cerrar la brecha entre los estudiantes con dificultades de aprendizaje y sus compañeros en la educación general. Sin embargo, esto subraya la necesidad de que los docentes reciban una formación integral y desarrollen competencias en el uso de dichas tecnologías (Atanga et al., 2019). Cabe destacar que en la misma encuesta se reveló que el 83% de los participantes sentían que su carrera inicial no los preparaba adecuadamente con los recursos necesarios para este tipo de enseñanza.

En cuanto a si el costo impacta la disposición de los docentes a recibir capacitación en métodos/programas de enseñanza multisensorial, según los hallazgos de esta investigación, en general, la mayoría de los maestros y maestros de jardín de infantes en la prefectura de Heraklion, tanto en educación general como especial, están interesados en capacitarse en algún método o programa multisensorial. Sin embargo, se observa que sus opiniones difieren según su nivel de estudios y específicamente, hay más personas que tienen un Máster que desean ampliar su educación, en comparación con quienes poseen una licenciatura. También se observa que la mayoría de los que están completamente en desacuerdo con que el Estado proporcione gratuitamente el aprendizaje de un método de enseñanza multisensorial, están completamente de acuerdo en que pagarían su formación si así lo decidieran.

La investigación realizada por Stephenson y Carter (2011) se alinea con los hallazgos de la presente investigación, destacando que las unidades escolares a menudo no ofrecen un apoyo sustancial en términos de oportunidades de aprendizaje profesional relacionadas con los métodos de enseñanza multisensoriales. Incluso cuando hay herramientas multisensoriales disponibles dentro de una unidad escolar, es posible que los maestros aún carezcan de la capacitación necesaria para utilizarlas de manera efectiva. Esta observación subraya la falta de capacitación gratuita por parte del estado sobre métodos de enseñanza multisensoriales y sugiere que los maestros que deseen recibir capacitación adicional para hacer uso de las herramientas multisensoriales disponibles pueden tener que asumir ellos mismos los gastos. Los estudios anteriores subrayan los desafíos que los maestros de preescolar y primaria a menudo enfrentan cuando se trata de sentirse adecuadamente preparados para enseñar a estudiantes con discapacidades, particularmente en aulas inclusivas. Estos maestros han informado de una falta de conocimientos y habilidades específicos necesarios para instruir eficazmente a estudiantes con discapacidades en aulas inclusivas, del mismo modo que los participantes de este estudio.

La financiación adicional y los programas de formación para docentes pueden desempeñar un papel crucial a la hora de dotarlos del apoyo que necesitan para implementar enfoques de enseñanza multisensoriales de forma eficaz, como sugiere Alwaqassi (2017). Las filosofías y actitudes profesionales positivas son esenciales para los docentes cuando trabajan con estudiantes con discapacidades. Esto se alinea con la idea de que los docentes deben tener respuestas constructivas a las diversas necesidades de aprendizaje de sus estudiantes, como enfatizan Shute y Rahimi (2017).

Los hallazgos de la investigación actual indican que los maestros de jardín de infantes tienden a estar más familiarizados con las prácticas multisensoriales en comparación con los maestros de grados superiores. Esta diferencia podría atribuirse al hecho de que los maestros de jardín de infantes a menudo tienen más experiencia en el uso de tecnología de asistencia (TA) y han aceptado o aprendido filosofías específicas que guían la selección e integración de la TA en sus entornos de aprendizaje (Koch, 2017).

Los programas de capacitación para maestros de educación especial son fundamentales para prepararlos para crear experiencias de aprendizaje valiosas para los estudiantes con discapacidades. Estos programas familiarizan a los maestros de educación especial

con las características integradas de AT, permitiéndoles brindar instrucción y apoyo adecuados a todos los niños en sus aulas (Erdem, 2017). La participación activa de profesores de educación especial capacitados en el proceso de aprendizaje es particularmente importante, dada la sensibilidad y la naturaleza especializada de sus funciones (Holstein et al., 2017).

La investigación realizada por Boardman (2020) sugiere que los docentes que reconocen los beneficios de la enseñanza multisensorial para todos los estudiantes tienen más probabilidades de continuar con su educación y desarrollo profesional. Este hallazgo respalda nuestra investigación, que ha evidenciado que los profesores que expresan un deseo de formación en un método multisensorial ya están utilizando técnicas multisensoriales tanto en materias relacionadas con el lenguaje como con las ciencias.

Respecto al quinto objetivo, se encontraron las siguientes conclusiones:

Los profesores y maestros de jardín de infantes en la prefectura de Heraklion ya sean en educación especial o general, tienden a estar más dispuestos a aplicar actividades multisensoriales y métodos de enseñanza en materias relacionadas con las ciencias, cuando perciben que la enseñanza multisensorial ayuda a los estudiantes con dislexia a lograr sus objetivos de aprendizaje en estas materias. Esta observación resalta el potencial de los métodos de enseñanza multisensoriales para mejorar las experiencias de aprendizaje de los estudiantes, particularmente en materias relacionadas con las ciencias.

En el contexto del jardín de infancia griego, se introducen muchos conceptos matemáticos y prematemáticos, y algunos de estos conceptos pueden resultar particularmente desafiantes para los estudiantes jóvenes. La alineación entre estos hallazgos subraya la importancia de incorporar enfoques multisensoriales para mejorar la comprensión y el compromiso entre los estudiantes cuando se enfrentan a conceptos matemáticos y geométricos complejos. Este enfoque puede facilitar una experiencia de aprendizaje más integral y efectiva, especialmente en las primeras etapas de la educación.

Los estudiantes de escuela primaria a menudo enfrentan desafíos al adquirir habilidades matemáticas, posiblemente debido a los métodos de enseñanza predominantes que se basan principalmente en lecciones formales con una

incorporación limitada de actividades multisensoriales dentro del aula (Cuturi et al., 2022). Al reconocer el valor de los enfoques multisensoriales, los educadores pueden ofrecer experiencias de aprendizaje más atractivas y efectivas, especialmente en materias que tradicionalmente requieren una comprensión abstracta y conceptual, como las matemáticas y las ciencias. De manera más general, parece que la mayoría de los profesores y profesores de jardín de infancia de la prefectura de Heraklion consideran que la elección de la enseñanza multisensorial es muy importante o absolutamente esencial para la inclusión de todos los estudiantes, aunque esta opinión está más apoyada por los docentes de jardín de infantes de educación general.

Se observan diferencia de opiniones de los docentes en función de su nivel de estudio, siendo más importante la selección de un método/programa multisensorial para la inclusión de estudiantes con dislexia para el profesorado que ha cursado un Máster, en comparación con aquellos que no tienen. Además, aunque la mayoría de los docentes creen que al utilizar prácticas multisensoriales ofrecen igualdad de oportunidades de aprendizaje a todos los estudiantes sin excepción, aquellos que tienen un Máster puntúan más alto. Además, se observa que, tanto los maestros como los maestros de jardín de infantes en educación general y especial en la prefectura de Heraklion tienden a estar de acuerdo o muy de acuerdo en que la participación de los estudiantes con dislexia en la lección aumenta cuando utilizan actividades multisensoriales. Sin embargo, los profesores que han cursado un Máster muestran mayor acuerdo que los que no.

Del mismo modo, quienes consideran la inclusión de los estudiantes como un factor muy importante o absolutamente esencial en su elección de la enseñanza multisensorial, están de acuerdo o completamente de acuerdo con que la enseñanza multisensorial ayuda a todos los estudiantes a comprender mejor el objetivo de la enseñanza. Además, en general parece que cuanto mayor acuerdo existe respecto a esta afirmación, mayores oportunidades brindan a los estudiantes con dislexia, aumentando así su participación. Esta correlación sugiere que estos educadores reconocen los beneficios de las actividades multisensoriales para promover la igualdad de oportunidades educativas para los estudiantes con dislexia y aumentar su participación en las lecciones. Parece que los profesores y profesores de educación infantil de educación general y especial de la prefectura de Heraklion, estén o no especializados en educación especial, tienden a estar de acuerdo en que la enseñanza multisensorial ayuda a los estudiantes con

dislexia. Sin embargo, casi el doble del profesorado de educación especial está totalmente de acuerdo con esta afirmación. Especializados o no en educación especial, los profesores y profesores de jardín de infancia de la prefectura de Heraklion, tienden a estar de acuerdo en que la enseñanza multisensorial ayuda a todos los estudiantes a comprender mejor el objetivo de la enseñanza, aunque el profesorado especializado en educación especial representa el doble.

En el presente estudio se encontró que los maestros y maestros de jardín de infantes de la prefectura de Heraklion, que tienen experiencia en educación especial, tienden a estar de acuerdo en que la enseñanza multisensorial ayuda a los estudiantes con dislexia a lograr objetivos de aprendizaje en materias relacionadas con la ciencia y el lenguaje, en comparación con aquellos que no la tienen. Además, se encontró que hay más profesorado que tiene los conocimientos necesarios para la enseñanza multisensorial y están especializados en educación especial que quienes no los tienen. Desafortunadamente, a diferencia de las investigaciones sobre educadores típicos, los estudios sobre los puntos de vista de los educadores especiales son raros (Huang et al., 2022). Sin embargo, se podría decir que los hallazgos anteriores convergen indirectamente con la literatura existente, ya que se informa que, en comparación con los educadores típicos, los profesores de educación especial pueden tener un conocimiento más amplio de los estudiantes con diferencias de aprendizaje, utilizar diferentes estructuras de conocimiento profesional, utilizar métodos más multimodales y prácticas de evaluación para interpretar eventos del aula, resolver problemas educativos, monitorear el progreso y responder a los estudiantes (Blanton et al., 1994; Byrd & Alexander, 2020; Stough & Palmer, 2003). Además, la investigación de Puspitaloka y Syarif (2020) ha destacado específicamente la idoneidad de la educación multisensorial para enseñar a estudiantes disléxicos. Sus hallazgos indican beneficios significativos en la mejora de las habilidades de lectura de los estudiantes disléxicos mediante la implementación de prácticas de enseñanza multisensoriales. Estos conocimientos subrayan colectivamente la eficacia de los métodos multisensoriales, especialmente para ayudar a los estudiantes con dislexia en su desarrollo lector.

Los enfoques multisensoriales se utilizan comúnmente en intervenciones para estudiantes con dislexia, ya que pueden abordar los diversos desafíos cognitivos asociados con esta condición. Sin embargo, la eficacia de las intervenciones multisensoriales puede variar según diferentes estudios. Por ejemplo, Schlesinger y

Gray (2017) encontraron que las intervenciones multisensoriales no necesariamente proporcionaban una ventaja sobre las intervenciones estructuradas para estudiantes con desarrollo típico o dislexia. Sin embargo, ambos tipos de intervenciones produjeron efectos generales positivos del tratamiento para los participantes.

Por otro lado, la investigación de Boardman (2020), que se centró en las opiniones de los docentes, indicó que la enseñanza con un enfoque multisensorial es muy valiosa para los alumnos individualmente y la instrucción de toda la clase. Además, el desarrollo positivo del lenguaje, particularmente en las habilidades de vocabulario expresivo, se ha asociado con programas de narración multisensorial, como respaldan publicaciones e investigaciones previas, de Caldwell (2007) y Hettiarachchi et al. (2022). Hettiarachchi et al. (2022) demostraron que un enfoque multisensorial, que incluye estímulos visuales, auditivos, táctiles y cinestésicos, tiene el potencial de facilitar el aprendizaje de vocabulario en niños con discapacidades. Estos estudios enfatizan colectivamente la importancia de los enfoques multisensoriales para mejorar las experiencias y resultados de aprendizaje de los estudiantes con diversas necesidades.

Otros estudios también han destacado que los profesores de preescolar y primaria no se sienten preparados para enseñar a estudiantes con discapacidad. Informaron que había una falta de conocimientos y habilidades específicos para la enseñanza en aulas inclusivas (Ruppar et al., 2016), lo que se confirma indirectamente en este estudio. Además, la financiación adicional y los programas de formación para los docentes les brindarían el apoyo que necesitan para aplicar adecuadamente enfoques multisensoriales en sus aulas (Alwaqassi, 2017).

Si los estudiantes con discapacidades graves sólo pueden beneficiarse de la exposición a entornos multicurriculares, no sería exagerado afirmar que los estudiantes con discapacidades especiales de aprendizaje o incluso los estudiantes típicos podrían beneficiarse enormemente de actividades y pruebas específicas. Se identificó un gran vacío bibliográfico sobre la efectividad de la educación multisensorial en relación con la especialidad del docente y el tipo de escuela, las materias relacionadas con las ciencias (escuela general o de educación especial) y la frecuencia de uso de la enseñanza multisensorial. Además, se identificó una brecha en cuanto a los factores que influyen en la frecuencia de uso de prácticas multisensoriales, las barreras para la implementación de estas prácticas en el jardín de infantes y la escuela primaria, y

finalmente en cuanto a quién es el maestro más adecuado para enseñar con metodología multisensorial.

Del mismo modo, se encontró un vacío en la literatura con respecto a los puntos de vista de los educadores sobre quién es el más adecuado para enseñar a un niño con dislexia, lo que resalta la necesidad de realizar más investigaciones en esta área. Además, se podrían realizar investigaciones para sopesar dos herramientas, una de las cuales sería sobre ortografía superficial y la otra sobre ortografía opaca, de modo que puedan traducirse a diferentes idiomas y la investigación posterior pueda producir resultados más generalizables y contribuir a mejorar o modificar estas herramientas. Además, se considera necesario que los docentes entren en contacto con las técnicas multisensoriales a través de los programas de estudio de las universidades y también en su posterior trayectoria como docentes en activo. La financiación adicional y los programas de formación para los docentes les brindarían el apoyo que necesitan para aplicar adecuadamente enfoques multisensoriales en sus aulas (Alwaqassi, 2017).

Como educadores, es nuestra responsabilidad explorar y adoptar continuamente enfoques de enseñanza exitosos, respaldados por teorías y estrategias de aprendizaje relevantes (Yin et al., 2017). Un ejemplo digno de mención es el sistema educativo finlandés, de renombre internacional, que pone un fuerte énfasis en el enfoque multisensorial del aprendizaje. Este enfoque en el aprendizaje multisensorial ha contribuido al alto rendimiento constante de Finlandia en evaluaciones internacionales como las pruebas PISA (Puustinen et al., 2018). El aprendizaje multisensorial se considera un catalizador para el cambio a largo plazo (Mackay, 2012). Este enfoque se alinea con la teoría de Vygotsky, que destaca que lo que los niños pueden hacer hoy con el apoyo de un adulto, lo podrán lograr de forma independiente mañana. En un enfoque multisensorial, los niños son agentes activos de su propio aprendizaje y desarrollo (Wood, 2010). La investigación de Boardman (2019) respalda la idea de que un enfoque creativo y multisensorial es la forma más eficaz e inclusiva de enseñar e involucrar a todos los estudiantes. Esto se confirma con los hallazgos de Melhuish (2014) y Finnegan (2016), quienes sostienen que el cerebro aprende mejor cuando se expone a entornos y actividades ricos, complejos y multisensoriales. Comprender las creencias de los docentes es esencial para comprender sus intenciones y acciones en el aula. Identificar las creencias profundamente arraigadas de los docentes sobre el papel de la

tecnología en la enseñanza y el aprendizaje es un paso crucial para impulsar un cambio significativo en las prácticas educativas (Bice y Tang, 2022).

**Importancia e innovación de la investigación**

En esta investigación, se examinan las opiniones de los maestros y maestras de jardín de infantes de educación general y especial en la prefectura de Heraklion, como se detalla en subsecciones anteriores. Examinar las opiniones de los docentes es particularmente importante porque son los órganos docentes oficiales/formales del estado griego. Las exigencias de la Unión Europea y las recomendaciones de la OCDE para desarrollar prácticas inclusivas son un hecho y la opinión de los docentes es la que capta si hemos pasado de la teoría a su aplicación práctica para una escuela que brinde igualdad de oportunidades educativas a todos los estudiantes sin excepción.

El papel de los educadores es crucial, no sólo porque lideran el proceso de enseñanza, sino también porque ellos, junto con los estudiantes, sienten la dinámica de la experiencia de aprendizaje. Pueden mejorarlo, ajustarlo, enriquecerlo, transformarlo o adaptarlo para garantizar su eficacia y el logro de los objetivos educativos.

Las perspectivas de los docentes sobre la eficacia de la enseñanza han sido un tema de investigación en el escenario global. En Grecia, numerosos estudios han investigado la eficacia de la enseñanza en general; sin embargo, ninguna investigación identificada ha explorado específicamente los puntos de vista de los docentes sobre la enseñanza multisensorial. Las ideas proporcionadas por las opiniones de los profesores tienen especial importancia ya que arrojan luz sobre cómo comprenden e implementan la enseñanza multisensorial. Además, esta investigación profundiza en las opiniones de los docentes en relación con variables como el género, los años de experiencia y el nivel educativo, que, o no se han explorado sistemáticamente en Grecia, o se han examinado esporádicamente.

Creta es la isla más grande y poblada de Grecia, ubicándose como la quinta más grande del Mediterráneo tanto en términos de tamaño como de población, con 623.065 residentes. La región de Creta, que abarca 8.336 kilómetros cuadrados, ocupa el quinto lugar en tamaño de población entre las regiones griegas. Su capital y ciudad más grande, Heraklion, sirve como sede regional y abarca islas e islotes adyacentes. La prefectura de Heraklion, una parte constituyente de la región, se ubica como la cuarta prefectura más poblada de Grecia y alberga a 302.405 habitantes según el censo de población de

2021. Estos datos demográficos subrayan la presencia de una importante población estudiantil, numerosas instituciones educativas y, en consecuencia, un número sustancial de docentes.

Además, la variada geomorfología de Creta, particularmente dentro de Heraklion, que presenta tanto terreno montañoso como llanuras fértiles, ha alentado a los residentes a dedicarse a actividades agrícolas. Como resultado, los docentes empleados en la prefectura de Heraklion provienen de diversos orígenes geográficos de toda Grecia, en lugar de ser predominantemente locales.

Además, la crisis económica de Grecia, que persiste desde 2008, ha provocado la suspensión de los nombramientos docentes permanentes, lo que ha hecho necesarios contratos estacionales para cada año académico. Muchos de los educadores de este sistema eran sustitutos y rotaban anualmente a diferentes lugares y escuelas. La inseguridad laboral resultante ha llevado a los docentes a mejorar su competitividad en el mercado laboral y adquirir habilidades especializadas. Si bien en 2020 comenzaron a restablecerse nombramientos permanentes limitados, una proporción considerable de docentes siguió sin poder trasladarse a sus ubicaciones preferidas y continuaron trabajando en su lugar de asignación inicial.

Heraklion, debido a sus numerosos puestos docentes en educación primeria y de jardín de infantes, ha atraído a educadores recién nombrados de varias partes de Grecia. Si bien los hallazgos de este estudio no pueden generalizarse a todo el país, pueden ofrecer ideas que podrían ser indicativas de tendencias más generalizadas a nivel nacional.

**Limitaciones de la investigación.**

Todo esfuerzo de investigación debe reconocer las limitaciones del mundo real, ya que opera dentro de este contexto (Robson, 2007). Por lo tanto, tanto los objetivos de la investigación como los métodos de recopilación de datos deben alinearse con las limitaciones prácticas de tiempo y recursos.

Una limitación asociada con el plazo ajustado para realizar esta investigación es la utilización de un cuestionario como herramienta de recopilación de datos. En consecuencia, la investigación hereda las limitaciones inherentes de las encuestas como instrumentos de recopilación de datos, que incluyen la incapacidad de proporcionar aclaraciones o hacer preguntas de seguimiento, la ausencia de opciones adicionales de

recopilación de datos, la falta de control sobre la honestidad de los encuestados y otros problemas potenciales (Bryman, 2016).

Además, la extensión del cuestionario y el tiempo necesario para completarlo representan limitaciones prácticas que deben tenerse en cuenta. Si bien se podrían haber incluido preguntas adicionales para investigar cómo los profesores definen la eficacia y la facilidad de la enseñanza multisensorial, esto habría ampliado el cuestionario y potencialmente disuadido a los encuestados de completarlo (Vamvoukas, 2010). Además, se podrían incluir algunas preguntas abiertas para permitir que los participantes agreguen lo que ellos mismos quieran y no haya sido previsto por el investigador. Estas debilidades podrían aliviarse hasta cierto punto utilizando un segundo medio de recopilación de datos, como la entrevista. Pero esto no se pudo hacer porque después del COVID-19, en los servicios públicos y en las escuelas en particular, se siguieron estrictos protocolos sanitarios. Además, debido a la falta de márgenes de tiempo, las entrevistas retrasarían significativamente la finalización de esta investigación.

**Ética de la investigación**

La ética de la investigación se refiere a la aplicación de principios éticos fundamentales a diversos aspectos de la investigación científica. Estos principios guían a los investigadores en áreas como el diseño de la investigación, su implementación, el manejo de datos, la prevención del plagio, la evitación de la falsificación de datos y la garantía de la dignidad y los derechos de los participantes en la investigación. La ética de la investigación desempeña un papel crucial en el mantenimiento de la integridad, la credibilidad y la conducta responsable de los esfuerzos de investigación.

En el presente trabajo se tuvieron en cuenta los siguientes principios:

- Respetar la personalidad de los entrevistados y no causar ningún daño.
- El anonimato de los encuestados y su no trazabilidad.
- Participación voluntaria, consentimiento informado y capacidad de los encuestados de retirarse de la investigación.
- Confidencialidad de la información.
- Información sobre el propósito de la investigación, etc. (Cohen et al., 2008).

Todo lo anterior quedó asegurado mediante una carta pertinente que acompañaba al cuestionario. En particular, la carta menciona: El propósito de la investigación, el anonimato, el tiempo para completar el cuestionario y la participación voluntaria.

**Referencias**


Akamatsu, N. (1999). The effects of first language orthographic features on word recognition processing in English as a second language. *Reading and Writing, 11*(4), 381–403. Doi: 10.1023/A:1008053520326

Akinde, T. A. & Adetimirin, A. E. (2019). Administrative and infrastructural factors affecting library and information science educators' actual use of educational support systems for teaching in Nigerian universities. *Journal of Librarianship and Information Science, 51*(1), 180-195. Doi:10.1177/0961000618773140

Alexander, R. J. (2017). *Towards Dialogic Teaching: Rethinking Classroom Talk*. Diálogos.

Alwaqassi, S. A. (2017). *The use of multisensory in schools today* (Doctoral dissertation, [Bloomington, Ind.]: Indiana University).

Armstrong, T. (2009). *Multiple Intelligences in the Classroom* (3rd ed.). Association for Supervision & Curriculum Development.

Atanga, C., Jones, B. A., Krueger, L. E. & Lu, S. (2020). Teachers of Students With Learning Disabilities: Assistive Technology Knowledge, Perceptions, Interests, and Barriers. *Journal of Special Education Technology, 35*(4), 236-248. Doi:10.1177/0162643419864858

Baron, N. S. (2001). Commas and canaries: The role of punctuation in speech and writing. *Language Sciences*, *23*, 15-67. Doi: 10.1016/S0388-0001(00)00027-9

Bautista, A., Wong, J. & Gopinathan, S. (2015). Teacher professional development in Singapore: Depicting the landscape. Psychology, *Society and Education, 7*(3), 311–326.

Biancarosa, G. & Griffiths, G. G. (2012). Technology tools to support reading in the digital age. *The Future of Children, 22*, 139–160. Doi:10.1353/foc.2012.0014

Bice, H. & Tang, H. (2022). Teachers' beliefs and practices of technology integration at a school for students with dyslexia: A mixed methods study. *Educ Inf Technol 27*, 10179–10205. Doi:10.1007/s10639-022-11044-1

Boardman, K. (2020). An exploration of teachers' perceptions and the value of multisensory teaching and learning: a perspective on the influence of Specialist Dyslexia Training in England, *Education 3-13, 48*(7), 795-806. Doi: 10.1080/03004279.2019.1653349

Brown, A. L., Palinscar, A. S. & Purcell, L. (1986). Poor Readers: Teach, Don't Label. In U. Neisser (Eds.), *The School Achievement of Minority Children New Perspectives.* Routledge.

Bryman, A. (2016). *Methods of social research*. Gutenberg.

Caldwell, J. E. (2007). *Clickers in the Large Classroom: Current Research and Best-Practice Tips. CBE-Life Sciences Education, 6*, 9-20. Doi:10.1187/cbe.06-12-0205

Caravolas, M., Volín, J. & Hulme, C. (2005). Phoneme awareness is a key component of alphabetic literacy skills in consistent and inconsistent orthographies: Evidence from Czech and English children. *Journal of Experimental Child Psychology*, *92*(2), 107-139. Doi: 10.1016/j.jecp.2005.04.003

Cohen, L., Manion, L. & Morisson, K. (2008). *Educational research methodology.* Metaichmio.

Coltheart, M. (2005). Modelling reading: The dual-route approach. In M. J. Snowling & C. Hulme (Eds.), *The Science of Reading: A handbook* (pp. 6–23). Blackwell.

Cowley, S. (2013). *The Seven R's of Great Group Work*. Sue Coley books.

Cuturi, L. F., Cappagli, G., Yiannoutsou, N., Price, C. & Gori, M. (2022). Informing the design of a multisensory learning environment for elementary mathematics learning. *J Multimodal User Interfaces 16*, 155–171. Doi:10.1007/s12193-021-00382-y

Darling-Hammond, L., Wei, R. C., Andree, A., Richardson, N. & Orphanos, S. (2009). *Professional learning in the learning profession: A status report on teacher development in the United States and abroad*. National Staff Development Council.

Davies, C. (2012). *Creating Multisensory Environments*. Routledge.

Degani, T., Yagev, B. D., O. & Levy, A. L. (2023). Does brief exposure to a written text affect spelling performance in a second language?. *Read Writ* 36, 1901–1935. Doi:10.1007/s11145-022-10349-4

Devaney, A. A., Begeny, J. C., Haskett, M. E. & Ginns, D. S. (2019). Effects of a Reading Fluency Intervention on Middle School Students Attending a Residential Treatment Center for Youth with Emotional and Behavioral Disorders. *Contemp School Psychol*, *23*, 367–378. Doi:10.1007/s40688-018-0184-z

Erdem R. (2017). Students with special educational needs and assistive technologies: A literature review. *Turkish Online Journal of Educational Technology: TOJET*, 16(1), 128–146.

Ernst, M. O. & Banks, M. S. (2002). Humans integrate visual and haptic information in a statistically optimal fashion. *Nature, 415*, 429–433. Doi:10.1038/415429a

Ernst, M. O. & Bülthoff, H. H. (2004). Merging the senses into a robust percept. *Trends in Cognitive Sciences, 8*(4), 162–169. Doi:10.1016/j.tics.2004.02.002

Fazmina, A. F., Jazeet, A. M. & Saravanakumar, A. R. (2020). Enhancing the Attainment of Students with Dyslexia in Science through Multisensory Instructional Strategies. *J. Xidian Univ*, *14*(6), 1812-1818.

Finnegan, J. (2016). *Lighting up Young Brains. How Parents, Carers and Nurseries Support Children's Brain Development in the First Five Years*. Save the Children.

Flanagan, S., Bouck, E. C. & Richardson, J. (2013). Middle school special education teachers' perceptions and use of assistive technology in literacy instruction. *Assistive Technology, 25*, 24–30. Doi:10.1080/10400435.2012.682697

Flecker, M. & Cogan, J. (2000). The Learning Skills. In *Dyslexia in Practice: A Guide for Teachers*. In J. Townend & M. Turner (Eds.), 209–249. Kluwer Academic/Plenium Publishers.

Frk, V. (2014). Zmeny, očakávania a výzvy profesijného vzdelávania zamestnancov, Vzdelávanie asociálna stratifikácia, University of Prešov, pp. 50-71. https://tinyurl.com/yc248nt2

Gaitanidi, L.-A., Corujo-Vélez, C. & Vega-Gea, E. (2023). The Impact of Dyslexia Box: A Case Study on Students in an Integration Class in Greece. *Education Sciences*, *13*(5), 486. MDPI AG. Doi:10.3390/educsci13050486

Gillingham, A. & Stillman, B. (1956). *Remedial Training for Children with Specific Disability in Reading, Spelling and Penmanship* (5th ed). Educators Publishing Service.

Gnardellis, Ch. (2022). *Data analysis with the IBM SPSS Statistics 28*. Papazisi.

Gonzalez, M. T. D., Phillips-Silver, J., Maurno, N. G., Fernández García, L. & Ruiz-Castañeda, P. (2023). Improving phonological skills and reading comprehension in deaf children: A new multisensory approach, *Scientific Studies of Reading*, *27*(2), 119-135. Doi:10.1080/10888438.2022.2095280

Goswami, U. (2015). *Children's Cognitive Development and Learning*. Cambridge Review Trust.

Harari, Y. N. (2015). Sapiens: *A brief history of humankind*. Alexandreia.

Harlen, W. (2007). *Assessment of Learning*. SAGE Publications.

Heafner, T. L., Lipscomb, G. B. & Fitchett, P. G. (2014). Instructional Practices of Elementary Social Studies Teachers in North and South Carolina. *The Journal of Social Studies Research, 38*(1), 15-31. Doi:10.1016/j.jssr.2013.12.002

Hébert, C., Jenson, J. & Terzopoulos, T. (2021). Access to technology is the major challenge: Teacher perspectives on barriers to DGBL in K-12 classrooms. *E-Learning and Digital Media, 18*(3), 307-324. Doi:10.1177/2042753021995315

Holmes, V. M. & Carruthers, J. (1998). The relation between reading and spelling is skilled adult readers. *Journal of Memory and Language, 39*(2), 264–289.

Holstein, K., McLaren, B. M. & Aleven, V. (2017, March). Intelligent tutors as teachers' aides: exploring teacher needs for real-time analytics in blended classrooms. In Proceedings of the seventh international learning analytics & knowledge conference (pp. 257–266). ACM.

Huang, J., Liu, J., Tian, R., Liu, K., Zhuang, P., Sherman, H. T., Budjan, C., Fong, M., Jeong, M.-S. & Kong, X. -J. (2022). Correction: Huang et al. A Next Generation Sequencing-Based Protocol for Screening of Variants of Concern in Autism Spectrum Disorder. *Cells* 2022, *11*(20), *Cells*. Doi:10.3390/cells11203276

Hunter-Carsch, M. 2001. *Dyslexia; A Psychosocial Perspective*. Whurr.

Joshi, M. R., Dahlgren, M. & Boulware-Gooden, R. (2002). Teaching reading in an inner city school through a multisensory teaching approach. *Annals of Dyslexia, 52*, 229–242.

Joshi, M. R., Dahlgren, M. & Boulware-Gooden, R. (2002). Teaching reading in an inner city school through a multisensory teaching approach. *Annals of Dyslexia, 52*, 229–242.

Kelly, K. & S. Phillips. (2016). *Teaching Literacy to Learners with Dyslexia A Multisensory Approach*. 2nd ed. Sage.

Kennedy, M. M. (2016). How does professional development improve teaching? *Review of Educational Research, 86*(4), 945–980. Doi:10.3102/0034654315626800

Khlaif, Z. (2018). Teachers' Perceptions of Factors Affecting Their Adoption and Acceptance of Mobile Technology in K-12 Settings, *Computers in the Schools, 35*(1), 49-67. Doi: 10.1080/07380569.2018.1428001

Koch, K. (2017). Stay in the box! Embedded assistive technology improves access for students with disabilities. *Education Sciences, 7*(4), 82.

Krainer, K. (2011). Teachers as stakeholders in mathematics education research. In: B. Ubuz (Ed), *Proceedings of the 35th conference of the International Group for the Psychology of Mathematics Education,* 1, 47–62).

Loizou, F. (2016). Changes in teaching in order to help students with learning difficulties improve in Cypriot primary classes, International Journal of Primary, *Elementary and Early Years Education, 44*(4), 371-390. Doi:10.1080/03004279.2014.948031

Mackay, N. (2012). *Removing Dyslexia as a Barrier to Achievement: The Dyslexia Friendly Toolkit (3rd Edition).* Wakefield: SEN Books.

Mccaskill, M. (2001). Grammar, Punctuation, and Capitalization - A Handbook for Technical Writers and Editors. *Research gate*. https://tinyurl.com/mumyme4e

Melhuish, E. C. (2014). *The Impact of Early Childhood Education and Care on Improved Wellbeing in "If you Could do one Thing…" Nine Local Actions to Reduce Health Inequalities*. The British Academy.

Minogue, J. & Jones, M. G. (2006). Haptics in education: Exploring an untapped sensory modality. *Review of Educational Research, 76*(3), 317–348. Doi:10.3102/00346543076003317

Mpastea, A. (2014). *An intervention for Specific Learning Disorder-Dyslexia through the development of Multisensory Teaching Method.* (Doctoral thesis). Aristotle University, Thessaloniki.

Nijakowska, J. (2008). An experiment with direct multisensory instruction in teaching word reading and spelling to Polish dyslexic learners of English. *Language learners with special needs: An international perspective*, 130-157.

O'Brien, J., Ottoboni, G., Tessari, A. & Setti, A. (2021). Multisensory Perception, Verbal, Visuo-spatial and Motor Working Memory Modulation After a Single Open- or Closed-Skill Exercise Session in Children. *J Cogn Enhanc,* 5, 141–154. Doi:10.1007/s41465-020-00189-x

O'Connor, C., Michaels, S. Chapin, S. & Harbaugh, A. G. (2017). The Silent and the Vocal: Participation and Learning in Whole-Class Discussion. *Learning and Instruction, 48*, 5–13. Doi:10.1016/j.learninstruc.2016.11.003

O'Muircheartaigh, C., Krosnick, J. & Helic, A. (1999). *Middle Alternatives, Acquiescence, and the Quality of Questionnaire Data, Working Papers 0103*, Harris School of Public Policy Studies, University of Chicago.

Orton, S. T. (1937). *Reading, writing and speech problems in children.* W W Norton & Co.

Pappas, T. (2002). *The Methodology of Scientific Research in the Humanities*. Kardamitsa Publications.

Porpodas, K. D. (2002). *The reading*. Hellenika Grammata.

Puspitaloka, N. & Syarif, H. E. (2021). Teacher's Perception on How Multisensory Approach in Teaching Reading for EYL with Dyslexia, *Advances in Social Science, Education and Humanities Research, 539, Proceedings of the Ninth International Conference on Language and Arts (ICLA 2020).* Atlantis Press.

Robson, C. (2007). *Real World Research*. Gutenberg.

Roulstone, S., Wren, Y., Bakopoulou, I. & Lindsay. G. (2012). Interventions for Children with Speech, Language and Communication Needs: An Exploration of Current Practice. *Child Language Teaching and Therapy, 28*(3), 325–341.

Ruppar A. L., Neeper L. S. & Dalsen J. (2016). Special education teachers' perceptions of preparedness to teach students with severe disabilities. *Research and Practice*

*for Persons With Severe Disabilities*, *41*(4), 273–286. Doi:10.1177/1540796916672843

Saris, W. E. & Gallhofer, I. N. (2007). *Design, evaluation, and analysis of questionnaires for survey research.* Wiley-Interscience. Doi:10.1002/9780470165195

Schlesinger, N. W. & Gray, S. (2017). The impact of multisensory instruction on learning letter names and sounds, word reading, and spelling. *Ann. of Dyslexia* 67, 219–258. Doi:10.1007/s11881-017-0140-z

Selwyn, N. (2011). *Education and Technology: Key Issues and Debates*. Continuum International Publishing Group.

Serafini, M. (2018). The professional development of VET teachers in Italy: participation, needs and barriers. Statistical quantifications and benchmarking in an international perspective. *Empirical Res Voc Ed Train, 10*(3). Doi:10.1186/s40461-018-0064-9

Slater, Z. & Chambers, G. (2022). Primary teachers' perceptions of whole-class teaching and learning in English primary schools: an exploratory study of perceived benefits, challenges and effective practice, *Education 3*(13). Doi: 10.1080/03004279.2022.2110603

Spiteri, M., Chang Rundgren, S.-N. (2020). Literature Review on the Factors Affecting Primary Teachers' Use of Digital Technology. *Tech Know Learn,* 25, 115–128. Doi:10.1007/s10758-018-9376-x

Stanovich, K. E. (1986). Matthew effects in reading: Some consequences of individual differences in the acquisition of literacy. *Reading Research Quarterly, 21*(4), 360–407. Doi:10.1598/RRQ.21.4.1

Stephenson, J. & Carter, M. (2011). The Use of Multisensory Environments in Schools for Students with Severe Disabilities: Perceptions from Teachers. *Journal of Developmental and Physical Disabilities*, *23*(4), 339-357. Doi: 10.1007/s10882-011-9232-6

Stoner, J. B., Parette, H. P., Watts, E. H., Wojcik, B. W. & Fogal, T. (2008). Preschool teacher perceptions of assistive technology and professional development responses. *Education and Training in Developmental Disabilities, 43,* 77–91.

Sun, M., Penuel, W. R., Frank, K. A., Gallagher, H. A. & Youngs, P. (2013). Shaping professional development to promote the diffusion of instructional expertise among teachers. *Educational Evaluation and Policy Analysis, 35*(3), 344–369. Doi:10.3102/01623737134822763

Syahputri, D. (2019). The Effect of Multisensory Teaching Method on The Students' Reading Achievement, *Budapest International Research and Critics in*

*Linguistics and Education (BirLE) Journal, 2*(1), 124-131, Doi:10.33258/birle.v2i1.192

Thompson, N. (2019). Ontario school board projects $28.7M shortfall due to provincial cuts', *CTV news*. https://tinyurl.com/e42z7ey7

Toste, J. R., Didion, L., Peng, P., Filderman, M. J. & McClelland, A. M. (2020). A meta-analytic review of the relations between motivation and reading achievement for K–12 students. *Review of Educational Research, 90*(3), 420–456. Doi:10.3102/0034654320919352

Tsakiridou, H. & K. Polyzopoulou (2014). Greek Teachers' Attitudes toward the Inclusion of Students with Special Educational Needs. *American Journal of Educational Research, 2*(4), 208-218. Doi:10.12691/education-2-4-6

Tyk, I. (2014). Whole Class Teaching: A Paper for the Campaign for Real Education. Halland: The Campaign for Real Education. https://www.cre.org.uk/docs/CRE-Whole-Class-Teaching.pdf.

Vamvoukas, M. (2010). *Introduction to psychopedagogical research and methodology*. Grigoris.

Volpe, G. & Gori, M. (2019). Multisensory interactive technologies for primary education: from science to technology. *Front Psychol*, *10*, 1076.

Wood, E. (2010). Cross Curricular Teaching to Support Child-Initiated Learning in EYFS and KS1. In T. Kerry (Ed), *Cross Curricular Teaching in the Primary School* (pp. 34–58). Routledge.

Wright, M. C., Bergom, I. & Bartholomew, T. (2019). Decreased class size, increased active learning? Intended and enacted teaching strategies in smaller classes. *Active Learning in Higher Education, 20*(1), 51-62. Doi:10.1177/1469787417735607

Wu, H. K., Hsu, Y. S. & Hwang, F. K. (2008). Factors Affecting Teachers' Adoption of Technology in Classrooms: Does School Size Matter?. *Int J of Sci and Math Educ 6*, 63–85. Doi:10.1007/s10763-006-9061-8

Yeager, E. A. & Hover, S. V. (2006). Virginia vs. Florida: Two Beginning History Teachers' Perceptions of the Influence of High-Stakes Tests on Their Instructional Decision-Making, *Social Studies Research and Practice, 1*(3), 340-358. Doi:10.1108/SSRP-03-2006-B0005

Yin, H., Han, J. & Lu. G. (2017). Chinese Tertiary Teachers' Goal Orientations for Teaching and Teaching Approaches: the Mediation of Teacher Engagement. *Teaching in Higher Education, 22*(7), 766–784. Doi: 10.1080/13562517.2017.1301905.

Zafeiropoulos, K. (2015). *How Is A Scientific Work Done? Scientific Research And Paper Writing.* Kritiki.

# INTRODUCTION

Language is one of the most important tools that people has used for their survival and evolution. From ancient times to the present, it has played a significant role in the transmission of knowledge, communication and development of human society.

Although it is not the only means of communication, language is as a primary tool that enables individuals to interact with others, sharing thoughts, emotions, and experiences. This ability to convey information is pivotal for shaping social frameworks and fostering collaboration within the human society. The term “language” refers to symbols, grammatical regulations, and syntactic arrangements employed for conveying and disseminating information. It serves as a conventional medium embraced by a community to express ideas and transmit information. Many times, “language” is equated with the term “speech”, yet the disparity lies in the fact that speech pertains to the human ability to utilize language for cogitation and to give meaning to what is said.

The development of complex societies required man to manage a large amount of information, which was not possible to retain in his memory. Then it arose as a natural need, to communicate in a way that could preserve information, which was not possible through the oral speech. Thus, man invented writing, and then new horizons were opened regarding the development of knowledge and science, since he was able to store, transmit, and process a lot of information, overcoming the limits of finite human memory and allowing the storing and transferring information regardless of time and space (Porpodas, 2002; Harari, 2015). Also, the appearance of writing highlighted new forms of organization of society and knowledge, as it allows the spread of information to a large number of people and for a long time (Harari, 2015).

According to Papadatos (2011) and Magula (2013), the expression of speech, it is considered that it goes through four stages which are briefly mentioned below:

1. The phonological stage which refers to the lowest level of language processing and concerns the phonemes, i.e., the sounds produced by the visualization of the phonemes of a language.
2. The morphological stage that concerns the selection of the main semantic axes of the proposed proposal.

3. The syntactic stage in which the grammatical and syntactic structure of the words is formed mentally in order to capture the transmitter's thought and.
4. The conceptual stage of meaning formation, which is the most complex of all and requires mental process.

The human ability to speak is considered innate according to many theories (Lenneberg, 1967; Chomsky, 1968; Pinker, 1994), however the ability to read and write did not exist in the human genome but was invented and is acquired (Baars, 1986). From the time reading and writing were first invented up to the present day, both oral and written word are directly connected to the life and daily routine of man. Oral language refers to communication made with the voice and traditional face-to-face communication. It involves the production and perception of the voice, volume, tone, pronunciation and facial expression. The combination of the above arbitrary symbols allows for a very large number of potentially complex and abstract messages (Banse et al., 1996; Scherer et al., 1991). The speaker's tone of voice, expressions, pauses, pace, and emphasis in individual elements of the sentence, can significantly influence the way in which his words are perceived and interpreted. There are some examples below of how different expression can affect meaning:

1. **Tone of voice:** Tone of voice can create different feelings or impressions. For example, a high-pitched voice with an intense expression may convey excitement or irritation, while a low-pitched voice with a relaxed expression may provoke a sense of calmness or indifference.
2. **Facial expression:** Facial expressions are natural stimuli (Stahelski et al., 2021) and can add extra layers of meaning to our language. For example, a smile during a sentence may indicate joy or irony, while a serious look may be interpreted as the listener paying attention to the speaker.
3. **Pauses and rhythm:** The way somebody pause or adjust his voice conveys gradations in meaning. The length of time required by interlocutors to respond to each other during conversation is an important and key element of spoken interaction (Hoogland et al., 2023). A long pause between words can indicate suspension or thought, while a continuous flow can provoke emotional tension.

4. **Emphasis:** Voice intonation can produce various effects and convey different emotions. For instance, an excessively low voice may convey strength or authenticity, while an excessively high voice may reflect sensitivity or inhibition. Emphasis is about identifying words or phrases that we want to highlight as important. It can be achieved by increasing the volume of our voice, prolonging the pronunciation of words, or even with a short pause before or after the volume. Emphasis can differentiate the meaning of a sentence, not only on an emotional level, but also in the way the words are interpreted. Thus, depending on whether and where the speaker emphasizes the meaning, the message of the sentence is differentiated as follows:

    - I asked him to buy me **three** kilos of green apples. (e.g. not 2 kilos)
    - I asked him to buy me three **kilos** of green apples. (e.g. not 3 apples)
    - I asked **him** to buy me three kilos of green apples. (e.g. not you)
    - I asked him to buy me three kilos of **green** apples. (e.g. not red apples)
    - I asked him to buy me three kilos of green **apples**. (e.g. not grapes)

The voice parameters that add extra semantic content and emotion to our utterances are called prosody. In fact, according to research by Schirmer (2010), emotional prosody, regardless of intensity and quality, has long-term effects on existing memory representations, shaping the emotional character of what has been said.

Moreover, the oral speech includes some other non-linguistic elements, such as body movement and gestures, which give additional meaning and emotional expression to the communication. The use of such non-linguistic elements can even completely reverse the meaning of a sentence. This can be understood if we think persons A and B having the following ordinary dialogue: A: “How are you?” B: “I'm fine.” The way the answer is said in combination with all the non-linguistic communication elements can completely differentiate the meaning of the answer. Maybe, indeed, person B is fine, but what would we think if he said this with bleary eyes? What would we think if he said it while avoiding eye contact? What would we think if he said it while his face was red? In spoken language, the stimuli sent by the transmitter and the way the receiver interprets them create many different combinations of meaning.

On the other hand, written language refers to communication through writing and reading. Uses written media such as texts, articles, emails, messages on social networks

and others. Written language is based on the use of letters, symbols and syntactic rules to express ideas and thoughts. It allows the transmitter to organize his thoughts and choose the right words to express them. At the same time, it allows the receiver to read and understand the content at their own pace and time. Also, the written word is important because it allows the preservation of information over time and the recording of specific thoughts and opinions. It is also an effective method of communication for transmitting information to distant places and exchanging ideas between people who are not in the same place.

Thus, the question arises: how could the transmission of the complex messages of the spoken word, which is often done even spontaneously or unintentionally, be transferred without losing some part of the meaning essential for the communication? In writing, the use of grammar, syntax, correct spelling and punctuation are vital to understanding and conveying messages effectively. Punctuation marks serve meaning by separating the elements of a sentence, distinguishing continuous clauses, dependent clauses and parenthetical clauses, as well as marking emphasis, stress and pauses in a sentence (Mccaskill, 2001), while at the same time clarifying the meaning (Jackson, 2005; Baron, 2001; McCaskill, 2001). Especially in languages like Greek that do not invert the words in the question, the existence of punctuation marks is necessary, as otherwise a great deal of semantic confusion would be created. To make this more understandable, it follows a translated Greek sentence without punctuation:

Σήμερα είναι Παρασκευή (Today is Friday)

Without the use of any punctuation, its interpretation becomes highly subjective as it could mean and indicate different messages.

Σήμερα είναι Παρασκευή. (Today is Friday.)

If there is a full stop at the end of the sentence, then there is a statement that expresses certainty. If there is no other visual symbol, the sentence is neutral and does not convey the sender's mental state.

Σήμερα είναι Παρασκευή;  (Is today Friday?)

If there is a question mark at the end of the sentence, then we have a question, that is, the sender does not know whether his statement is true or false.

Σήμερα είναι Παρασκευή! (Today is Friday!)

The exclamation mark at the end of the sentence has a prosodic function, giving the readers of the texts information about how the utterance can mean irony, surprise, admiration, joy, etc. depending on the communication context and topic.

The issue of the necessary existence of punctuation marks has remained from antiquity to the present day through a proverbial phrase that has been associated with ambiguity. This particular phrase comes from a Pythia's prophecy at the oracle of Delphi and is a clever hoax.

"*Ἥξεις ἀφήξεις οὐκ ἐν πολέμῳ θνήξεις"*

The prophecy was oral and could be interpreted subjectively by the receiver. If this phrase were transferred to the written word, it would certainly have commas, but this in this particular case would completely change the meaning.

"Ἥξεις, ἀφήξεις, οὐκ ἐν πολέμῳ θνήξεις." meaning, "you will go, you will return, you will not die in war" whereas "Ἥξεις, ἀφήξεις οὐκ, ἐν πολέμῳ θνήξεις." meaning "you will go, you will not return, in the war you will die." Thus, regardless of the outcome of the person's fate, the oracle took the credit.

All the complexity of the spoken word conveyed through the written code often makes it difficult for students. Reading and writing as higher mental abilities, require abstract functions and coordination of complex cognitive mechanisms (Porpodas, 2002). The act of reading brings about the activation of corresponding mental representations of written words, including information such as semantics, orthography, phonology, and morphology (Akamatsu, 1999). Specifically, the same mental linguistic representations are also involved during the process of spelling, so in order to accurately write a word, one must have access to these various types of information (Fender, 2008; Russak & Kahn-Horwitz, 2015). As a result, correct spelling ability can function as a glimpse into the cognitive linguistic representations that substitute the act of reading. Additionally, considering the overlap within these underlying representations (Holmes & Carruthers, 1998), reading and spelling are closely linked, thus improvements in one process may result in advancements in the other (Degani et al., 2023).

According to the Lexical Quality Hypothesis (Perfetti & Hart, 2002), the extensive and accurate understanding of word meanings, spelling precision, and phonological

accuracy of words function as essential components that contribute to effective comprehension during reading. Thus, orthographic knowledge constitutes a significant foundation for higher-level processes of reading comprehension. Additionally, improving orthographic knowledge through learning proper spelling can support effective reading (Degani et al., 2023). For example, Ouellette et al. (2017) demonstrated that among adults, enhancements in the spelling of individual words led to faster reading of the same words. Thus, gains in spelling accuracy can translate into improvements in reading. The interdependent relationship between reading and writing is evident in the reading process, during which implicit learning of correct spelling takes place, consistent with the statistical view of spelling acquisition (Treiman & Kessler, 2022). According to this perspective, students encounter untaught and familiar spelling patterns as they read a text (Degani et al., 2023). Thus, given that reading and writing share common representations, improvement in one domain may improve performance in the other domain and vice versa (Ouellete et al., 2017).

The central ideas regarding challenges in acquiring reading skills mainly focus on the development of recognizing sounds in words. As outlined in the dual-pathway model for reading (Coltheart, 2005; Coltheart et al., 2001), the ability to transform written symbols into their corresponding speech sounds plays a vital role in the process of reading. This mechanism particularly aids the phonological or sub-lexical route, which is one of the two reading paths defined by the model. When this route is activated during reading, following an initial visual examination of a word, a conversion from the letters (graphemes) to their associated sounds (phonemes) becomes necessary to create the auditory representation of that word (Gonzalez et al., 2023).

This process of converting letters into sounds, known as phonological recoding, serves as the foundation for effective reading. Its effectiveness, however, depends on whether the word's sound representation or code has been stored in the mental inventory of sound structures. Once this stored representation is brought into action, the reader can connect the word to its meaning through the semantic system (Coltheart et al., 1988).

In languages characterized by a straightforward writing system, this reading pathway holds particular significance during the initial stages of children's literacy development. Whenever a child encounters a written word that aligns with an existing phonological representation they possess, proficient phonological recoding skills empower them to

promptly identify the word, comprehend its significance, and simultaneously cultivate an understanding of its orthographic structure (Gonzalez et al., 2023).

Moreover, the phonological pathway might play a pivotal role in autonomous learning. In such instances, when youngsters come across unfamiliar words, their ability to decipher these words (using phonological recoding) allows them to extract orthographic cues from them, thereby initiating a gradual process of constructing the word's visual representation (Share, 1995; 1999).

During the process of reading and writing, a complex cognitive function is activated that involves the integration of visual, auditory, and tactile-kinesthetic abilities (Minogue & Jones, 2006). When an individual fails to acquire reading skills, it negatively affects their attitude towards any activity involving reading (Stanovich, 1986). As a result, there is a limited vocabulary compared to the peer group and a restricted ability to employ metacognitive strategies for understanding written text (Palinsar et al., 1986; Nagy et al., 1985). In the same vein, reading comprehension, in addition to cognitive and metacognitive processes, is also linked to the reader's motivation, i.e. the individual's internal drive that comes from a set of goals, beliefs and attitudes of the individual towards reading (Conradi et al., 2014; Toste et al., 2020).

The majority of children learn to read - many times even implicitly - and write regardless of the educational method that will be applied. However, at least 10-15% of children need further teaching support as they have reading difficulties (Snowling et al., 2000). However, learning difficulties in modern times do not imply school failure. There are significant indications that early intervention in literacy can potentially reduce instances of reading difficulties and enhance later life conditions (Mathes & Denton, 2002; Stanovich, 1986; Vellutino et al., 2004).

Difficulties in the learning process might stem from the fact that instructional approaches often fail to consider sensory perceptions adequately. Specifically, taking into account that a majority of information is conveyed through visual mediums such as textbooks and presentations (Volpe & Gori, 2019), it's reasonable to presume that vision holds a predominant role within the classroom. Nevertheless, individuals possess multisensory systems for perceiving and engaging with their surroundings (Cuturi et al., 2021). Studies on multisensory perception have demonstrated how integrating diverse sensory modalities enhances the processing of object attributes, such as their

height (Ernst & Banks, 2002) or shape (Helbig &Ernst, 2007). This mechanism is recognized as sensory integration and takes place when the brain harmonizes different sensory methodologies (Ernst & Bülthoff, 2004).

Early childhood is a critical period for the development of young children's germinal reading and writing skills (Rimm-Kaufman & Pianta, 2000; Whitehurst & Lonigan, 2001). Early intervention in learning difficulties primarily emphasizes phonology and the strengthening of the student's phonological awareness, that is, his ability to understand that speech is made up of distinct phonological structural elements, syllables and phonemes as well as the ability to analyze words in these phonemic elements. Through the detailed presentation of language structure, graphophonemic matching, the combination of phonemes, phonemic awareness, strengthening of vocabulary and reading comprehension, students with learning difficulties are expected to be able to read satisfactorily (Galuschka, et al., 2015; Scammacca, et al., 2015; Wanzek et al., 2013) and on par with their peers without having to have photographic memory to recall words as pictures (Mpastea, 2014).

If reading difficulties are not addressed in the early school years, then in higher grades where the texts are longer, the student will not read in order to understand the meaning, but as practice in the process of reading itself (Stanovich, 1986). It is easily understood through the following hypothetical conditions, let's imagine: A. listening to a text syllabically, with pauses and many reading mistakes and B. listening to a text of the same level of difficulty as the first one at a normal reading pace. When would comprehension of text content be better? It is certain that in the second case listening comprehension would be much better. The same could be argued to be the case with reading comprehension. Students who have difficulties in reading and especially those who have received a diagnosis of a specific learning disability should undeniably have early teaching intervention in reading and writing that meets their needs as this is the only way to deal with their learning difficulties (Caravolas, et al., 2005; Harlen, 2007). Another reason for the necessity of following a specialized teaching program for students who have not developed early reading skills is the fact that they are more at risk of dropping out of school (Reschly, 2010) and developing emotional disorders in the future (Devaney et al., 2018).

The term “multisensory” is defined by Kelly and Phillips (2016) as the presentation of information through visual, auditory, kinesthetic, and tactile forms, with guidance aimed at providing as many of these experiences as possible. Consequently, multisensory learning heavily relies on all the senses used as a fundamental method of information retention, in contrast to the more common practices of teaching using sight and hearing alone (Boardman, 2019). Research conducted Goswami (2015), and Roulstone et al. (2012) has revealed that when it comes to children who experience difficulties in acquiring reading skills, the teaching method that incorporates multiple senses, known as the multisensory approach, tends to yield the most successful outcomes in terms of instruction effectiveness.

In the same vein, there are numerous international studies that confirm the benefits of multisensory teaching for students with and without specific learning difficulties (Gaitanidi, et al., 2023; Sadoski et al., 2013; James & Engelhardt, 2012; Joshi et al., 1998; Post et al., 2002; Uhry et al., 1993), some of them focusing on decoding skills and others on spelling proficiency. Teaching approaches that employ sensory-based methods are built upon scientific discoveries which reveal that throughout the process of learning, the brain absorbs information and messages by utilizing the full array of sensory organs available (Mpastea, 2014). This becomes especially significant when a particular sensory pathway may not be as developed as others. In such instances, it becomes imperative to compensate for this deficiency by harnessing alternate sensory pathways (Orton, 1937; Gillingham et al., 1956; Miles, 1989).

Dual coding theories highlight the distinctions in how verbal stimuli are encoded, represented through an auditory code, and non-verbal stimuli are encoded, represented through visual or haptic codes (Mathias et al., 2022). The connections between verbal and non-verbal codes are believed to assist in memory retrieval. The theories of mental imagery propose that information encoded during learning is mentally reconstructed during testing (Cuturi et al., 2021). Similarly, predictive coding theories posit that incoming sensory information is processed using an internal generative model, which is capable of reconstructing multi-dimensional representations (Friston & Kiebel, 2009). The multisensory approaches in reading instruction are also grounded in the dual coding theory (Paivio, 1991; Sadoski & Paivio, 2001, 2013), which proposes that there are two separate encoding systems for the internal forms of cognitive representations used in memory.

In a broader sense, we might hypothesize that an abundance of multisensory stimulation functions at its best by offering a multitude of diverse stimuli to the brain. This process results in the brain merging various sensory signals into a unified perception, with the coherence of this perception being determined by the reliability of the sensory information available.

Regarding developmental aspects, studies have shown that the process of multisensory integration unfolds gradually throughout childhood. For instance, it takes approximately eight years for optimal integration of visual and tactile sensory information to develop (Gori et al., 2008; Cuturi & Gori, 2019).

The present doctoral thesis is structured into two main parts: 1) the theoretical part, which encompasses a review of the relevant literature and consists of seven chapters, and 2) the research part, which includes the research purpose and objectives, means of data collection, the research sample, research reliability-validity. Next, there are the statistical results, discussion, and conclusions. At the end you can also find limitations of the research.

# THEORITICAL PART

# CHAPTER 1

## LEARNING DIFFICULTIES AND SPECIFIC LEARNING DISORDERS

### 1.1. Clarification of the terms

The definition of specific learning disorders has caused dispute and controversy among the scientific community (Sandravelis, 2015) especially at the fields of school psychology and neuropsychology (Decker et al., 2013). Thus, it is observed that depending on the scientific point of view the definition significantly differs, while variations of the definition are found even in the same scientific field.

As Papadatos (2011) states, many researchers use the term specific learning disorders and dyslexia as identical. Furthermore, it is observed that the terms learning disorders and specific learning disorders depending on the geographical and communication context are used sometimes end up meaning the same or so different things. In the United Kingdom the term learning disorders refers to cognitive or intellectual disorders while in Australia and America the term learning disorders is synonymous with specific learning disorders (McDowell, 2018). Moreover, sometimes the term 'dyslexia' is overused trying to find a suitable word to describe any difficulty in the process of learning and producing written speech. In the present thesis these two terms are used to describe disorders of different types and quality. The conceptional deviation above is illustrated as well in the Diagnostic and Statistical Manuals of Mental Disorders ICD-10 written by the World Health Organization's (WHO, 2016) and the DSM-5 written by the American Psychiatric Association (APA, 2013).

Furthermore, it is empirically observed that all students facing difficulties in their studies, particularly when lacking interdisciplinary consultation, are often labeled as students with learning difficulties (LD), regardless of the specific type of difficulty. This can lead to ambiguity and does not substantially contribute to the teaching process, as it generalizes a situation. The reasons for a student's academic performance divergence can vary widely. The term learning difficulties (LD) is commonly employed to describe students who encounter challenges in developing their cognitive or learning skills. These challenges encompass physical difficulties, such as problems with motor

skills or sensory perception, as well as issues related to emotional regulation and behavior, difficulties stemming from inadequate attendance, parental neglect, emotional challenges, and more. Within this broader framework, specific learning disabilities are also included. These disabilities encompass difficulties in recognizing and comprehending written and spoken words, analyzing texts, as well as applying mathematical and other academic skills (Woolfson & Brady, 2009; Papadatos, 2010). It is often observed that students with learning difficulties commonly face challenges in more than one cognitive subject. Specifically, according to research by Moll et al. (2019) and Willcutt et al. (2019), learning difficulties in reading frequently coexist with learning difficulties in mathematics, yet the underlying reason for this comorbidity is not clearly defined (Viesel-Nordmeyer et al., 2023).

The term learning disorders is general and defines cognitive difficulties, and more specifically difficulties in acquiring listening, speaking, reading, writing and reasoning skills or mathematical abilities (Vasiliou, 2018) which the individual face during school life. This term refers to a heterogeneous set of problems related to the functioning of learning and speech comprehension, reading comprehension and mathematics (National Joint Committee on Learning Disabilities, 1998, cited in Thanopoulos, 2005, p. 33). The causes of generalized learning disabilities are a secondary symptom of another difficulty or disorder.

There is a potential coexistence of learning disorders with problems of self-control behaviors, social perception and social interaction is possible, but it does not imply that such problems constitute learning disorders on their own (Vasiliou, 2018). Additionally, learning disorders in comparison to specific learning disorders, there may be comorbidity with some other sensory impairment, mental retardation and / or severe emotional disorders.

In this study, the term Learning Difficulties (LD) refers to the challenges that students face in the development of their cognitive and academic skills, without being specific to defined criteria of specific learning disorders as outlined later. These difficulties may impact students' ability to recognize and comprehend written and spoken words, analyze texts, and apply mathematical and other academic skills. Although not categorized as specific learning disorders, these difficulties can significantly affect students' academic performance and the completion of their educational programs.

Primary care and pediatric practitioners are likely to encounter cases within their clinical practice children who deal an identified learning disability that profoundly affects their capacities in auditory perception, verbal expression, reading proficiency, written communication, deductive reasoning, and mathematical comprehension (Prelock & Hutchins, 2018). The term learning disability has been employed to delineate the discernible incongruity between an individual's overarching cognitive potential and their concrete scholastic attainments (National Center for Learning Disabilities, 2010). These cognitive hurdles are inherent to the individual and imply underlying neurobiological distinctions (Prelock, 2013). While it is plausible for learning disabilities to co-occur alongside other neurodevelopmental conditions and to be susceptible to contextual influences, establishing a definitive causal relationship remains elusive in this domain (Prelock & Hutchins, 2018).

The introduction of the concept of learning problems was first addressed in the third edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-III) by the American Psychiatric Association in 1980. During this edition, the focus centered on what was termed as disorders of academic skills. Subsequent to that, the 1994 version, DSM-IV, brought about a shift in terminology to refer to these conditions as learning disorders. In the subsequent revision, DSM-IV-TR (American Psychiatric Association, 2000), the term learning disability was omitted, although the diagnostic framework encompassed conditions related to reading, writing, or mathematics disorders.

The DSM-5 introduces a broader perspective, taking into consideration the latest scientific research in the field. The central concept encompasses persistent difficulties in reading, writing, arithmetic, and/or mathematical reasoning, manifesting during the course of formal schooling (Prelock & Hutchins, 2018). Common phenomena include slow and laborious reading approaches, challenges in text comprehension, unclear written expression, and struggles with memorizing numerical events or engaging in mathematical reasoning tasks (APA, 2013; National Research Center on Learning Disabilities, 2014). Frequent indicators of Specific Learning Disorders (SLD) include reading strategies characterized by slowness and exertion, or inaccuracies, challenges in comprehending written material, expression in writing lacking clarity; struggles in retaining numerical information and encountering difficulties when addressing tasks involving mathematical reasoning (APA, 2013; National Center for Learning Disabilities, 2014). Typically, the academic skills exhibited would fall considerably

below the expected level relative to the individual's age, especially when evaluated using culturally and linguistically appropriate assessments in reading, writing, or mathematics. Moreover, these difficulties should not be better accounted for by other developmental, neurological, visual, auditory, or motor disorders (APA, 2013; NRCLD, 2014).

In the current study, the term Specific Learning Disabilities (SLD) refers to the difficulties as defined in the DSM-5, encompassing challenges related to reading, writing, arithmetic, or mathematical concepts, which manifest during the early school years, persist for more than 6 months, and despite the provision of specialized intervention to the student (APA, 2013). These disorders persist despite the child's other cognitive abilities varying between standard limits (Taanila et al., 2014). The common point of all the SLD is that the pupil's intelligence does not justify the unexpected level of difficulty and the students' poor performance cannot be attributed to sensory disabilities, lack of effort or internal motivation, deprived of social stimuli or another reasonable explanation (McDowell, 2018; Gillam et al., 2018). However, there is research supporting that specific learning functions may manifest independently of a child's intelligence quotient (IQ) (APA, 2013; Elbeheri & Everatt, 2012).

The IQ plays a decisive role in fostering the efficacy of teaching intervention and ameliorating learning dysfunction. However, it does not substantively contribute to the accurate diagnosis of SLD (Snowling et al., 2003). This can possibly be explained as certain cognitive gaps often remain covered by the student's broader cognitive and functional profile. The heterogeneity manifested in the learning profiles of students having SLD is conceivably owed, in part, to potential variations in intelligence quotient (Mpastea, 2014). Drawing upon the works of Jordan et al. (2006) and Shalev (2004), it is understood that the spectrum of cognitive functions susceptible to impairment, varying in accordance with an individual's age, engenders, inter alia, the diversification characterizing the learning profiles of students with SLD.

As is evident, a singular parameter, such as that of the intelligence quotient, is not capable of predicting the presence or absence of SLD accurately and timely on its own. However, in psychometric tools such as the Wechsler Intelligence Scale for Children (WISC), a pronounced discrepancy between Verbal Intelligence (VIQ) and Performance Intelligence (PIQ) constitutes a worrisome indicator of the presence of SLD. The findings of the study by Drummond et al. (2005) on a sample of 124 children

aged 7 and 8 demonstrated that there is correlation between underperformance in VIQ and PIQ in children with dyslexia and dyscalculia, respectively.

It is important to highlight that SLD are inherent and characterize an individual from birth throughout their life, requiring specialized educational interventions for their management (Reid, 1998; Papadatos, 2010).

### 1.2. Prevalence, signs and development of SLDs

The opinions of researchers regarding the prevalence of SLD do not always converge. Thus, epidemiological studies conducted by the Mayo Clinic in the United States, regarding the frequency of SLDs affecting the learning of written language, have indicated that approximately 20% of school-age children and young individuals in the United States may exhibit some form of SLD that could potentially hinder their academic progress at some point during their education (Katusic et al., 2001; Katusic, et al., 2009; Stoeckel et al., 2013; Yoshimasu et al., 2012). Other research reports that while dyslexia is the most common SLD, the exact rate of its occurrence is not definitively known and many of the important studies that have been conducted on this topic are outdated or not recent (Barbiero et al., 2012). A study carried out in the United States (US) reported a lifetime prevalence rate of 9.7% for learning disorders in children (Altarac & Saroha, 2007). In a separate study conducted in Brazil, the observed prevalence stood at 7.6% (Fortes et al., 2016).

The difficulty of accurately defining the prevalence of SLDs is also evident through the following studies. In research involving 3rd and 4th grade students in India, the prevalence was documented as 3% (Padhy et al., 2016). Another research conducted within the same geographical area indicated an approximate prevalence of 1.58% for specific learning disorders among students in grades 7 through 12 (Arun et al., 2013). Nevertheless, several other studies in the same area have identified a relatively elevated occurrence of learning disorders within the educational environment (Mogasale et al., 2012), reporting rates of learning disorders ranging from 10% to 15%. As perceived the range of prevalence of specific learning disorders is not easy to define. According to DSM-5, the estimated prevalence of SLD ranges between 5% and 15% among school-age children, encompassing diverse languages and cultures (APA, 2013).

As mentioned, the appearance of SLDs takes place during the first school age, when engaging the reading process and the production of written speech are required by the students. However, sometimes there are some warning precursors that may be signs of this disorder. The indicators associated with SLD are typically not considered sudden symptoms that emerge during elementary school (Coleman et al., 2006). According to Smith (1994), the symptoms that may be observed in early childhood relate to areas such as reading, speech, motor skills, and predictive abilities. The aforementioned early indicators are further affirmed by the APA (2013), in which delayed speech, limited language usage, fine motor difficulties, and so on are referred to as early signs of SLD. Furthermore, the deficiences observed in SLD, such as the regulation of learning methods, knowledge, and visual analysis skills, as well as in certain other abilities that may be related to SLD, also constitute indicators of SLD (Smith, 1994).

The research of Byrne et al. (2000) demonstrated that there is a correlation between the slow rate of phonological learning during preschool age and performance in reading during school age. Similar results are confirmed by research by Lyytinen et al. (2012) where they report that early knowledge of letters is predictive of the acquisition of early reading skill. Another sign of concern is the child's inability to store and retain in memory the connections between the written representation of the phoneme and the sound of the phoneme (Lyytinen et al., 2012).

According to the Jyväskylä Longitudinal Study of Dyslexia (JLD) conducted in Finland, at the age of two, many children who later experienced language difficulties showed signs of delay in their ability to express and comprehend speech (Lyytinen, & Lyytinen, 2004) and also had difficulties articulating words accurately (Turunen, 2003). By age 5, many of the children who later showed difficulties in early reading acquisition were delayed on color and object serial naming tasks (Lyytinen et al., 2004; Lyytinen et al., 2004). More generally, it is expected that once children enter elementary school, they will show significant deficits in reading, writing, spelling, or mathematical processing compared to their peers, leading to a diagnosis of SLD (Balikci & Melekoglu, 2020).

These disorders are lifelong, however, their course and clinical expression change as they are affected by a number of factors such as: age of person, environmental factors, educational interventions, severity of disorder, etc.

At school age, children with SLD show difficulty in decoding, reading comprehension, spelling, writing, listing facts, and/or mathematical reasoning, skills that are well below expectations for their chronological age (McDonough et al., 2017). The symptoms of SLDs on children attending elementary school age 6 to 12[1] are mentioned below.

SLD at this stage manifests itself as a barrier to learning graphophonemic correspondence, the ability to decode words, spelling or mathematical operations. As reported in APA (2013), there is a slow, strenuous reading with phonological alterations and hesitations. Also, children in the age group of 6 to 9 years may have difficulty in sequencing numbers and letters and in addition and subtraction algorithms (McDonough et al., 2017). Also, there is a chance of having an issue on vocal recognition and management, reading common words but with a graphic imprint such as the word παιδεία (/paideia/ in greeklish) is pronounced /pedía/ (Vasiliou, 2018). It is worth noting that in Greece the diphthong /αι/ is pronounced as /e/ and diphthong /ει/ is pronounced as /i/. Students 9 to 12 years old, may develop impaired phonological reading ability, omitting or replacing phonemes, which is far from being automated reading which is the desideratum. Difficulties in recalling names, numbers, dates, and completing tasks within a specific time are also mentioned, while the phenomenon of guessing the word takes place when a student reads the first or both first and second syllables of a word and guesses which word it is (APA, 2013; McDonough et al., 2017). For example, the student might read the word «κορίτσι» (girl) while the word «κοριτσίστικος» (girly) is written.

### 1.3. DSM-5 and ICD-10 Diagnostic Criteria

The two criteria for diagnosing SLD are derived from diagnostic and static manuals of mental disorders DSM-5 (Diagnostic and Statistical Manual of Mental Disorders) of the American Psychiatric Association (APA), and the ICD-10 (International Statistical Classification of Diseases and Related Health Problems) of the World Health Organization (WHO) (Bastea, 2014).

[1] In Greece, the visual representation, depiction, and reading of letters begins mainly at the Class A of elementary school, in which the student is about 6 years old

### *ICD-10 diagnostic criteria*

As mentioned in ICD-10 (WHO, 2019), these disorders fall under the broader category of psychological development disorders. All disorders in this category have some common features which are: their appearance in infancy or childhood, impairment or delay in the development of certain functions directly related to the biological maturation of the central nervous system and a steady course without recurrences (WHO, 2019). More specifically, specific learning disorders belong to the subcategory of special developmental disorders of academic skills.

According to the first criterion of the ICD-10, a certain academic skill must have a serious deficiency, which can be certified by: the percentage of students is expected not to exceed 3%, the early signs (speech delay, carelessness, hyperactivity etc.) and the fact that these difficulties are not significantly reduced even when there is specialized support (WHO, 2010). The second criterion of the ICD-10 states that the academic student's difficulties should not be able to be justified by mental retardation and that his academic performance should be unexpectedly low (WHO, 2010). As mentioned in the third criterion, the disorder should be developmental, namely that it occurred during the first school years and not during the school course of the student (WHO, 2010). The fourth ICD-10 criterion for academic skills development disorders states that there should be no external factors that could justify school underachievement and academic difficulties (WHO, 2010). The fifth criterion states that these disorders should not be a sensory adequacys' aftereffect (WHO, 2010).

At this point, it should be mentioned that the World Health Organization classifies the following categories with specific learning disorders under the code F81:

1. Specific reading disorder (F81.0)
2. Specific spelling disorder (F81.1)
3. Specific disorder of arithmetic skills (F81.2)
4. Mixed disorder of scholastic skills (mixed disorder of scholastic skills-F81.3)
5. Other developmental disorder of scholastic skills (F81.8)
6. Developmental disorder of scholastic skills, unspecified-(F81.9)

Dyslexia is separated from the previous ones and classified it in the category "Dyslexia and other symbolic dysfunctions, which are not classified elsewhere" with classification code R48 (WHO, 2016).

### *DSM-5 diagnostic criteria*

Criterion A of the DSM-5 description of SLD is "difficulties in learning and using academic skills as indicated by the presence of at least one of the following symptoms that have persisted for at least 6 months, despite the provision of interventions that target those difficulties" (APA, 2013, p. 66). The symptomology includes inaccurate or slow and strenuous reading, difficulty in reading the content, difficulty in spelling the words, difficulties with the written expression, difficulties in understanding the concept of numbers, numbering events, calculating actions or difficulties relating to abstract and mathematical reasoning (McDonough et al., 2017).

Criterion B of the DSM-5 requires that academic competencies be ranked qualitatively and quantitatively below what is expected based on chronological age and peer group performance. In addition, these difficulties should cause significant impediments to one's school performance, occupation or day-to-day activities. In addition, the deviation of academic skills should be determined by standardized assessment tests.

According to APA (2013), the criterion C states that SLDs emerge at the nascence of the school life but may not become perceptible from the beginning until the academic requirements exceed students' abilities (McDonough et al., 2017).

The criterion D relates to the fact that these learning difficulties are not due to intellectual disabilities, to hearing or visual impairment, to other mental or neurological disorders, to psychosocial impairments, to a lack of understanding of spoken language in mother tongue or to a different mother tongue (McDonough et al., 2017).

What is more, it is mentioned in DSM-5 that there is a gradation of SLDs in mild, moderate, and severe depending on the extent of their severity. It is a mild disorder when the student is underperforming in one or two cognitive fields but can become sufficiently functional when providing support services. In the classification the category moderate is used when the individual has weaknesses in one or more academic fields that cannot be overcome without occasionally intensive and specialized interventions in school life. The designation severe disorder is used when the interventions must be continuous, intensive, personalized and take place almost at the whole school life (APA, 2013).

It is important to emphasize that according to the revised edition of DSM-5, it is possible to diagnose specific learning disorders even when individuals exhibit low or even borderline levels of cognitive functioning, specifically within the IQ range of 80 to 70 ± 5 (APA, 2013). This introduces a new perspective in the assessment of specific learning disorders, in contrast to previous editions of the same manual and other diagnostic systems like ICD-10, which required average or higher intellectual capacity for diagnosing learning disorders. Moreover, this change is maintained in the revised DSM-5-TR edition (APA, 2022).

However, many question the scientificity of the DSM-5, considering it more of a political document that provides practitioners with diagnostic codes that are useful to practitioners for billing purposes (Frances, 2013).

Shaywitz and Shaywitz (2020) state that the DSM-5 is biased against minorities because of the definition it puts on dyslexia as it is very difficult to identify students with dyslexia who belong to minorities where they do not have the resources for diagnosis which creates social inequalities.

### 1.4. Historical review of the term dyslexia

The question “What is dyslexia?” although is simple and simplistic, it is complex and complicated to answer and there is no single, definitive diagnosis or definition for it (Neil, 2017).

The word “dyslexia” - in Greek δυσλεξία - comes from the greek words [{δυς} + {λέξη}] etymologically. The preposition 'dys' has a negative meaning and indicates either a bad attribute for example δυσ-οσμία (unpleasant smell), or a difficulty δυσ-καμψία (inflexibility) (Babiniotis, 2004). So, looking back at the Greek language, we find that the word dyslexia can literally be understood as a difficulty in words. The above literal rendering aiming at semantic completeness could be enriched as follows: difficulty in using, recording and reading words.

According to Stein (2018), the term dyslexia was used for the first time in 1887 by Rudolf Berlin, a German ophthalmologist, who coined the term “dyslexia” to apply to stroke patients who had selectively lost the reading ability without loss of basic vision or hearing and retaining most other cognitive skills. However, Pringles Morgan

managed to associate his name with that term because he gave human characteristics in it. Dyslexia had originally been described as word blindness and the reason behind was a Morgan's patient who, although having no cognitive impairment, nevertheless he learned how to write and read at the age of 14 despite receiving systematic training. He also seemed that he could not hold any visual structure and/or representation of words.

Over time the term word blindness was replaced by the term dyslexia as it became clear that the visual acuity is not responsible for difficulties and deficiencies in these individuals (Mac-Meeken, 1939; Norrie, 1939, cited in Stein, 2018).

Later, in the 1950s, with the insertion of Noam Chomsky's revolutionary notions of general grammatical and repetitive genetic phonology (1955), dyslexia became completely perceived as a problem with the acquisition of phonological skills. Many years later, in the 20th century, with the insertion of functional magnetic resonance imaging, it was realized that readers with poor skills have clear differences in the activity of their cerebral cortex and especially in the left hemisphere, which is particularly important for language (Fulbright et al., 1997). However, it is very important to note that these differences in the brain do not by themselves prove that cause the reading difficulties. On the contrary, they could be the result of them.

Moreover, as time went on and more research on dyslexia was conducted, additional aspects of difficulties were identified which are not related to academic education. For instance, people with dyslexia have difficulty in tuning, fine motor skills, balance, handwriting, short-term memory processing, working memory, memory recalling, left-to-right distinction, and numerical concepts. Mirror or inverted writing and visual confusion are observed as well (Neil, 2017).

As it has already been mentioned, there are many different views and definitions of Special Learning Difficulties, and it seems that the scientists' opinions do not converge. Concerning the difficulty inherent in specific learning difficulties, the International Dyslexia Society (2002) characterizes a neurobiological disorder that manifests with deficits in language perception and expression and other processes involved in the acquisition of knowledge. On the other hand, in DSM-5 (2013), there is no term for dyslexia per se and emphasis is given to the type of learning disorder of individuals.

Despite scientists' differing views on the definition of dyslexia, there is a common denominator everywhere: the intelligence can be down to 70 ± 5, that is, at lower or

even borderline levels of normal mental functioning. This happens because if students with lower intelligence could be placed under the umbrella of dyslexia, then their difficulties could merely be attributed to their cognitive impairment and not necessarily to the presence of a disorder.

### 1.5. Trying to define the term dyslexia

For an extended period, dyslexia research advanced with the assumption that it constituted a distinct learning disability. The term "specific" in this context denoted that youngsters afflicted by dyslexia encountered language processing challenges that were unforeseen considering their age and IQ. Educational and clinical psychology conventionally sought to identify a discrepancy between projected and realized reading performance to "diagnose" dyslexia. Nevertheless, the validity of the discrepancy criterion started to wane as no substantial qualitative disparities emerged in reading and phonological awareness between children with dyslexia and those with broader learning challenges (Snowling et al., 2020).

Stanovich (1991) was one of the first critics of the definition of the discrepancy between IQ and achievement in dyslexia. His two main arguments are mentioned below. Initially, learning to read has a positive effect on verbal skills and vocabulary. That is, children who are good readers have more opportunities to learn through the written word. Therefore, good readers become better while the reading skills of initially struggling readers deviate from the peer group (Stanovich, 1986). In addition, Stanovich and Siegel (1994) showed that regardless of IQ, poor readers experience the same basic phonological difficulties. Simply put, the term "dyslexia" is used incorrectly for any cases of poor reading.

The Diagnostic and Statistical Manual of the American Psychiatric Association (APA, 2013) attempting to leverage the fruitful counterargument, uses the term "Specific Learning Disorder with impairment in reading" to describe what is called dyslexia (Snowling et al., 2020). According to the DSM-5 the term refers to a pattern of learning difficulties. These learning difficulties include problems with accurate or pleasurable word reading, poor decoding, and poor spelling that persist for at least 6 months, despite educational interventions. Also, it is stated that a good indicator is deviating from the

expected according to chronological age and peer group school performance despite the student making a significant effort.

An international and one of the most widely accepted definitions regarding dyslexia, even though it belongs to two decades ago, is that of Lyon et al. (2003) who state that:

> *Dyslexia is a specific learning disability that is neurobiological in origin. It is characterised by difficulties with accurate and/or fluent word recognition and by poor spelling and decoding abilities. These difficulties typically result from a deficit in the phonological component of language that is often unexpected in relation to other cognitive abilities and the provision of effective classroom instruction. Secondary consequences may include problems in reading comprehension and reduced reading experience that can impede growth of vocabulary and background knowledge. (p. 2)*

Although the above definition was developed in 2003, a recent survey of more than 30 international dyslexia researchers and practitioners supported keeping the definition unchanged (Dickman, 2017).

Characterizing dyslexia as a specific learning disability, two main characteristics emerge. On the one hand, people with specific learning disabilities have weaknesses in specific processes and not a generalized difficulty in language or cognitive functioning (Grigorenko et al., 2019). For dyslexia, the most common language deficit is in phonological processing, which refers to the use of speech-based encoding when processing oral or written language (Wagner & Torgesen, 1987). On the other hand, the reading problem is unexpected (Fletcher et al., 2019).

While phonological awareness plays a highly significant role in reading development, nonetheless, its deficit alone falls short of fully explaining the intricacy of reading difficulties (Brandy, 2019; Gibbs & Elliott, 2020). Sometimes, individuals diagnosed with dyslexia do not exhibit phonological challenges (Giofrè et al., 2019; White et al., 2006), and it is also possible for children with limited phonological skills to develop sound-based reading abilities (Catts & Adolph, 2011; Catts et al., 2017).

Attempts to distinguish differences in poor reading between a dyslexic and a non-dyslexic student lack sufficient scientific and practical basis (Elliott & Grigorenko, 2014; Elliott & Nicolson, 2016). Although dyslexia and reading disability are frequently treated as interchangeable terms in academic literature, there exists a notably distinct viewpoint beyond the realm of scholarly circles. In this context, there's a

prevailing belief that dyslexia should specifically pertain to a subgroup within a broader population characterized by challenges in word decoding (Gibbs & Elliott, 2020). Some proponents argue that dyslexia encompasses a pervasive condition that extends beyond difficulties solely related to literacy. In fact, it might not manifest primarily as a reading challenge; instead, its diagnosis should be based on a range of deficient cognitive processes. This perspective is notably prominent within British universities (Elliott, 2014; Ryder & Norwich, 2018).

Dyslexia is currently understood as a complex matter influenced by various factors across genetics, neural processes, cognitive functions, and environmental aspects. The significance of each factor varies among individuals, contributing to a multifaceted perspective on the condition (Pennington et al., 2012; Vandermosten et al., 2016).

### 1.6. Subtypes of dyslexia

Some researchers, considering the time of onset of dyslexia symptoms, as a point of reference, distinguished it into: acquired dyslexia and developmental or evolutionary dyslexia. **Acquired** dyslexia is not often encountered in students as it is the result of acquired events that act on the anatomy and physiology of the brain, i.e. it involves brain-damaged readers who take a long time to read words (Price & Humphreys, 1992; Shallice & Saffran, 1986) and presupposes that the individual had mastered the skills of reading and writing before the event in question (Papadatos, 2010). **Developmental or evolutionary dyslexia** occurs in early childhood and when the child first comes into contact with the reading process and the written word. Such are the deficits created by the specific neurobiological disorder that are usually found when the child is in the first grade of primary school. More specifically, the student has problematic reading and writing of words and pseudowords, poor phonological processing and short-term memory skills as well as problems associated with visual-perceptual deficits (Mpastea, 2014). The acquired dyslexia view contrasts with the view that dyslexia has a genetic or biological origin and remains stable throughout life.

In 1984, John Marshall suggested that we can use a system model of the reading process to explain not only acquired dyslexia, but also developmental dyslexia. The term "dual-route model" was chosen for this approach (Castles, et al., 2006). The "dual-route

model" proposed by Marshall and Newcombe (1973) posits that the process of reading involves two main routes or pathways in the brain:

The **phonological** route: In this path, words are read based on the analysis of their phonemes and the combined reading of the vowels and consonants that make up the word. This process is good for reading words that are new or not well known, as the reader analyzes the word phonetically.

The **semantic** route: In this path, words are read based on their semantic meaning and how they relate to other words and concepts. This process is useful for reading words that are familiar and have meaning.

Given the above, it was considered that children learning to read may have varying difficulty levels in acquiring one or the other route. The "dual-route model of word reading" is a theory that describes the process of word reading. This model posits that there are two separate processes that occur simultaneously during word reading:

- **Lexical Process:** This process corresponds to understanding the word as a whole. It includes understanding the meaning of the word and how it relates to other words. This process is based on the spelling of the word.
- **Sublexical Process:** This process corresponds to the breakdown of the word into smaller phonological elements, such as vowels and consonants. This process helps to read the word from its spoken form (Castles & Coltheart, 1993).

The "dual-route model" predicts phonological dyslexia and surface (orthographic) dyslexia, which are due respectively to phonological and orthographic deficits (Castles & Coltheart, 1996; Hanley et al., 1992).

1. **Phonological dyslexia** is when someone has difficulty recognizing words based on their sounds. Usually, this happens when someone has trouble parsing the vowels and consonants in words. Pseudoword reading is poor, but irregular word reading is within the normal range (Castles, et al., 2006).
2. **Surface (orthographic) dyslexia** is when someone has difficulty recognizing words based on their spelling, without being able to recognize the meaning of their sounds. When word reading performance deviates from the peer group, but pseudoword reading is within normal range (Castles, et al., 2006). Usually, this

happens when someone has difficulty reading words that they cannot identify based on their spelling.

It is worth noting that there are people who present both phonological and orthographic dyslexia. These individuals have deficits in processes related to graphophonemic matching. At the same time, they have deficits in the ability to acquire, store and use knowledge of the representation of spoken language in written form (Apel, 2011).

In an effort to clearly define the etiology of dyslexia and provide answers, several studies have examined deficits in visual and auditory processing in relation to dyslexia.

Regarding the deficit in visual processing various hypotheses have been made such as that there may be a deficit in the perception of visual form, although no clear deficit has been identified between dyslexic and non-dyslexic individuals (Vellutino, 1979). Another hypothesis for which there is considered to be more and stronger evidence, concerns the deficit in early sensory processes in vision, and specifically this deficit is in the magnocellular channel of the visual system, which is responsible for rapid visual processing (McAnally et al., 2000).

With regard to auditory processing, in a gap-detection experiment in reading, McCroskey and Kidder (1980) found that children with reading difficulties needed more time between auditory stimuli to discriminate between two different sounds than did children who did not read normally (McAnally et al., 2000). The prevailing theory about how deficits in auditory processing occur states that problems in auditory processing can affect the way one perceives and understands speech signals, and this can be linked to the onset of dyslexia (Tallal et al., 1996a).

Theories about deficits in visual and auditory processing contributed to the creation of two subcategories of dyslexia: visual and auditory dyslexia.

- **Visual dyslexia** is characterized by difficulty in decoding the written word and is thought to be governed by deficits in the triad of visual perception, discrimination and memory (Bastea, 2014). As the word itself testifies, visual dyslexia is related to a dysfunction in the visual discrimination and processing of letters and numbers that are similar to each other, such as /β/ with /θ/ and /96/ with /69/. The main learning problems that arise as a result of visual dyslexia

are difficulty in reading and understanding texts and in the production of written language.

- **Auditory dyslexia** Auditory dyslexia involves the interface between hearing and speech. More specifically, in this type of dyslexia, the person has difficulty decoding and distinguishing the phonemes of the words they receive aurally. The person confuses phonemes whose pronunciation can be considered similar such as /δ/ with /θ/, as well as having difficulty identifying words that have the same sound in their first or last syllable, e.g. κρα-νίο, κρά-μπα / πιστό-λι, ραβιό-λι. In order to alleviate the difficulties faced by students with auditory dyslexia, it is recommended that teaching be done slowly and with linguistic clarity, as well as being broken down into individual sections with the aim of testing listening comprehension (Kujala et al., 2006).

It is worth mentioning that the above subcategories are still the subject of research by scientists in the relevant fields, and the scientific community has not reached an absolute consensus on the existence and characteristics of these supposed subtypes of dyslexia.

## 1.7. The dominant theories about dyslexia

### 1.7.1. The phonological deficit hypothesis

One of the dominant theories trying to interpret the causes of dyslexia is the phonological deficit hypothesis, on which many diagnostic tools and intervention programs have been based (Hatzimichael, 2010). This theory advocates that there is a specific deficit in the representation, storage, and / or retrieval of information (Ramus et al., 2003), namely, the phonological theory suggests that children are unable to learn how to read because they are unable to acquire the required reading skills (Stein, 2018).

In order to make the above theory more understandable, it is sufficient to think of the linguistic system as a hierarchy of elements, where the highest levels are the neurological systems involved in complex processes, e.g. semantic, syntactic and linguistic, while at the lower level is the phonological section, which performs the process of distinguishing the sounds that constitutes the language. The functional part of the phonological section is the phoneme, which is defined as the smallest audible

discrete element of speech (Hatzimichael, 2010). Reading as a process, presupposes one's ability to split the word into smaller parts which are syllables and phonemes. In this regard, Shaywitz & Shaywitz (2003) argue that the awareness all words can be subdivided into phonemes allows the reader to decipher the reading code "Leonard Apt lecture".

Thus, according to the phonological deficit hypothesis, people with dyslexia have difficulty in understanding the word as an autonomous linguistic unit as well as having difficulty in understanding the sound – phonological structure (Gundi, 2015). Furthermore, these people have difficulties with the mental representation of grapho-phonemical matching (Gundi, 2015). However, findings on poor verbal short-term memory and strenuous reading also indicate a more crucial phonological deficit, perhaps in relation to the quality of phonological representations or the access and retrieval (Snowling, 2000).

At the center of this hypothesis is the belief that people with dyslexia of all ages have a central deficit in phonological awareness, as well as a gradation of deficits in the various aspects of phonological processing. The development of reading skills in a person with dyslexia is related to the severity of the deficits in these areas, their linguistic abilities, environmental factors, etc. (Snowling, 1998). The main weakness of this theory is that it advocates that the existence of sensory and motor disorders in dyslexic individuals is not a causal factor of central deficit but merely indicators (Snowling, 2000).

### 1.7.2. The hypothesis of cerebral palsy disorder

The cerebellum in people with dyslexia is dysfunctional thus creating a variety of cognitive deficits (Nicolson & Fawcett, 1990). The cerebellum is a brain structure that plays a significant role in coordinating one's movements. It regulates the movements and posture of the body indirectly as it modifies the commands coming from the motor centers of the brain. Although cerebellar lesions do not cause paralysis, they do affect the coordination of limb and eye movements, balance is still disturbed and muscle tone reduced (Dimitriou et al., 2008). According to the above, even the movements made by the tongue in conjunction with the lower jawbone are disrupted when there is a malfunction in the cerebellum resulting in a potential enunciation problem

(Hatzimichael, 2010). Thus, there may be a correlation between delayed or defective enunciation and defective phonological awareness.

In addition, this case assumes that there is a general deficit of people with dyslexia in the ability to automate as a result of cerebellar dysfunction (Nicolson et al., 2001). The role of automation in academic skills is certainly important, as the individual gradually eliminates the conscious involvement of controlling actions in learning new skills (Gundi, 2015). The result is an increase in processing speed even in demanding conditions.

However, the deficit in automation and processing speed, according to Nicolson et al. (1995), is not only about academic skills but it is broader than that and affects all the involved sectors. However, dyslexic individuals do not appear to be inadequate compared to the general population in terms of their performance in other activities, which is attributed to their over-effort, use of compensatory strategies, and increased attention to each activity. The above hypothesis is the case of conscious replenishment (Moore et al., 2003). One of the main problems identified in this theory is the association and causal relationship between articulation and phonology, which has so far been strongly disputed as it has not been scientifically documented (Ramus et al., 2003).

### 1.7.3. The double deficit hypothesis

Wolf & Bowers (1999), supporters of the double deficit theory, stated that difficulties in reading and writing do not entirely stem from the phonological deficit, as there is a second deficit in the ability of speed recognition of visual information. It is noteworthy that, according to this theory, the second deficit can exist alone without the coexistence of the phonological deficit.

Thus, with the double deficit hypothesis, the difficulties in reading and writing may stem from individual deficits:

- Exclusively on phonological awareness
- Exclusively in quick word naming or
- In both areas

The latter category of deficits in both areas is the most severe form of dyslexia (Wolf & Bowers, 1999). As in the theory of phonological deficit, the main weakness of this theory is that it advocates that the existence of sensory-motor disorders in dyslexic individuals is not a causal factor of central dyslexia in dyslexia but only evidence (Snowling, 2000).

### 1.7.4. The magnocellular deficit hypothesis

In 1980, for the first time Bill Lovegrove (Lovegrove et al., 1980) stated that the development of the transient visual system, now known as the visual magnocellular system, has been reduced in children with dyslexia (Stein, 2018).

The theory of magnocellular deficit, as formulated by Stein and Walsh (1997), holds that magnocellular dysfunction is not only responsible for the visual system but affects all the senses of the individual, namely visual discrimination, auditory and tactile perception. There are research findings that support the view that dyslexic individuals, in addition to their inherent difficulties in reading language, also perform poorly on braille and Morse code (Rudel et al., 1976). In addition, Stein et al. (2001) have argued that the cerebellum is likely to be affected by a generalized magnocellular disadvantage as it receives accumulated information from various magnocellular brain systems.

It has also been suggested that magnocellular deficiency may not be the cause of reading problems, but a secondary consequence of less reading practice (Olulade et al., 2013). It is possible that reading practice can help improve the magnocellular function evaluated for example with visual sensitivity on movement. However, studies have confirmed that the sensitivity on movement to dyslexic readers is worse than of younger typical readers who match with reading age / skill and that the sensitivity on movement to young readers predicts their subsequent reading ability (Boets et al., 2011). In addition, according to Giraldo-Chica et al. (2015) it seems unlikely that reading practice could modify the thickness of the alveoli of the lateral genome of the nucleus. The major problem with the magnocellular theory is that the findings of the relevant studies were not repeatable, so their credibility is called into question.

### 1.7.5. Characteristics of children with dyslexia

Regarding to the characteristics of children with dyslexia, it is suggested to focus on three main points: the cognitive profile, the psychosocial profile, the learning profile, which affect each child to varying degrees.

As for the cognitive profile of children with dyslexia, there are difficulties in visual and auditory discrimination, phonological deficits, memory problems (Sandravelis, 2015), and some studies also report problems in executive functions (Palladino & Ferrari, 2013) and in metacognitive strategies (Pressley & Gaskins, 2006).

With regard to the psyche of children with dyslexia, the literature is not particularly extensive, however, there are reports of children's negative emotions either as recipients of negative third-party criticism (Pumfrey & Reason, 1995), or experiencing a frustration themselves because their efforts do not result in good school performance (Sandravelis, 2015; Sideridis, 2003).

In the same vein, many researches on dyslexia have focused on its social and emotional aspects, and self-perception. However, the results are not clear (Gibby-Leversuch et al., 2019). Thus, there are conflicting results with some studies showing that dyslexia is associated with stigmatizing and reduced self-esteem experiences (Polychroni et al., 2006; Riddick 2000), some others suggesting that dyslexia is not associated with negative perceptions (Burden & Burdett 2005), while some researchers argue that the dyslexia label may increase self-esteem (Gibson & Kendall 2010; Glazzard, 2010; Solvang, 2007) as diagnosis most often results in feelings of relief (Stamboltzi & Polychronopoulou, 2009). Some of the deviations of those research above can certainly be attributed to the set of definitions and the measuring tools which were used.

Research by Passe (2006) has shown that students with dyslexia experience intense stress at school during the first years of school, which is characterized by emotional and psychosomatic issues such as fear, tachycardia, etc. According to Novita (2016), children with and without dyslexia have similar anxiety and self-perception profiles. However, children with dyslexia were found to have higher generalized anxiety and lower self-esteem in the school environment than children without similar difficulties. Therefore, it is understood that it cannot be generalized by saying that children with dyslexia develop higher anxiety and lower self-esteem in all aspects and facets of their lives than in a specific school-educational context.

The learning profile of children with dyslexia includes difficulties in decoding, automated reading, and comprehension of written texts (Archer et al., 2003). Children with dyslexia have difficulties in the phonological processing of the language and as a result they have difficulty in understanding and decoding the structure of the language in the first grades. According to Stathis (2006), a dyslexic student has deficits in the recognition of sound characteristics and their sequential arrangement, the differentiation of graphical elements, the interpretation of a sound's symbolic representation through a visual symbol, the segmentation of words, the retention of the corresponding graphical representation, and the comprehension of grammatical attributes. The difficulty of linguistic decoding contributes decisively to making reading very tedious process in which spelling each word is more likely to happen than read automatically. What is more, these students' difficulty in comprehending texts is inextricably linked to problematic reading, as the sentence is given meaning by the set of words and not by each word separately. There is also difficulty in writing the language code, especially in languages where there is no clear correspondence between phonological and spelling display (Caravolas, 2005).

According to Neil (2017), at school many children with dyslexia spell a text instead of reading it and develop strategies to avoid detection or camouflage their spelling difficulties using, for example, only shorter words that they can write instead of words they can pronounce but cannot write.

### 1.7.6. Signs of dyslexia

Dyslexia as a disorder may be directly related to the processing of the written word (reading or writing), however some of its symptoms may appear from infancy. Unfortunately, they are not always obvious as some of them can be attributed to the child's age, temperamental characteristics, or elements of the child's personality. More specifically, students with dyslexia during infancy to first grade may have difficulty learning an easy nursery rhyme, just as they may have difficulty learning the names of the letters of the alphabet (Shaywitz, 2005) even when they are included in a rhyme or a song. Also, there is difficulty in recognizing even letters that are in the child's name. Baby talk, mispronouncing a lot of words and non-recognition of rhyme in simple

Consonant-Vowel-Consonant words (CVC) are among the early signs of dyslexia (Shaywitz, 2005).

From Second Grade to High School, the indications mainly concern the processing of writing (decoding/reading phonemes and writing words and phrases). Thus, it is observed that students find it very difficult to read and make many mistakes such as: guess the word, mispronunciation, substitution / inversion / deletion / addition of phoneme (Shaywitz, 2005). Poor reading skill is associated with deficient understanding of the texts, but when the texts are read by someone else, the level of understanding is significantly improved. Writing is a difficult process for students with dyslexia, as well. Their handwriting is usually messy, and they do spelling errors of various types (depending on the severity of the disorder). Thus, are observed phonological, etymological, and ending errors. Intrusion of capitals into lowercase, arbitrary joining or unnecessary separation of words are also indications of dyslexia.

Even though dyslexia is commonly associated with reading difficulties, the persistent issue actually revolves around spelling (Schulte-Korne et al., 1998). Moreover, individuals with dyslexia might exhibit relatively strong abilities in understanding auditory and verbal expressions on a syntactical level, despite grappling with spelling and word representation. Developmental dyslexia typically becomes noticeable when handwriting, word decoding, and spelling are explicitly introduced during early education, such as in kindergarten or the initial grades of elementary school (Berninger, et al., 2015)

In oral speech, they often take longer to respond to questions. They confuse similar-sounding words such as "κανόνι" instead of "μπαλόνι" (Shaywitz, 2005) or reverse phonemes in words such as "τεχνίζομαι" (not existing word) instead of "χτενίζομαι". Regarding life skills, students with dyslexia encounter difficulties in remembering information such as: names, dates, multiplication tables, etc. and in learning foreign languages (Shaywitz, 2005).

### 1.7.7. Transparent and opaque orthographies in dyslexia

Research spanning across different languages has shown that dyslexia is influenced by the level of consistency in spelling rules, which plays a crucial part in shaping reading

development and dyslexic tendencies (Ziegler et al., 2010). Each language, depending on its phonological, morphological, and orthographic peculiarities, affects the level of difficulty cognitively processed by its users. The key distinction lies in the connection between letters and their corresponding sounds. In languages with transparent spelling systems like Finnish or Italian, letters maintain a consistent sound, even when placed within different words. In contrast, languages with opaque spelling systems like English or French often feature letters that produce varying sounds in different words (Ziegler et al., 2010). The Greek language is an alphabetic language in which graphic symbols represent phonemes (Gundi, 2015). It belongs to transparent or shallow languages as it has a simple syllabic structure and a one-to-one relationship between its graphic symbols and phonemes (Seymour, 1999), with the peculiarity that some sounds can be represented by more than one letter (Porpodas, 1993). For example, the sound /o/ can be represented either as “ο” or “ω” (Gaitanidi, et al., 2023).

Given the extreme variability in transparency between writing systems, it is difficult to extrapolate results from monolingual studies to other languages. Paulesu et al. (2001) highlighted that although dyslexia has a biological basis, it is more likely to occur in graphic systems that have greater opacity. Some researchers assert that the underlying issues causing reading difficulties might vary across different languages' writing systems (Caravolas, 2004; Ziegler & Goswami, 2005).

The above claim is generally accepted by the scientific community. However, when a difference in transparency in the writing system begins to affect the acquisition of reading skill is not as clear (Bigozzi et al., 2015). This is because most studies of dyslexia and its predictors are based primarily on studies of children beginning to read in English, who have opaque orthography (Landerl et al., 2013; Tilanus, et al., 2013). At this point it needs to be clarified that children develop reading problems and specific learning disorders in more transparent writing systems, however research on them is more limited (Tilanus et al., 2013).

### 1.7.8. Etiopathogenesis, comorbidity and heritability in dyslexia

There are long-standing debates about how to diagnose dyslexia and whether it exists. It is worth noting that dyslexia has varying degrees and manifestations so that it is rare to find two dyslexics with exactly the same range of difficulties (Neil, 2017).

Furthermore, there is a convergence of opinions among experts that there is no single known cause that adequately explains the development of SLDs but rather it is the result of numerous factors (McDonough et al., 2017). However, there is no consensus as to the causes.

There may also be comorbidity with other mental or neurodevelopmental disorders. In the first case, it is easy to exclude -or not- the specific learning difficulties when there is schizophrenia or psychosis, as there is a difference in performance from the onset of the mental disorder and then, while before the required skills were acquired to an extent corresponding to the student's age (Papadatos, 2010). On the other hand, in neurodevelopmental and other mental disorders, the diagnosis of specific learning difficulties is not an easy task, since these disorders interfere with the entire range of student's activities and skills and therefore on learning process as well (APA, 2013; Papadatos, 2010).

According to the DSM-5, a SLD is a neurodevelopmental disorder with a biological basis that results in cognitive abnormalities. The onset of the disorder is considered the period when deficits in academic skills appear. The interplay of genetic, epigenetic and environmental factors can affect the brain's ability to perceive or process information efficiently or accurately (APA, 2013; McDonough et al., 2017).

In addition, there is evidence to suggest that the role of heredity is a particularly significant factor contributing to etiopathogenesis of dyslexia. The above claim regarding the heredity of SLDs is substantiated as it is observed that special learning difficulties appear within families from generation to generation and especially reading and writing difficulties (Scerri & Schulte-Korne, 2010; Schulte-Korne, 2001). Children with a familial risk of dyslexia have lower levels of word decoding throughout primary school. Familial risk for dyslexia affects literacy development through its subsequent relationships with early literacy skills and word decoding ability, as well as through a direct relationship with reading comprehension (van Viersen et al., 2018). In the same direction, research by Cortiella & Horowitz (2014) highlights a correlation between heredity and learning abilities and difficulties.

### 1.8.1. Diagnosing dyslexia

Specialists who diagnose dyslexia often argue that it is marked by the presence of one or more of a very long list of deficient processes. These deficits may be in phonological awareness, i.e. the ability to recognize and process the sounds of language, the speed with which we can name familiar objects, working memory/short-term memory, i.e. the ability to store and recall recent information, attention and concentration, motor difficulties (such as balance, movement and coordination), personal organization, visual perception/sequencing and numerical difficulties (Gibbs & Elliott, 2020).The weakness of the above position is that such difficulties are common to all people with reading difficulties. Furthermore, apart from phonological awareness, there is little evidence that assessment of cognitive processes, which typically look for intra-individual differences involving contrasting strengths and weaknesses, is of little value in identifying dyslexia or guiding interventions (Fletcher et al., 2019; Fletcher & Miciak, 2017).

Although it is widely accepted that severe reading difficulties may be caused by neurobiological factors, this is not a critical factor in differential diagnosis procedures. As Sand and Bolger (2019) point out in their comprehensive review, simply arguing that "the disorder has a neurobiological basis" is neither theoretically satisfactory because it does not provide an explanation, nor is it diagnostically relevant at this point.

As mentioned, the model of IQ discrepancy with school performance is considered inappropriate for the determination of dyslexia (APA, 2013; Fletcher et al., 2019; Gresham & Vellutino, 2010; Stuebing et al., 2015). Indeed, the two largest dyslexia advocacy groups, the International Dyslexia Association and the British Dyslexia Association, clarify on their websites that people with dyslexia can be anywhere on the intellectual spectrum with the exception of very severe intellectual disabilities. Despite the recognition that the discrepancy model is not appropriate for the diagnosis of dyslexia, many clinicians continue to use it (O'Donnell & Miller, 2011).

Also, the "unexpected" factor is used to diagnose dyslexia. This means that the student, despite their IQ, the training/intervention they receive, their systematic attendance, etc., their performance is unexpectedly low (Shaywitz & Shaywitz, 2020).

The protocol for diagnosing dyslexia varies between countries and there is always a risk of misclassification or overdiagnosis (Hruby, 2019). There are various difficulties

in diagnosing dyslexia, for example, the fact that it is not visible, whether it is clear or not. Additionally, it is assumed that there is no single underlying cause. Difficulties in reading may arise from a variety of problems, such as a lack of well-structured phonological representations, an inability to map phoneme, or difficulty processing stored orthographic representations (Ziegler & Goswami, 2005). De Jong and van Bergen (2017), emphasize that the metrics used to assess deficits in children with dyslexia are not necessarily clear indicators. This means that the measurements used to identify dyslexia problems may be affected by various other factors and may not be completely accurate. This is especially important because when a child is diagnosed with dyslexia, more specialized teaching and help is often provided. Providing more and specialized help raises the issue of wanting to diagnose a child at an early age (Tilanus et al., 2020).

Prominent experts in the dyslexia identification field have suggested the utilization of hybrid models for its detection, which do not rely exclusively on an IQ-Achievement discrepancy. (Miciak & Fletcher, 2020; Wagner et al., 2020). As stated by Rice and Gilson (2022), staff in schools need to review their current practices and consider the possibility of using a hybrid model that includes multiple components for diagnosis. A hybrid model according to Miciak & Fletcher, (2020) can include three components:

1. low performance in reading (especially in accurate or enjoyable reading of words or spelling for dyslexia),
2. poor response to specialized teaching interventions and,
3. consideration of other factors that require additional evaluation.

The hybrid model proposed by Wagner et al. (2020) placed an increased focus on the unexpected. This model relies on two key factors for the diagnosis of dyslexia: a weakness in phonological processing and an unexpected reading problem. This model takes into account four components:

1. poor phonological decoding of nonsense words.
2. poor vocabulary of sight words.
3. poor response to specialized teaching interventions.
4. higher listening comprehension compared to reading comprehension.

It is obvious, the two hybrid models have quite a lot in common, however, the model of Wagner et al. (2020) adds the element of unexpected by comparing listening

comprehension to reading comprehension skills. Although there is not complete agreement, research has shown that such a hybrid approach improves the accuracy of dyslexia identification (Rice & Gilson, 2022).

### 1.8.1. Diagnosing dyslexia in Greece

The competent and recognized centers for probe and diagnosis of students' special educational needs in Greece are the Centers for Diagnosis, Evaluation, Counseling, and Support (CDECS) and the Mental Health Centers for Children and Adolescents (MHC).

The diagnostic process mainly serves educational purposes. Thus, collecting various data related to the child and his learning process, will be helpful in designing appropriate educational interventions. During the process of the student's difficulties depiction, mental and social factors related to the student's learning profile are taken into account (Law, 3699, 2/10/2008, Government Gazette of the Hellenic Republic).

More specifically, educational assessment probes skills related to the decoding and processing of spoken and written speech, such as accuracy, clarity and speed of reading words and pseudo-words, verbal fluency, comprehension of text, etc.

Psychometric assessment examines a student's mental ability (IQ) through weighted tests. The main tests currently used in Greece are the WISC-III and the RAVEN. The Greek WISC-III, which is the Greek version of the Wechsler Intelligence Scale for Children WISC-III, was adapted linguistically by Georgas et al. (1997). It is suitable for children aged 6 to 16 years old and its administration does not exceed 70 minutes. It includes 13 sub-scales, which evaluate various mental functions such as memory, comprehension, abstract thinking, etc. The assessment is carried out through audio-linguistic and visual-motor communication. RAVEN test consists of two parts: a) the colored Matrices that measure the non-verbal ability of the individual to draw conclusions in a visual-spatial context and b) the vocabulary scales that measure the verbal ability of the individual. The compound of the two parts provides a more comprehensive assessment of the mental potential of the individual. It is worthwhile to mention that WISC-III, as a psychometric tool is considered quite old, however on August 8$^{th}$ of 2020, the Minister of Education of Greece, issued a ministerial decision [in the framework of Sub-Project 7 "Supply CIECS with psychometric tools "of the Act "Enhancement" Education Support Structures 2019-2020 "(OPS CODE: 5048220) Priority Axis 6, 8 & 9 of the Operational Program "Human Resources Development,

Education and Lifelong Learning 2014-2020", which is co-financed by the European Union-European Social Fund (ESF) and National Resources], approving the purchase and language adaptation of WISC-V, WAIS-IV and WPPSI-III for diagnostic and differential centers.

The social worker is responsible for making the student's social profile. On this basis, information is collected concerning: a) genetic factors (heredity, family medical history, etc.), b) prenatal and perinatal factors (premature birth, maternal abuse, etc.), c) early childhood factors (exposure to toxic environment, chemotherapy, etc.), d) brain injuries or tumors and e) marital status (family environment, financial status, living conditions, family relationships, etc.) (Papadatos, 2011).

Probing the cognitive and learning deviation of the student in relation to his chronological age and the peer group is imperative during the educational assessment. Also, the main students' cognitive abilities and skills such as reading fluency, accuracy and speed, production of structured and unstructured written speech, oral communication, spatial reasoning, mathematical concepts, fluency of mathematical operations, etc. are studied and documented.

The process above presents valuable findings and helps the specially trained staff to depict the student's learning profile. A number of other factors are taken into account and examined as well, such as:

1. **Separation of normal deviations of academic performance**
   The separation of normal deviations of academic performance from deviations that have as a starting point a specific learning difficulty. Sometimes the low academic performance of students is due to non-systematic school attendance, insufficiency of teaching, teaching non-native speakers, etc. (APA, 2013).

2. **Sensory adequacy**
   The diagnosis of specific learning difficulties is based on the certainty that the student's sensory functions are operating adequately. Therefore, student's difficulties related to vision or hearing loss are excluded (APA, 2013).

3. **Separation of learning difficulties due to the presence of neurodegenerative cognitions**

The separation of learning difficulties due to the presence of neurodegenerative cognitions. In these cases, the student's difficulties are attributed to the pathological findings and are not specific learning difficulties aftereffect (APA, 2013; Papadatos, 2010).

4. **The socio-cultural context**

   The socio-cultural capital of the student and more specifically the presence of sufficient educational stimuli, the financial status of the family, the presence of psycho-social factors (postpartum depression of the mother, absence of the mother, etc.). Students living in troubled family environments can lead to school failure, with features that resemble dyslexia (APA, 2013; Papadatos, 2010).

5. **Presence of behavioral and emotional disorders**

   The presence of behavioral and emotional disorders before or simultaneously with learning disabilities. As reported in the APA (2013), children with emotional and behavioral difficulties may experience reduced school performance as those difficulties may play an inhibitory factor in the regular school career.

6. **Separation from Attention Deficit Hyperactivity Disorder (ADHD)**

   A student with ADHD may have low school performance, because this disorder affects the use and management of the necessary academic skills and not the process of learning them (APA, 2013).

7. **Separation from mental retardation**

   Students having mental retardation, with mild mental disability have a similar learning profile to dyslexic students. As mentioned in the revised version of the DSM-5 (APA, 2013), specific learning disorders are distinguished from the general learning difficulties associated with mental disability because the first one appears at normal or borderline intelligence levels (IQ70 ± 5). However, in exceptional cases a specific learning disorder can be diagnosed even when the IQ index <70, when the individual's learning difficulties far exceed the link with mental retardation. Namely, when learning disorders are much greater than expected given the mental disability (APA, 2013).

# CHAPTER 2

## LEGAL FRAMEWORK AND LAWS ABOUT SPECIAL EDUCATION IN GREECE

### 2.1. Students with disabilities and special educational needs in accordance with Greek law

In accordance with Article 3 of Law 3699 (Government Gazette 199 / 2-10-2008), students with special educational needs are those who, either in the short or long term during their school life, have significant learning disabilities due to sensory, mental, cognitive, developmental problems, mental and neuropsychiatric disorders and according to interdisciplinary assessment affect the process of school adaptation and learning. Students with disabilities and special educational needs include especially those who have:

1. Mental disability.
2. Sensory visual impairments (blind, blurred with low vision) and sensory. hearing impairments (deaf, hearing impaired).
3. Kinetical disabilities Chronic.
4. Long term non-curable diseases.
5. Speech and speech disorders.
6. Specific learning disorders such as dyslexia, discalculia, dysgraphia, dyslexia, dysorthographia.
7. Attention Deficit Hyperactivity Disorder (ADHD).
8. Diffuse developmental disorders.
9. Mental disorders and multiple disabilities.
10. Students with complex cognitive, emotional and social difficulties, abusive behavior due to abuse, parental neglect and abandonment or domestic violence.
11. Students with one or more mental abilities and talents developed to a level well beyond their age range.

Students with low school performance that are causally related to extrinsic factors such as linguistic or cultural diversities are not included in students with special educational needs.

## 2.2. School units for special education in Greece

### 2.2.1. Integration Classes (IC)

IC is a special education facility in Greece, which takes place within the typical school. Goal of the IC is to help and support students with disabilities or special educational needs, operating within school hours, using specialized, differentiated individual or group programs which are provided to those students by the special educator. IC constitutes a separate section of the Greek School Unit, in which students from all grades can be registered. ICs operate in both Primary and Secondary education.

In order to establish an integration department, a prerequisite is that there are at least three (3) students and a relevant proposal from a diagnostic service. In the case of co-located or adjacent school units, ICs shall be joined up to a maximum of twelve (12) students per IC. (Article 6 of Law 3699/2008 of the Greek Government).

IC operates as a supportive education facility for students with disabilities and special educational needs who attend typical school units and fall under the categories listed in Law 3699/2008 of Greek Government, article 3, paragraphs 1, 2, 3. As mentioned above, low-performing students due to other causal factors such as those with linguistic or cultural diversities, as they do not fall into the category of students with disabilities and/or special educational needs are not supported at the IC.

In order to a student to be registered and take specialized lessons in an IC there must be:

1. Expert valuation by Centers for Interdisciplinary Evaluation, Counseling and Support (CIECS) or other certified public entity
2. Written affirmation of the parent that he/she allows and wishes the evaluation and support of his/her child by the special educator at the IC
3. The agreement of the Special and Integration Education Advisor (SIEA)[2]

[2] The main role of the SIEA is the pedagogical and scientific guidance of teachers and members of the Special Education and Support Personnel (SESP), training, fostering innovative educational initiatives, as well as evaluating educators and SESP members. They participate in collective planning and self-

In cases where students' subpar academic achievements stem from behavioral disturbances, lack of focus, hyperactivity, learning obstacles, or various psychological and emotional difficulties, the educator of the typical class, in which the student attends, suggests the implementation of differentiated instruction as part of inclusion. Students face challenges in the typical class that require attention, concentration, self-regulation, and impulse control for executive and memory functions in order to develop metacognitive and learning strategies. However, these students face difficulties in those fields, so they can be supported at the IC by the special educator with:

- A written affirmation by the guardian of the student mentioning that he/she allows his child to be evaluated and supported by the special educator of the IC (Law of Greece Government 3699/2008 article 6 par. 1).
- Having received the concurring opinion of the SIEA.

In cases where parents of students with special needs and/or disabilities want the support from a special educator at an IC and there is not an expert evaluation, SIEA can recommend the support of the students' attendance to IC provided that there is:

- A copy of the pedagogical session, in which the typical education teacher mentions the reasons why it is necessary for the student to be supported by the special educator.
- The Short-Term Intervention Program (STIP) that has been implemented for this student for a minimum of two months and its results.
- A written affirmation by the guardian of the student mentioning that he/she allows his child to be evaluated and supported by the special educator of the IC (Law of Greece Government 3699/2008 article 6 par. 1).

assessment processes within educational units and support facilities of Primary and Secondary education. The SIEA has the scientific responsibility of all the school units and Laboratory Centers (LC) that are under the Directorate of Primary or Secondary Education.

### *2.2.1.1. Designing and Implementing an Intervention Program – Responsibilities of a special education teacher working in an IC*

Students attending ICs belong to the student body of their typical class. The co-operation and equitable participation of teachers of the school unit who teach in the typical class and in the IC is essential, aiming of differentiated activities and teaching practices as well as adapting the educational material and environment appropriately to the student's educational and psycho-emotional needs.

The main goal of the IC is the full integration of students in the school environment through specific educational interventions and programs. IC teachers are specialized to implement special intervention training programs aimed at gradual integration of students. Due to their specialization, they can advise and inform the members of the school unit on special education and teaching issues.

When designing and implementing the intervention program the special educator:

1. Collaborates with the typical teacher to establish a link between the public and the personalized curriculum on its content and how it is implemented (for example: collaborative teaching / co-teaching practices). The support and help from the IC must be assessed and redefined during the school year in order to fully integrate into the school environment and support students in their typical class without support.
2. Draws up for review the weekly schedule of operations and the annual evaluation report of the IC through the manager of the school unit.

According to the Ministerial Decision 27922 / Γ6, Government Gazette 449/08-03-2007 special educators working at IC:

1. Evaluate students for exploring their specific educational needs based on the suggestions made by the responsible typical teachers.
2. In cooperation with the head of the school unit, they inform, the parents and guardians of the student of the necessary procedures to be followed in order to support the student in the IC. As mentioned above, if parents and guardians wish to enroll their child in the Department of Integration and there is no recommendation from the appropriate diagnostic services (Centers for Interdisciplinary Evaluation, Counseling and Support, Medical Education), the

Special Education Coordinator & Specialist Teacher may recommend attendance so that the student is not excluded from the Integration Department. According to article 28 of Greek Law 4186/2013, the decision of the Centers for CIECS is necessary to determine the appropriate educational framework of support at school and therefore it is necessary for parents to be informed of the opportunity to apply to the CIECS and / or Medical Center).

3. Collaborate with the typical education teacher to establish a link between the public and the specialized curriculum on its content and how it is implemented (for example, co-teaching). As for secondary education, students who attend IC are supported in specific lessons such as: Modern Greek Language, Ancient Greek Language, Mathematics, Physics, Chemistry, History, Biology and Geography.

4. Enhance the overall adaptation of students in IC in the common school environment, by participating in work groups, sports games and other school life activities.

5. Ensure the regular updating of the student's personal file, which is kept in a safe place under the responsibility of the minister of the school unit (MD 27922 / Γ6, Government Gazette 449/2007). Indicatively the folder may contain:

    - a brief family and social history of the student.
    - opinions and assessments concerning the student's educational needs and abilities.
    - suggestions for the development of a personalized training program.
    - if the school environment changes (duplicate or register) the address of the new school unit is updated.

6. They inform and advise members of the school community on special education issues and cooperate with their local school counselors and CIECS personnel.

7. They draft and submit for approval to the Special Education Coordinator the weekly schedule of operations and the annual evaluation report of the IC.

8. They offer their services to students in co-located schools or in peer-to-peer support programs upon recommendation by the school's special education counselor in whose jurisdiction the school belongs.

The principals of the schools in which the IC operates:

1. Provide equipment and meet the operational needs of the ICs, following suggestions from the teachers in charge and informing the special education school counselor.
2. Ensure the smooth operation of the ICs, do not disturb these teachers in other activities, and do not suspend their operation without the approval of the special education school counselor.

### 2.2.2. Parallel support/co-education

According to article 6 of Greek Law 3699/2008 (199 A), "Students with disabilities and special educational needs can attend: [...] typical school class, with parallel support-co-education, by special education teachers, when this is required by the type and level of their special educational needs" (p.7).

Parallel support is provided to students who, with appropriate individual support, can follow their class syllabus. It is also provided to students with more serious educational needs, when there is no special school or IC in their area or when parallel support is deemed necessary - based on the opinion of CDECS - due to their special educational needs. The support is provided by a special education teacher in a fixed and planned way.

From 1-9-2010, the recruitment of special education teachers for parallel support/co-education is part of Actions co-financed by the European Union and the State within the framework of the National Strategic Reference Framework (NSRF).

#### *2.2.2.1. Responsibilities of a special education teacher working as a parallel support teacher*

The teachers who work in the typical school as a parallel support teacher have all the duties and responsibilities determined by the no. 27922/Γ6/2007/Ministerial Decision, Τ.353.1/324/105657/Δ1 as amended by Ministerial Decision No. 48275/D3/2019 - Official Gazette 1088/B/2-4-2019 as follows:

- They are informed by the school director about the student's needs, taking into account the report of CDECS and any pedagogical reports and evaluations from other entities.
- They evaluate the student's educational potential and draw up an individualized education program (IEP).
- They implement the individualized program and are overall responsible for all school activities of the student for whom parallel support has been approved.
- They cooperate with CDECS if a need arises.
- They collaborate with the teacher of the department and jointly draw up the student's weekly program of supporting activities.

### 2.2.3. Special Education School Units

Special Education and Training Schools are public schools established and operated in accordance with the provisions of the Law for the provision of special education and training to children with disabilities. These schools are staffed with the necessary teaching and other science (psychologists, speech therapists, physicians, physiotherapists and others) supportive and auxiliary staff and are provided with modern facilities necessary to fulfill their mission (Special Education, 2019).

As determined by the Law of Greece Government 3699/2008, the facilities of the Special Education Units, in which students with disabilities and/or special educational needs can attend, are the following: special education kindergarten (SEK), special education elementary school (SEES), special education high school (SEHS), special education Lyceum (SEL), Unified Special Vocational Gymnasium-Lyceum (USVGL), Special Vocational Education and Training Workshop (SVETW).

Students with special needs may attend to SEK up to the age of 7.

After SEK, students with special needs may attend SEES up to the age of 14. SEES have a preliminary grade and the corresponding grades of the typical elementary School. Attendance on SEES can be extended up to the fifteenth (15th) year of the students' age, after a recommendation from the CDECS.

After SEES, students with special needs may attend to the SEHS until the age of 19. This also includes a preliminary grade and the three corresponding grades to the typical high school.

After SEHS, in accordance with the Law of Greek Government 3966/2011, students with special needs may attend to SEL, which also includes a preliminary grade and the three corresponding grades to the typical education Lyceum.

According to the Law of Greek Government 4415/2016, the USVGL include four grades of high school and four grades of Lyceum. Students with special needs may attend in USVGL, and through academic and professional education they can be led to post-lyceum facilities and to independent or supervised work.

In particular, students who graduated from typical elementary school, SEES and the 1st or 2nd grade of SVETW can be enrolled in the 1st grade of High School. Students have the right to first registration up to the age of 16. After the completion of the students' studies in the 4th grade, a high school diploma is granted.

Students may change educational facility and have a transition from special to typical education school, and specifically to the 1st grade of the high school, as long as the following conditions are met: they are students who have graduated from a SEEL or from the 1st or 2nd grade of the SVETW. Students have the right to first registration up to the age of 16.

SVETW are secondary education school units, in which may attend typical education students or students with special needs up to the age of 16, following the recommendation of CDECS, who face difficulties in following the academic program of the high school and have disabilities and/or special educational needs.

In general, teachers in special education schools

1. Organize, develop and implement the personalized educational program of students in their class in collaboration with the Special Education Staff (SES).
2. They guide parents in home education and assistance and suggest activities to deploy their children's leisure time.
3. Collaborate with dedicated teaching staff to address the individual needs of their students.

4. They are informed about their students' rehabilitation programs, which are implemented outside the school and work with specialist scientists.

Regardless of the severity of the child's disability, Greek law allows parents to choose whether they wish their child to attend a general or special school. The recommendation of CDECS also plays a significant role, as it is the competent authority that recommends the attendance of a student in a special education facility. CDECS may also suggest that a student may skip some of the preliminary grades of special education school units.

### 2.2.4. University Departments of Special Education in Greece and Colleges

In Greece, special education is a separate and independent part of university education. There are two Greek public universities whose graduates have employment rights either as special education kindergarten teachers or as special education elementary school teachers. In all the other university faculties (teachers, kindergarten teachers, philologists, mathematicians, etc.) courses related to special education are not sufficiently taught and therefore no employment rights are granted to work in special education. Therefore, if a typical educator wishes to specialize in special education and obtain employing rights, he should attend a relevant postgraduate program or seminar.

Furthermore, with the law 4763/2020 (Government Gazette A 254/21.12.2020), the professional equivalence of a standard higher education title of a member state of the European Union or a third country with that awarded in the context of the national education system is recognized. In simple words, the graduates of the private higher education colleges that have a branch in Greece, award degrees from which derive equal employment rights with Greek universities, which was not the case until recently.

### 2.2.5. Special educators' recruitment regime

Greece, due to the financial problems that were plaguing the country in the last decade, was left a step behind regarding the developments in the field of special education. This can be seen from the fact that there was no state care that all teachers at all educational tiers to be trained in special education. However, the demand for special education teachers was and remains high.

The country's fiscal crisis led to the absence of permanent appointments in education. a five-figure number of hirings of teachers were employed on fixed-term contracts that expired at the end of each school year. These teachers did not know in which district of Greece they would work in the next school year. This work regime has led a large portion of teachers to specialize in order to become more competitive in the labor market. Fortunately, from 2020 onwards, appointments have been made in education, something that certainly favors the educational process and creates the conditions for the provision of better educational work. Most special schools and ICs are now staffed by permanent personnel. However, in parallel support, the working conditions remain with fixed-term contracts, namely until the end of the school year.

### 2.2.6. Diagnostic, evaluative and supportive institutions for special education

In Greece, the special needs of students are analyzed and ascertained by Centers for Interdisciplinary Evaluation, Counseling and Support (CIECS). Also, Mental Health Centers (MHCs) and Community Child and Adolescent Mental Health Centers (CCAMHCs) may also provide diagnostic services which are certified by the Ministry of Health (Law 4547/2018 No. 4). However, the CIECS can only certify the special educational needs of students. Other supportive structures and organizations that deal with special education are the Educational Support School Networks (ESSNs) and the Interdisciplinary Support Committee (ISC).

#### *2.2.6.1. Centers for Interdisciplinary Evaluation, Counseling and Support (CIECS)*

According to 4823/2021 - Gazette A 136 – 03.08.2021, the main responsibilities of CIECS are briefly mentioned below.

The purpose of the CIECS is to provide support to students, school units and Educational Centers of the respective region, aiming at the insurance of equal access to education to all students and promoting their harmonious psychosocial development and progress.

**CIECS:**

- assess the educational needs of pre-school and school-aged students, including students with disabilities or special educational needs, as well as issue relevant evaluation reports.

- recommend to the school unit for the preparation of customized individual or group programs of psychopedagogical and teaching support for students with special needs.
- exclusively prepare assessment reports for students in public or private education defining the special arrangements, such as for example (providing more time, use of assistive technologies, oral exams, etc.), depending on the type of disability or special educational needs and the limitations they entail, for unhindered participation in educational processes.
- collaborate with other entities and implement customized pedagogical and counseling psychosocial support programs for students, activities to strengthen students' cognitive and psychosocial skills, empower specific members or vulnerable groups of the student community, etc.
- provide advisory support to teachers, special education teachers and special auxiliary staff of the school units for optimal teaching practice, response to the needs of students with disabilities or special educational needs, acceptance of diversity and utilization of the heterogeneity of the student population and promotion of inclusion practices.
- provide counseling support to parents carries out actions of a preventive and informative nature in order to promote an inclusive culture and the acceptance of diversity.

As for the diagnostic procedure according to Law 4547/2018 no.5, sensory impairments of the eyes, hearing, motor or other physical problems, as well as serious or chronic health problems, are certified by medical advice from a public health institution or public health committee. The research, evaluation and identification of the types of difficulties and potential educational, emotional, psychosocial and other learning needs and barriers are carried out at CIECS.

At the end of the evaluation by the CIECS, the interdisciplinary team shall prepare an evaluation report - opinion. The report identifies and describes the type of special needs or learning or psychosocial difficulties the student is facing, as well as his or her inclinations and interests, and proposes, taking into account the needs of each child, an appropriate educational and integrated framework, changing school contexts whenever

appropriate, the necessary psycho-educational and teaching support as well as the necessary technical aids and educational materials to facilitate the student's education and communication. The evaluation report - opinion is accompanied by a Personalized Education Program (PEP), which includes key points and general guidelines. The core components of the PEP are formulated in collaboration with the parent or guardian of the student with a disability or special educational needs or even the student himself, wherever possible. The final evaluation report - opinion and the main PEP axes are communicated to parents or guardians.

CIECS, depending on the type and level of special educational needs and learning difficulties, determine the time of reassessment for each student, which is stated in the assessment report - opinion. If no reassessment time is indicated, CIECS reports are in force permanently (GG 136/A/3-8-2021). However, if a family, teacher or student consider that it needs to be reviewed, he can make the corresponding request.

Where there is a divergence of views between the CIECS evaluation reports and Community Mental Health Centers for Children and Adolescents for the same student or when parents and guardians disagree with the outcome of the CIECS assessment/ opinion report, parents or guardians have the right to appeal to a five-member Secondary Committee Interdisciplinary Assessment (SCIA), established by decision of the Regional Education Director. The SCIA decision is final. If there is a divergence of opinion between the CIECS assessment reports and the Community Mental Health Center for Children and Adolescents for the same student and the parents or guardians do not resort to the five-member SCIA, the CIECS evaluation report prevails.

#### *2.2.6.2. Mental Health Centers (MHCs)*

The purpose of the MHCs is to provide comprehensive care for the mental and social health of the population covered, focusing mainly on prevention and primary/basic psychiatric care services. It offers services that ensure the continuity of treatment and contributes to the rehabilitation of patients through enhanced recovery programs, cooperating with rehabilitation units. In addition to other services, they are able to provide timely diagnoses and comprehensive treatment to people who suffer from mental disorders, with an emphasis, in terms of urgency and multidisciplinary, on severe mental disorders.

#### *2.2.6.3. Community Child and Adolescent Mental Health Centers (CCAMHCs)*

The CCAMHCs, according to the Official Gazette 2289/11-6-2019, are decentralized organic units of the psychiatric clinics of general hospitals. They are Mental Health Units for children, adolescents (0-18 years) and families. Among the clinical services they offer are diagnostic assessment, parent counseling and issuing medical opinions. The purpose of the CCAMHC is to provide comprehensive mental health care for the child and adolescent population it serves. This is achieved through a range of services that offer prevention, diagnosis and treatment. CCAMHC are allowed to assess and certify learning difficulties on children, only when they have the required clinical personnel, including at least a Special Educator, Psychologist, Child and Adolescent Psychiatrist and Speech Pathologist.

#### *2.2.6.4. Educational Support School Networks (ESSN)*

According to GG 5009/2021 no. 134960/ D3, the School Educational Support Networks (SEDNs) have as their main objective to strengthen and promote the cooperation and coordination of school units, with the aim of ensuring equal access for all of students in education and the promotion of their cognitive and psychosocial development.

Specifically, the objectives of the SEDN include:

- The promotion of cooperation, the coordination of the work of the school units and their reinforcement so that they meet the educational needs of their students.
- The development of collaborative initiatives to find solutions that promote the inclusion of students in the school environment and enhance the learning environment.
- The support of the ICs, the parallel support - co-education and the students who receive home teaching, offering special education.

#### *2.2.6.5. Interdisciplinary Support Committee (ISC)*

The ISC operates within the typical or professional school unit and aims to develop practices for interdisciplinary assessment of students, counseling and pedagogical support. Its operation is based on the principles provided by the International Convention on the Rights of the Child (n. 2101/1992, A΄ 192) and the International Convention on the Rights of People with Disabilities.

ISC aims to identify and understand the educational needs and difficulties faced by students. It promotes the adoption of pedagogical, educational and supportive measures for all students, including students with disabilities or special educational needs. In addition, it conducts customized or group activities that enhance students' cognitive and psychosocial skills. It provides pedagogical and counseling psychosocial support to the teachers, as well as to the parents or guardians of the students. Overall, ISC helps to strengthen and develop all members of the school community.

### 2.3. Financing operating needs of schools in Greece

Schools in Greece are financed by the school committees of the municipalities. School committees are legal entities governed by public law, governed by a board of up to fifteen (15) members, in accordance with the provisions of Article 103 (2) of Law 3852/2010 and Article 240 of the Code of Municipalities and Communities. Each school committee is responsible for the schools in its area and manages the financial affairs of the schools. The money is allocated by the state to the municipalities and then the school committees the school manage them and give them to schools. In addition to normal state funding, public Primary and Secondary education units may receive financial support from donations, inheritances, legacies and other contributions from third parties, as well as funding from various sources, such as events in accordance with Article 41 paragraph 4 of Law 1566/1985 (Official Gazette A' 167).

Particularly in the years of the financial crisis, this money was marginally enough for the absolutely necessary materials needed by schools to operate such as electricity, heating, etc. Thus, in many schools in Greece, teachers asked each student to carry an A4 package of papers so that the department could function smoothly. Taking into consideration the situation above, it is realized that the extras (multicolored cardboard, plasticine, educational software, tablets, computers, lego bricks, etc.) that a teacher needs to work are not provided by the state. The few schools that have the basic equipment owe it to charities, donations and receiving inheritances. Pasiardis & Pasiardi (2000) include among the factors for the effectiveness of schools, among others, the logistical infrastructure and financial resources as depending on their adequacy and appropriateness of channeling, financial resources can either support or limit the operation of school unit. They also state that financial resources should be given to schools from a separate budget according to the real needs that they identify and realize better than anyone else. In a comprehensive study conducted by Spyropoulou et al., 2007, which focused on the allocation of financial resources to education, participants, including executives, managers, teachers, and parents, particularly emphasized the insufficiency of resources to address the operational requirements of school units. Specifically, the study highlighted significant issues such as a shortage of space and inadequate funding for the acquisition of new books and laboratory equipment in the education sector.

# CHAPTER 3

## HUMAN SENSES AND THEIR IMPORTANCE IN LEARNING

### 3.1. The sense of the senses

In Greek the verb /αισθάνομαι/ (where the word "αίσθηση" [sense] comes from) has a double meaning. On the one hand, it means to detect something and on the other hand that the person has a sensory impression or a sensation. But what are the senses? A lot of things has been said about the senses, but the "traditional" and commonly accepted senses were classified by Aristotle more than 2000 years ago and these are: vision, taste, hearing, smell and touch. Vision is considered by many people to be the dominant of the senses, however the touch that often goes unnoticed plays a prominent role in the perception that is formed (Lundborg, 2014; Pallasmaa, 2005). Several years later, in 1906, Sherington, divided the senses into three categories depending on the origin of the sensory organs: extracorporeal (intake of stimuli from the external environment), intrinsic (intake of stimuli from the body cavities) and proprioceptive (understanding of body movements through muscles, tendons, joints, etc.) (Papadatos, 2011). According to other researchers, this distinction is limited to extraneous and receptive (Marcus, 2019). In the 21st century, the scientific community accepts the reception of stimuli beyond the five senses classified by Aristotle, such as the sense of pain, temperature, sense of movement, etc. (Kapralos et al., 2017).

According to Pediapolis, (2016), the senses, as physical abilities, provide direct access to the world around them and provide the person with as much information and data as he can receive (as referred to Kapralos et al., 2017). Auer (2008), Pallasmaa (2005, 2006) and Ponty (1962) claim that the use of the five senses connects the individual with the stimulus itself. The transition from the existence of a stimulus to the formation of knowledge is a complex process, which is achieved through the sensory response to the stimulus and its following process by the nervous system (Seitz et al., 2007). In addition, Kapralos et al. (2017), claim there is an interaction both between the different senses and between the way they are processed and the final perception. In support of this view, Woods et al. (2011), in their research found that the presence of sounds affects the perception of food. They characteristically mention, the taste of the background sound interacts with the taste of the food itself. In simple words, the effect of sound on

food liking is correlated with the taste of sound itself (Wood et al., 2011). According to the above, the interaction of the senses determines the way in which the individual structures the environment around him and interacts with it (Kapralos et al., 2017).

### 3.2. Senses and brain

Continuous multisensory stimulation is considered the beginning of gaining experience of the world around us (Sham & Seitz, 2008). Neuroscience provides evidence regarding the correlation between sensory experience and its strong effect on human functionality (Barrett & Barrett, 2010). For example, tactile stimuli through the activation of sensory receptors reach the somatosensory cortex through nerve endings in the spinal cord (Lundborg, 2014). The senses function holistically so that the individual forms an internal image of the external world (Lundborg, 2014). If one sense is impaired or not working properly for some reason, the other senses tend to compensate for this condition by improving their abilities (Lundborg, 2014).

According to Lundborg (2014), the acquisition of special sensitivity in the fingers of the blind who read with Braille takes place as the areas of the brain that normally process visual stimuli, remaining empty, so they are involved in the processing of tactile stimuli. As an example, we can imagine of ourselves trying to cross a very dark room (that is, a condition in which vision plays an extremely limited role). So, in order to be able to cross the room, the other senses are sharpened and paying attention to things considered as details because vision is temporarily ineffective. Thus, we can sense the objects that we touch, paying attention to the differentiation of sounds as we pass by, even in smells. Therefore, the understanding and experience of the world around us is based on the multisensory and multimodal abilities of the brain both in cases of people with and without sensory impairment (Lundborg, 2014).

Each human sensory organ, as a transducer, can be divided into two parts: the receptor and the converter. The receptor is stimulated by the presence of a stimulus to produce a reaction and the converter encodes or reproduces the reaction and produces a signal which is distributed through the nerves (Kroemer et al., 2018) and ends up in the brain which is responsible for this sensation (Marcus, 2019; Larimore, 2017).

The fragmentation of stimuli we receive would have overwhelmed us if there was no some kind of filtration. Thus, only signals of sufficient importance are transmitted to the CNS (Kroemer et al., 2018).

The execution of specific functions is achieved through the brain cells and their individual tasks (Larimore, 2017). First, the brain receives the information and then interprets it based on previous experiences (Larimore, 2017). This interpretation is the perception of the individual (Larimore, 2017). The organs that work as receptors for stimuli are called sensors (Kouvelas, 1985).

### 3.3. Senses

#### 3.3.1. Vision (perception of visual stimuli)

The visible spectrum captured by the human eye is between 400-700 nm. Light radiation of different wavelengths is perceived as chromatic diversity. But how does the process of vision finally happens? The sensory organ of vision is the eye, which consists of a visual and a nervous part (Vander, et al., 2011). When light falls on the retina, then the photoreceptors of the eye are stimulated. The image of the object we see is formed on the macula, an area of the retina with the highest visual acuity (Vander et al., 2011). Then, the optic nerve where it starts from the ganglion cells (Kouvelas, 1985), is stimulated. Through the stimulation of ganglion cells and nerve fibers of the optic nerve, information is transmitted in the form of energy potential impulses (Vander et al., 2011). This information ends up in an area of the brain called the cerebral cortex, stimulating the corresponding cells in the optic cortex.

According to Mpastea (2014), achieving reading requires pumping visual stimuli. In the same vein, Willis (2007), emphasizes that the cooperation of different brain regions through complex neural networks is necessary in order to achieve the reading process. Thus, when one of the areas involved malfunctions, the ability to access, understand and use information from a written text may be affected (Willis, 2007). Minskoff (2005) argues that linking words to pictures or images is a very good educational practice for students. An example of the above good practice is the visualization of words (Mpastea, 2014). As shown in the figure below, the goal is learning that the word “tear” in Greek

language “δάκρυ” is written at the end with /υ/. Thus, the image is connected to the written imprint of the word.

**Figure 1**

*Visualization of orthography*


### 3.3.2. Hearing (sense of perception of sounds)

For the sense of hearing, many processes take place in nanoseconds. This sensation is based on the physics of sound, the physiology of the ear (outter ear, middle ear, inner ear) and the stimulation of the respective brain areas (Vander et al., 2011). But what are all these processes? The sense of hearing occurs when sounds (movements or vibrations) are propagated and converted into electrical stimuli in the ear (Marcus, 2019). The first step for hearing is the entry of the sound wave into the external auditory canal (Vander et al., 2011). More specifically, the acoustic waves are channeled through the auditory canal to the drum. As these waves affect the drum, it vibrates. This pulsating movement, in turn, is transmitted to the three bones of the middle ear and the lymph of the inner ear. The pulsating movements of the lymph are transmitted to the Corti organ, where there are hair cells, which are the receptors of hearing. Through this process, the adherents of the hair cells move, which stimulates the auditory nerve. Then, the stimulation of the auditory nerve, through nerve stimuli reaches the cerebral cortex, where the sensation of hearing is caused (Kouvelas, 1985).

According to Foy and Mann (2006), the acquisition of phonetic knowledge of letters is particularly important as it plays a significant role in reading letters process. Research by Foy and Mann (2006), as well as Neumann (2004) highlights the importance of music and rhyme activities in gaining phonological awareness and phonemic

awareness. Furthermore, (Lundetræ & Thomson, 2017) point out that "rhythm plays an organizational role in the prosody and phonology of language" (p.215) and that difficulties in performing rhythmic activities may coexist with difficulties in reading and writing (Bonacina et al., 2020; Lundetræ & Thomson, 2017). In support of the above, Bastea (2014) argues that the use of metered speech and music is considered more effective when it comes to learning through the auditory pathway. Greater difficulty is observed in learning letters with similar phonological structure, as a result of the difficulty of distinguishing them (Foy & Mann, 2006; Treimer & Kessler, 2003)

### 3.3.3. Olfaction and taste

Olfaction and taste can be considered among the simplest, most archaic and primitive senses, as they are found even in the lower animals. These respond to physical stimuli, meaning that the stimulus must come into contact with the sensory epithelium (The chemical senses, 1970). Olfaction and taste are two of the senses that rely on chemical interactions, which is why they are called "chemical senses" (Elsner, 2015). In the case of these senses, the chemical stimulus must dissolve in the moist environment, be it the air we breathe or the food we eat, in order to cause a reaction in the receptors of the sense, scientifically called chemoreceptors (The chemical senses, 1970; Elsner, 2015).

In humans, these two senses are frequently interconnected, as much of what we consume is often accompanied by a simultaneous olfactory experience, thereby enhancing our sensory perception (The chemical senses, 1970). Also, sometimes when for some reason one sense temporarily weakens, the enjoyment of the sensory experience decreases. This becomes noticeable if we consider how tasteless food seems to us, when our sense of smell is weakened after an acute cold when the nose is all blocked up with snot (The chemical senses, 1970). More specifically, taste is usually considered to be a combination of retro nasal olfaction, taste, along with non-chemical senses, including hearing, sight, and touch (Elsner, 2002).

In these sensory systems, excitatory molecules enter either the oral cavity or the sinuses, where they interact with various receptors. These molecules, either transported from the front of the throat through the nostrils, or from the back of the throat, reach the sinuses and come into contact with the olfactory epithelium. There, the molecules bind to proteins found in the mucous layer, allowing them to reconnect with the olfactory

receptors. Olfactory receptors, which are specialized neurons, descend from the sinus plate and are located in different areas of the epithelium, with different types of receptors, in order to detect different odors (Fleischmann et al. 2008). In the oral cavity, stimuli come into contact with specialized receptors, located mainly on the tongue and called taste buds. It is worth noting that chemical sensations are associated with pleasure, memories with people, places, objects, events, etc.

### 3.3.4. Touch-Sensation of the skin and sensation of the body

As Paterson (2009) pointed out, “touch works not as a single sense but as a broad sensory modality that utilizes the combination of a number of receptors at the cutaneous and subcutaneous levels” (p.130). Accordingly, touch can be recognized as a common basis for the senses, and hence it is problematic to isolate the bodily experience specifically related to touch to the exclusion of other sensory experiences in order to categorize that sensation as 'tactile' (Garrington, 2010).

Until the last phases of the modernist period, the sense of touch was understood as more than just touch. It was about combining the aesthetics of touch and the contact of the skin with the human body, including the perception of movement from the whole body. Therefore, the modern understanding of the triple sense of touch (including touch, kinaesthesia, and proprioception) begins to be articulated mainly during the first decades of the 20th century. This fact is primarily explained by the need to depict the new experiences of the human body during this time period (Garrington, 2010).

In the skin there are receptors for 4 senses: touch, pressure, cold, hot and pain (Kouvelas, 1985). The sensation of the body includes the sensations of the skin and also includes the sensation of the skin, bones, joints and tendons, having a variety of sensors (Vander et al., 2011). Regarding the skin, these receptors are nerve endings, which through the stimulus transmit to the spinal cord and from there to the cerebral cortex where the corresponding sensation is created (Kouvelas, 1985). Regarding the body, the afferent nerve fibers from the body sensors after their entry into the central nervous system, are connected with neurons which terminate in the somatosensory cortex (Vander et al., 2011).

### 3.3.5. Senses in learning

The world is perceived through the senses. In earlier eras, when writing had not been yet invented and learning was done mainly by oral repetition, perhaps hearing was the more important sense in learning (Classen, 1999). In modern times, the dominance of sight tends to prevail. However, as Classen (1999) states, man does not only have eyes, but is a creature that perceives the world through all his senses.

The use of the senses through the sense organs (eyes, ears, nose, tongue and skin) in learning is crucial. Through these children from the time they are born try to learn the environment around them (Sert & Panieri, 2023). The world is surrounded by various objects that stimulate the human senses in a variety of ways. Thus, through the senses, connections are created with the external world, in order to perceive the environment and interact with it (Ranu, 2022). Therefore, it is beneficial for children to integrate all their senses during the learning process, as they learn best by actively participating in the action. To make this more understandable, we can think of the example of the bicycle. If someone is asked to theoretically describe how to ride a bike, they might make a mistake, skip a detail, etc. However, riding the bike itself is an experience that is difficult to forget as body sensations and movements are embedded in it (Sert & Panieri, 2023).

The brain's ability to store information is through the use of its different sensory areas (Mpastea, 2014) and they are stored in our sensory memory. This is the first step of short-term memory formation (Tang, 2017). After processing information in short-term memory, long-term memory is created, a multidimensional structure that takes on the role of storage for information that needs to be retained and communicated with the outside world for long periods of time. The complexity of this memory occurs through a sequential set of stages, which consist of encoding, storing, and retrieving the information. Each of these stages is connected to different neural networks of the brain, offering a complementary part of the memory process.

For example, sensory memory, which is involved in encoding, focuses on three different information encoding systems: the visual, auditory, and semantic systems. At the same time, the encoding of information develops through the interaction of the attention and memory networks. This collaboration highlights the complexity of the human memory

process, which can differ between different individuals and create their own unique way of learning and retrieving information (Sert & Panieri, 2023).

According to Laird's Sensory Theory (1985), effective learning takes place only through stimulation of the senses. It also states that the more senses involved in the learning process, the greater the chance that learning will take place.

Studies of learning have focused on learning that consists of only one sensory modality. However, as has been reported our experience of the world involves continuous stimulation of many sensors at the same time (Shams & Seitz, 2008). Thus, during the learning process to create more memory "stores", the goal is to activate as many brain areas as possible (Shams & Seitz, 2008). It is worth noting that Katai (2011) and Sheyesteh et al. (2019) state that a combination of senses connects people to the outside world and gives them the opportunity for inclusive learning, which is what 21st century education is all about.

# CHAPTER 4

## MEMORY AND LEARNING

### 4.1. Definition of memory

What is memory? A generally accepted definition is that memory is a biological activity in which the individual is able to store, retain and retrieve information (Lexcellent, 2019). In Greek, the term memory is rendered as μνήμη /mneme/. In ancient Greece the importance of memory was prominent and that is the reason it was believed that there is a goddess of memory (μνήμης) /mnemes/ named Μνημοσύνη /Mnemosyne/, who was Titaness, daughter of Uranus and Gaia. Mnemosyne was also mother of the 9 Muses.

| | |
|---|---|
| *Μνημοσύνης δ' ἐξαῦτις ἐράσσατο καλλικόμοιο,* | *Then he fell in love with the Mnemosyne who had beautiful hair,* |
| *ἐξ ἧς οἱ Μοῦσαι χρυσάμπυκες ἐξεγένοντο* | *from whom the nine golden-crowned Muses were born,* |
| *ἐννέα,* | *who like the festivities and the joy of singing.* |
| *τῇσιν ἄδον θαλίαι καὶ τέρψις ἀοιδῆς.* | |
| *Ησίοδος, Θεογονία 915-7* | *Hesiod, Theogony 915-7* |

In fact, in ancient Greek texts, is imprinted clearly the value of memory and those who have and practice it. One of them is listed below:

> *Πάντων δὲ μάλιστα τὴν μνήμην τῶν παίδων ἀσκεῖν καὶ συνεθίζειν· αὕτη γὰρ ὥσπερ τῆς παιδείας ἐστὶ ταμιεῖον, καὶ διὰ τοῦτο μητέρα τῶν Μουσῶν ἐμυθολόγησαν εἶναι τὴν Μνημοσύνην, αἰνιττόμενοι καὶ παραδηλοῦντες ὅτι οὕτως οὐδὲν γεννᾶν καὶ τρέφειν ὡς ἡ μνήμη πέφυκε. καὶ τοίνυν ταύτην κατ' ἀμφότερ' ἐστὶν ἀσκητέον, εἴτ' ἐκ φύσεως μνήμονες εἶεν οἱ παῖδες, εἴτε καὶ τοὐναντίον ἐπιλήσμονες. τὴν γὰρ πλεονεξίαν τῆς φύσεως ἐπιρρώσομεν, τὴν δ' ἔλλειψιν ἀναπληρώσομεν· καὶ οἱ μὲν τῶν ἄλλων ἔσονται βελτίους, οἱ δ' ἑαυτῶν. τὸ γὰρ Ἡσιόδειον καλῶς εἴρηται:*
>
> *εἰ γάρ κεν καὶ σμικρὸν ἐπὶ σμικρῷ καταθεῖο*
>
> *καὶ θαμὰ τοῦτ' ἔρδοις, τάχα κεν μέγα καὶ τὸ γένοιτο.*
>
> *Πλούταρχος, Ηθικά, 1*

Translation rendering

> *Above all, the memory of children should be trained and exercised; for this is, as it were, a storehouse of learning; and for this reason, the mythologists created the mother of the Muses, Mnemosyne, thus suggesting through an allegory, that there is nothing else in the world like memory for creating and fostering. Therefore, it must be practiced*

*in both cases, whether children are naturally gifted with a strong memory or not. Because so, when nature provides it generously, we strengthen it, while when it is in short supply, we replace it. And the first case of children may be superior to the others, however the second case of children will be superior to its previous self. The saying of Hesiod is admirably put:*

*Even if you add little by little*

*And you do it often, the set will soon be great.*

*Plutarch, Ethics, 1*

### 4.2. Amalgam of memory and learning

Memory is a higher human ability that is considered highly linked to learning, this is because learning is the process of acquiring new knowledge, while memory is the process of maintaining and retrieving them (Lexcellent, 2019; Kandel et al., 2014). There is often a misunderstanding about learning considering it a single process. However, many neurobiological and different types of mechanisms are involved and used for storing different types of information between working and long-term memory (Polk, 2018). Human knowledge and skills are mostly not innate but acquired through learning. So, for instance, gradually and over time we learn to crawl, to stand, to walk, to speak, to understand the mother tongue, to read and write, etc. The knowledge and even the formation of ourselves in some cases, is determined by what we have learned, by what we have managed to keep in our memory and by what we have forgotten (Lexcellent, 2019; Polk, 2018; Kandel, 2008; Kandel et al., 2014).

The types of learning and memory are varied and distinct. For instance, other mechanisms are activated when someone learns to ride a bike and others when someone needs to memorize something. Thus, a distinction is often made between declarative (learning what) and procedural (learning how) memory. From a medical point of view, the hippocampus plays a significant role in learning and memory, especially in declarative learning and memory, where there are correlations between different stimuli (Krupa, 2003).

It is a fact that, activation of memory mechanisms through environmental stimuli and mental processes affects learning. As mentioned above, the achievement of learning is a consequence of the reception and retention of incoming information. But what is the path that leads to memory? Initially, external/environmental stimuli activate the sensory receptors of neurons. Subsequently, they end up in the brain, cortex and cortical

formations, by stimulating the corresponding nerve pathway. The term "memory" refers to the mental ability that enables a person to retain a multitude of information and be able to retrieve it (Kandel, 2008; Kandel et al., 2014; Papadatos, 2010, 2011).

### 4.3. Short-term and long-term memory

According to existing scientific data, memory is divided into individual systems and processes, but there is no absolute convergence of views on which they are. Mnemonic species can be classified based on consciousness, associativity, and behavioral function. However, the predominant and commonly accepted separation concerns time and includes two major categories of memory: short-term and long-term memory (Baddeley & Patterson, 1971). There is often a misuse of the term "short-term memory" and it should be noted that its proper use should be limited to the small amount of information that is held for a few seconds or minutes. Long-term memory refers to the retention of information and fragmentary information of short-term memory for longer periods of time (Howard, 2013). In order to better understanding of the meaning of short-term memory we could imagine a child playing with sand on the beach. Imagine a light breezy day, a child constructing a sand tower on the beach one step before the point where the wave breaks on. For a specific and limited period of time, the child may be able to build his tower, rarely he may manage to dig a protective groove from the waves, even more rarely he may be able to build a second floor. However, no matter how many precautions are taken, the tower can never stay in place for long, because there will be always a wave come to tear it down.

The term working memory in mammals, including humans, means the form of short-term memory that contains process and storage functions. In working memory (WM), information and data are not simply stored, but kept in a processing state, for instance by recalling data, the individual is able to compare, monitor and correlate them. However, as WM falls into the broader category of short-term memory, the information received is retained for a few seconds. With WM, the recently received information is updated and the individual's behavior is shaped accordingly (Chudasama, 2015).

Baddeley (1979), noted that WM is a complex operating system, which is responsible for cognitive activities. Working memory’s fragmentation into a central executive, phonological loop, and visuo-spatial sketch pad was proposed by Baddeley and Hitch

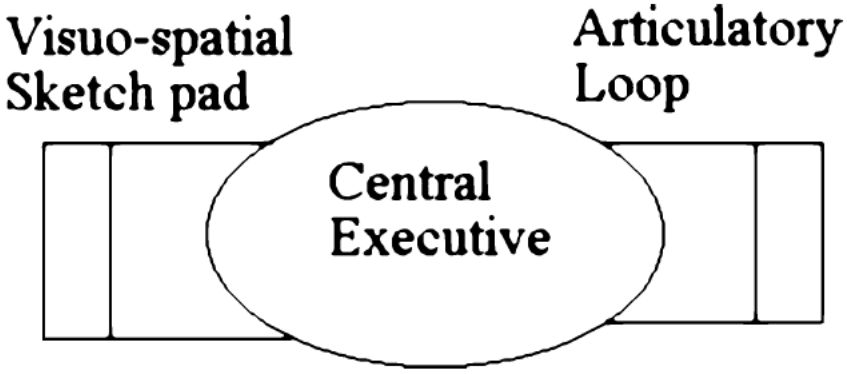
in 1974 (Figure 2). Baddeley & Hitch (1974), argue that the first system, as its name implies, plays a crucial role of coordinating, managing the receives information and sending some of it to the long-term memory, while at the same time making correlations with previous information which are stored in the long-term memory. More specifically, the basic functions of the central executive component are:

- the capacity to coordinate information coming from slave systems.
- the ability to switch plans or information retrieval strategies.
- the ability to focus on a stimulus.
- the ability to retain and handle information from long-term memory. (Baddeley, 1986).

The other two systems have a supporting role and function, as auxiliary short-term repositories (slave systems).

**Figure 1**

*Baddeley & Hitch's Working Memory Model*




*Note*: Baddeley & Hitch (1974)

The phonological loop directs the information of sensory memory, which is connected to the verbal and auditory memory. In addition, this system is associated with processing speech input. The visual-spatial information is stored in the visuospatial system and is related to the processing of the visuospatial stimulus reception.

The first of the two auxiliary systems directs the information of sensory memory, which is connected to verbal and auditory memory. The second auxiliary system, is the repository of the visual-spatial information. Although these three systems are presented as distinct, Baddeley and Hitch (1974), highlight that they are interconnected and in constant interaction with each other. Sixteen years later, Baddeley, also added a fourth

WM subsystem, episode memory regulator (buffer), which is capable of holding multidimensional episodes that could combine information of any sensory kind from slave systems (Baddeley, 2000).

In 2010, Baddeley made another modification to WM's existing split system, adding to the phonological loop, the phonological short-term store, and a rehearsal process phonological system. The first includes a storage space for traces of information that will instantly fade in a matter of seconds (within about 1.5-2 seconds), and the second is a phonological system for repeating these traces at verbal input (Gathercole & Baddeley, 1993). Thus, mnemonic traces can renew their presence in the phonological repository through oral or silent repetition, a process that can extend the life of the mnemonic trace (Baddeley, 2010).

Besides Baddeley's model which is widely known, other researchers have tried to construct a model for WM. In the model of Ericsson and Kintsch (1995), the central role is played by long-term working memory, which updates recently stored information, having access to previous ones. Thus, it acts as a data recovery lever. The two mechanisms responsible for this process are timeliness and processing.

Summarizing, memory is undoubtedly closely linked to learning. Working memory, as a part of short-term memory, is a cornerstone of the development of learning skills such as listening, speaking, reading and writing (Mpastea, 2014). Memorizing words and phrases, in terms of time, sequence and syntactic structure, takes place through auditory memory. The combination of audio and visual memory enables the individual to match the depiction of written language code with the corresponding sounds. Learning to read and write correctly is linked to visual memory. The ability to form letters is due to the memory of the movements. The comprehension of a text is closely related to the retention of information and data (Mpastea, 2014).

Long-term memory is the memory in which a lot of scattered information is stored for long periods of time. According to Papadatos (2011), it is considered a second level of storage which arises through structural changes and neural synapses of the brain. Long-term memory is inextricably linked to short-term memory as the storage and retrieval of information in the one, is an aftereffect of the frequency of repetitions on the other.

### 4.4. Mnemonic techniques

What do we mean by mnemonic techniques? Mnemonic techniques are inventions and semantic correlations, helpers of the imagination. They can often seem irrational and arbitrary; however, they help organizing and codifing the information needed with the ultimate goal of better understanding and faster retrieval of information. Commonly used mnemonic techniques are: acronyms, acrostics, rhymes, conceptual categorization, keywords, Yodai (mental system based on mental images, poems and songs), etc (Koliadis, 2018; Sacks, 2011; Koliadis, 2007; Bosniadou, 2008; Higbee, 1987).

### 4.5. Interconnection of memory and reading ability

In recent decades there has been intense scientific interest regarding the involvement of working memory in the active processing of current information. Therefore, it has been argued that the verbal processing systems of working memory are inextricably linked to learning the beginnings of academic skills, namely, reading and writing (De Jong, 1998; Gathercole & Baddeley, 1993). Furthermore, some researchers have argued that working memory and various developmental difficulties have a causal relationship (Baddeley, 1986; Gathercole & Baddeley, 1993).

According to Ricketts (2011), there are two different views regarding the role of verbal working memory and poor reading comprehension. Cain (2006), relates verbal working memory deficits to poor reading comprehension, as he believes that higher language skills involved in inference monitoring are undermined. Nation et al. (1999) associated poor oral language with problems in verbal working memory and reading comprehension. More recent research by Wong et al. (2017) converges more with the view of Cain (2006) than Nation et. al (1999) showing that there is a strong correlation between working memory and comprehension and inference. However, it is pointed out that this correlation seems to concern mainly children with a specific language disorder.

With her research, Maridaki-Kassotaki (2002), claims that the strengthening of phonological working memory bears fruits in early reading development. This can be achieved through the repetition of pseudowords during infancy. In fact, he states that with this process the reading skill improves both in Greek and in English, something

that “raises the question of the universality of the cognitive mechanisms operating” (Maridaki-Kassotaki, 2002, p.69).

# CHAPTER 5

## MULTISENSORY APPROACH

### 5.1. Clarification of the term multisensory

Multisensory literally means more than one sense. In other words, using more than one of the five senses at the same time. We learn through the information received through our senses, merely, through sight, hearing, smell, taste and touch. The multisensory learning approach integrates more than one sense during the teaching process, aiming to enhance the students' learning process. By adopting this approach, involving multiple senses in the learning process leads to enhanced learning capabilities among students and heightened efficacy in retaining acquired knowledge. However, it is noted that in reality, the majority of teaching in schools is still mainly based on the use of visual or auditory methods (Syahputri, 2019).

As previously noted, the multisensory teaching approach refers to an educational strategy in which students engage all their human sensory capabilities - including hearing, smell, touch, sight, sensation, and taste - within educational settings (Suryaratri et al., 2019). These interactive methods embody a natural approach, mirroring the inherent learning process observed in infants and young children as they explore the world through tactile experiences and taste exploration (Sarudin et al., 2019). The educational multisensory approach strives to enhance children's learning by engaging multiple senses simultaneously. This approach effectively tackles potential challenges arising from processing information through a single sense (like hearing or vision). By enabling the concurrent engagement of various senses (such as touch, movement, hearing, and vision), it provides a comprehensive solution within the learning process. Through this approach, children can cultivate diverse types of memories—tactile, visual, auditory, or kinesthetic. This empowers each child to harness their unique strengths for optimal learning outcomes (Loizou, 2016).

The names of neuropsychiatrist Orton and psychologist-pedagogue Gillingham have become synonymous with the multisensory teaching approach. Back in 1925, Samuel T. Orton postulated that while dyslexia's origin lies in biology, its remedy is fundamentally educational in nature (Henry, 1998). Consequently, building upon this hypothesis, it was believed that children afflicted with dyslexia could derive substantial

benefits from personalized remedial guidance, specifically focusing on systematic phonics-centered reading education (Henry, 1998). The groundbreaking Orton-Gillingham (OG) method, initially conceived by Orton and subsequently developed into a comprehensive curriculum by Anna Gillingham and Bessie Stillman (Gillingham & Stillman, 1956), has laid the foundation for numerous multisensory programs since its inception (Ring et al., 2017; Ritchey & Goeke, 2006). The OG approach entails a structured, sequential, and multisensory framework, emphasizing synthesis and phonics-based techniques for effective reading instruction (Ritchey & Goeke, 2006; Uhry & Clark, 2005). The Orton-Gillingham method activates three sensory inputs, namely visual, auditory and kinesthetic, which is known by the acronym VAK) (Hardiana & Suyata, 2018). Other multisensory methods also utilize the tactile factor (Chither, 2020), while others consider the kinesthetic factor to include the tactile as well.

### 5.2. The Significance of the Multisensory Approach in Education

According to Willis (2006), neuroscience provides evidence supporting the effectiveness of multisensory teaching in enhancing learning outcomes. This phenomenon is attributed to the creation of a greater number of memory “pathways”. These “pathways” can be likened to “branching dendrites” - tiny extensions connecting neuron cells, facilitating the transmission of nerve signals crucial for communication and the nervous system's functionality. Furthermore, these “pathways” develop in distinct regions of the brain as we acquire and utilize new information. These points of contact and “pathways” of multisensory interactions cover a wide variety of domains. They consist of various areas, from the brainstem to the primary sensory areas of the cortex (Driver & Noesselt, 2008; Ghazanfar & Schroeder, 2006), and extend to areas that go beyond simple sensory processing, such as association areas and other areas of cortex (Ghazanfar & Schroeder, 2006). These include the feedback paths (Foxe & Schroeder, 2005) and feedback paths (Falchier et al., 2002; Schroeder & Foxe, 2002). When multiple senses are engaged during teaching, these “pathways” emerge not solely within separate brain regions (like the visual or auditory areas), but also interconnect among these regions. This facilitates the simultaneous retrieval and utilization of information from these diverse areas regarding a particular subject. Willis (2006)

asserts that this interlinking of data amplifies comprehension of the learned material, transcending mere rote memorization.

More specifically neuroscience, using functional neuroimaging methods (providing images of brain activity during the performance of an activity, such as phonological processing for example), has verified that the areas of the brain (parietal and fusiform cortex) responsible for decoding of letters (orthography) to language sounds (phonology) in children with reading difficulties, show parallel atypical activation patterns (Hoeft et al., 2007; Shaywitz & Shaywitz, 2004, 2007; Shaywitz et al., 2004). These children might exhibit deficiencies in one or more of the essential sensory methods required for reading and spelling: visual perception (through visual adaptation), auditory reception (sound comprehension), verbal expression, and the perception of movement (linked to speech) as well as the execution of hand movements and the sensation of such movements (connected with writing) (Walker, 2000). The effectiveness of multisensory approaches is rooted in their ability to enable children to cultivate and employ all four sensory methods concurrently (Walker, 2000). The adoption of multisensory techniques aligns with the brain's natural functioning, which involves processing sensory inputs from multiple senses. This is due to the brain's fundamental role in integrating and processing information originating from diverse sensory channels (Farrell & Sherman, 2011).

Most educators and instructors acknowledge that teaching methods encompass elements such as maintaining eye contact, replicating actions, modulating tone, employing gestures, and utilizing bodily movements. These elements are not only ingrained within the instructional process but also serve as potent instruments for shaping the tone of lessons, conveying nonverbal communication between educators and learners, and adeptly overseeing the social and educational dynamics within the classroom. Thus, viewing educational practice from this angle underscores its inherent multisensory nature (Todd et al., 2021).

Furthermore, employing physical and sensory manifestations serves as a highly effective means to assess students' comprehension and engagement. A mere hushed whisper or a subtle sigh can swiftly convey to the instructor the level of student interest or potential disengagement. Likewise, an enigmatic facial expression signals the necessity for revisiting or reconsidering certain aspects (Todd et al., 2021).

Comprehending the realm of educational practice without the fusion of sensory and physical encounters appears to be an arduous if not insurmountable task. The traditional visual and auditory dynamics of a hushed and attentive classroom have encountered dynamic auditory environments in both the historical and contemporary context. The intricate interplay between sound and silence, movement and stillness, visibility and invisibility has played a pivotal role in shaping the sensory landscape of scholastic education (Landahl, 2019).

The human brain operates and evolves at its best within an environment that engages multiple senses simultaneously. The approach of multisensory education involves incorporating a methodology in which educators fuse interactions and academic content within personalized lessons. This approach guarantees the cultivation of students' capacities and readies them for efficient learning, while considering the numerous interactions that transpire within the human brain (Gharaibeh & Dukmak, 2022).

Numerous reports of multisensory interactions in diverse perceptual tasks and contexts suggest that these interactive elements are prevalent rather than exceptional in the processing of sensory information by the human brain (Shimojo & Shams, 2001). Moreover, a rapidly expanding literature in the fields of neuroanatomy, electrophysiology, and neuroimaging indicates that multisensory interactions have the potential to occur during the information processing (Ghazanfar & Schroeder, 2006; Driver & Noesselt, 2008).

Research conducted on both animals and humans in the early stages of life reveals that alterations in the environment or disturbances in sensory processing can induce a significant level of neural plasticity across different senses. Neural plasticity denotes the nervous system's capacity to modify its structure and adjust in response to experiences and training. This characteristic enables networks of neural cells to engage, reinforce, or modify themselves following the acquisition of fresh information or skills. Neural plasticity plays a pivotal role in learning, memory, and the ability to adapt to shifting environmental circumstances.

### 5.3. The Significance of Multisensory Education for Students with Learning Disabilities

The fundamental language skills encompass four key components: listening, speaking, reading, and writing. Among these, the capacity for listening tends to be universally more advanced compared to that of speaking. It's noteworthy that speaking and listening skills share a close interrelation, with their symbiotic interaction being a daily occurrence (Syahputri, 2019).

The prevalent mode of learning for the majority of individuals involves a combination of visual and hands-on experiences. For instance, consider the scenario where a teacher aims to introduce the letter "a" to students. Instead of solely displaying it on the board, an effective approach involves having students write it in their notebooks. This strategy not only engages their visual sense but also encourages active participation. This principle is particularly significant for young children encountering concepts like shapes. Simply conveying that a circular shape fits into a corresponding hole isn't as impactful as providing them with a tangible toy and allowing them to explore firsthand. These instances underscore the significance of experiential learning in a child's educational journey (Syahputri, 2019).

Moreover, the research conducted by Bahrick and Lickliter (2000) reinforces this notion. Their findings emphasize that multisensory stimulation offers a redundancy of stimuli crucial for extracting information that might not be attainable through purely non sensory stimuli during early infancy. This highlights the role of varied sensory experiences in enhancing early cognitive development.

The multisensory approach to education has demonstrated its effectiveness across all students, but its significance is particularly pronounced for children facing learning difficulties. These difficulties give rise to varying degrees of deficiencies in the brain's processing of information gathered from sensory inputs. Moreover, it is imperative to recognize that students' comprehension and retention of information are greatly enhanced when instruction aligns with their unique learning styles. These individual learning styles manifest through the way students engage with sensory inputs, whether they lean towards visual, auditory, kinesthetic, or other modes during the teaching and learning process. Educators who take into consideration the personalized learning style of each student open up greater avenues for effectively engaging with these students

(Syahputri, 2019). Uncovering the distinct learning style of each student emerges as a solution catering to a multitude of learning needs.

To enhance a teacher's effectiveness across all student populations, a diverse array of techniques must be mastered and employed. Among these approaches, the multisensory method stands out, incorporating multiple senses in the instructional process to elevate students' learning journeys. Embracing a multisensory approach fosters heightened learning capacities and bolsters the retention of acquired knowledge. Failing to tailor educational experiences to children's individual needs can lead to disengagement and ennui. Recognizing that each child possesses distinct learning styles, educators should possess the adaptability to experiment with various pedagogical strategies, ensuring every child's capacity to learn is realized. A lack of pedagogical flexibility on the teacher's part could potentially hinder the attainment of desired learning outcomes.

Multisensory teaching techniques and strategies enhance the learning experience by involving students across various dimensions, prompting them to employ some or all of their senses in order to:

- collect information for a task.
- connect the information to ideas they already know and understand.
- understand the logic involved in problem solving.
- learn problem solving tasks.
- utilize non-verbal reasoning skills.
- understand the relationships between concepts.
- store information and store it for later recall. (Syahputri, 2019).

From the 1920s onwards, researchers and therapists began to promote the idea that students with dyslexia needed not only clear and systematic training in graphophonemic mappings but also training that took into account a multisensory approach, making connections between in the visual/auditory and kinesthetic/tactile domains (Fernald & Keller, 1921; Orton, 1937).

Multisensory instructional methodologies for reading are grounded in the Dual Coding Theory (Clark & Paivio, 1991; Sadoski & Paivio, 2001, 2013). According to this theory, there are two distinct, yet interconnected coding systems employed for encoding information into memory. The first system is verbal, converting experiences and memories into linguistic symbols and verbal elements. The second system is non-verbal

or virtual, representing experiences through mental imagery or emotions. Incorporating multisensory techniques into reading instruction entails activating both of these systems concurrently, effectively enhancing students' learning processes. Retrieving a mental image from memory bolsters the recall of associated verbal information, when present, and vice versa. This theory posits that when information resides in both verbal and visual memory, its successful retrieval during learning or recall is heightened. Precisely, this theory advocates for the existence of two distinct “pathways” for information recall. Successfully implementing this approach enhances educational practices, as students engage in learning activities that tap into diverse sensory domains. The outcome is an amplified efficiency in learning and information retention (Block et al., 2008).

It's widely recognized that the sense of hearing is employed to perceive the teacher's spoken words. Visual perception can be impacted by challenges in tracking or visual processing. Additionally, students might encounter weaknesses in auditory processing. Addressing these challenges necessitates the engagement of multiple senses, with particular emphasis on touch (tactile) and movement (kinesthetic) experiences. This approach aids in fostering the development of tactile and motor memories, complementing auditory and visual ones. Individuals with learning disabilities often face difficulties in various domains, such as reading, spelling, writing, mathematics, listening comprehension, and expressive language. The implementation of multisensory techniques empowers students to leverage their individual strengths, thereby facilitating their learning journey.

Furthermore, the application of multisensory learning holds exceptional promise for students who grapple with learning disabilities and cognitive constraints, possibly encountering challenges across various educational domains. To illustrate, a student with distinct abilities might confront obstacles in processing visual input, impeding the acquisition and retention of knowledge solely through reading and visual cues. However, by incorporating alternative senses like touch or hearing, the student can forge a more robust and meaningful connection with the subject matter.

Mihandost et al. (2012) believe that there is no easy, quick, or single intervention that can alleviate the academic skills difficulties that typically result from dyslexia. However, these difficulties with systematic and intensive intervention - at least two hours per week in a dyadic context - can be reduced (Mihandoost et al., 2012). On the

other hand, the International Dyslexia Association (IDA) recommends that teaching for students with dyslexia be “practical” and “multimodal”, as well as explicit, systematic, summative, engaging, diagnostic and responsive (IDA, 2023). Recent legislative mandates and policy bulletins also promote the use of multisensory instruction. Stevens et al. (2021) reported that at least 20 states have passed legislation specifically requiring instruction for students with multisensory dyslexia. Parents of students with dyslexia often request multisensory reading interventions (Rose & Zirkel, 2007).

In a similar vein, Stephens (2018) underscores the significance of employing a multisensory approach encompassing oral storytelling, singing, rhyming, and reading aloud to lay a foundational framework for nurturing language development in children. Moreover, scientific observations underscore that enhanced learning outcomes materialize when individuals engage multiple senses, particularly in the context of advancing language acquisition (Korkmaz & Karatepe, 2018; Rao, 2018). Therefore, it becomes evident that since the benefits extend to all learners, equitably affording individuals with learning disabilities the same opportunities for learning multisensory approach is imperative. Embracing a multisensory methodology emerges as yet another avenue to cater to the distinct abilities and learning styles of students.

In line with the aforementioned, a plethora of studies corroborate the efficacy of the multisensory approach in yielding remarkable outcomes for students both with and without dyslexia, spanning the realms of decoding (Joshi et al., 2002; Oakland et al., 1998; Uhry & Sheperd, 1993) as well as writing (Post & Carreker, 2002; Uhry & Sheperd, 1993). Additionally, Mpastea (2014), in her study involving a cohort of 48 dyslexic students, discerned highly positive results arising from the implementation of the multisensory teaching methodology, spanning the domains of reading and writing within the entire sample.

### 5.4. Multisensory Environments (MSEs)

Originating in the 1970s, Multisensory Environments (MSEs) emerged as an inclusive and non-directive recreational pursuit, particularly tailored for individuals with developmental disabilities, pioneered by two Dutch therapists (Hogg et al., 2001). These environments were conceived as dedicated spaces, allowing users to exert agency over their sensory encounters. Within these spaces, individuals engage with purpose-

built equipment meticulously designed to facilitate sensory interactions (Cameron et al., 2019). Of paramount significance, these users possess the ability to govern their sensory inputs, thereby crafting an ambiance that either invigorates or soothes their senses based on their personal inclinations (Scanlan & Novak 2015). Typically, these spaces are characterized by subdued illumination, housing an array of components including mirror balls, bubble tubes, fiber optic sprays, projectors featuring dynamic and colorful imagery, aromatic oils, tranquilizing melodies, an assortment of inviting seating arrangements, and carpeted floors (Chan et al., 2010; Koller et al., 2018; Lancioni et al., 2002).

They are embraced on an international scale (Bozic, 1997; Chan & Chien, 2017; Cuvo et al., 2001) and find application in specialized educational institutions (Unwin et al., 2022), progressively gaining traction (Carter & Stephenson, 2010). Their adoption has spread significantly within schools catering to students with profound disabilities across various countries, including the United States, United Kingdom, and Australia (Carter & Stephenson 2011; Botts et al., 2008). An enlightening statistic reveals that over half of the schools in New South Wales, Australia, which cater to students with severe disabilities and participated in a recent survey, affirmed the presence of MSEs (Carter & Stephenson, 2010).

Advocates of MSEs assert that by employing gentle sensory stimuli that cultivate a serene and captivating ambiance, they foster heightened motivation for learning, with the residual effects of sensory engagement enduring long after utilization (Botts et al., 2008). Empirical research underscores the capacity of MSEs to enhance the quality of life and offer secure and enjoyable leisure experiences for individuals grappling with autism or dementia (Cameron et al., 2019), developmental disorders, and learning disabilities (The P-Scales, 2005). Nevertheless, the evidence substantiating claims of favorable outcomes resulting from their implementation, particularly within educational contexts, remains limited (Botts et al., 2008; Hogg et al., 2001; Lai 2003; Lancioni et al., 2002). Furthermore, the landscape lacks comprehensive insight into how educators integrate these environments and select from the array of available multisensory methodologies (Stephenson & Carter, 2011).

Experts have noted that the realm of information and communication technology (ICT) holds promise for reshaping the framework, dissemination, and execution of

personalized interactive learning encounters for students facing learning disabilities, particularly those grappling with profound learning obstacles and diverse learning challenges (Lancioni et al., 2001; Standen et al., 2001). A proposal by (Williams et al., 2007) underscores the potential for crafting digital applications capable of tailoring themselves to each user's unique attributes and inclinations.

Unfortunately, in most schools, teaching is mainly based on visual or auditory media. In Greece, general education classes consist of an average of 20 students with a maximum of 25, so the above condition cannot be satisfied within this context. But the role of the integration department, demonstrated as highly significant, as there is the possibility of one-to-one teaching and it could potentially become a multi-sensory environment. The use of multisensory approaches (Flink, 2014; Foss, 2016) as well as the use of multisensory learning environments may reduce the learning discrepancy between students with or without SLD.

# CHAPTER 6

## INTERVENTIONS-STRATEGIES IN DYSLEXIA

### 6.1. The first multisensory method - The Orton-Gillingham method

As previously mentioned, the Orton-Gillingham method is considered to be the cornerstone and ancestor of all subsequent multisensory methods and interventions, which is a flexible didactic approach (Mpastea, 2014). Although both collaborators advocated teaching through the use of visual, auditory and kinesthetic stimuli, a few years later they separated their paths and differentiated the focus of their methodology.

On the one hand, Orton's approach focused on the pronunciation of the sound of letters when writing the word (Sheffield, 1991), while on the other hand Gillingham focused on the pronunciation of the letter when writing the word (Laney, 2011; Sheffield, 1991). Students are first taught the sounds of letters, listen to the sounds of letters, pronounce the sounds of letters and finally, write the sounds of letters. The above sequence is not strictly absolute in order as it can be differentiated by focusing more on correct writing and reading (Laney, 2011; Rose & Zirkel, 2007).

The significant difference of the O-G method from other reading methods lies in the object of teaching and the way of teaching (Mihandoost & Elias, 2011).

The teaching subjects concern:

- phonological awareness.
- the phonetic mapping.
- the six types of syllable construction in English.
- rules.
- roots, suffixes and morphology.

The way of teaching includes:

- simultaneous multisensory instructions.
- systematic teaching with many practice opportunities.
- immediate, clear and explicit instructions.
- systematicity and aggregation.
- synthetic and analytical.
- diagnostic.

More analytically, it is characterized as a multisensory teaching method, as based on the optimal learning outcome, it simultaneously involves multiple sensory pathways, ie, the student receives at the same time, audiovisual and kinesthetic experiences (Ritchey & Goeke, 2006).

It is an individualized teaching method, which adapts to the specific learning needs of each child, recognizing that despite the fact that students with dyslexia show homogeneity in several of their learning characteristics, however each student as a different entity, conquers at a different pace each didactic goal (Mpastea, 2014).

Still, this method is based on teaching and understanding the structure of language through direct examples and not just through memorizing grammatical rules. A key axis is the student to understand what, why and how he should learn something, without trying to guess the rules that govern the language (Ritchey & Goeke, 2006). Furthermore, the student must understand the graphophonemic correspondence of the oral with the written code, as well as the fragmentation of the word into phonemes and its reconstruction by them (Mpastea, 2014).

The Orton-Gillingham method is structured, with objectives of graded difficulty that aims at the automation of knowledge. It is ensured that before moving on to the next teaching goal, the previous one has been completely mastered. The didactic goals and concepts are interconnected, so that each new knowledge is added and expands the already existing ones (Mpastea, 2014).

Teachers who choose to teach with this method, start by connecting the phoneme with its written representation, and then, gradually make generalizations that can be understood by the student. Thus, the student begins to read and write the simplest forms of the language independently, while gradually and after being mastered, these phonemes become syllables and then words. As the teaching goes by, the lesson includes more complex structural elements of language. At a more advanced stage, the teacher teaches higher language concepts such as vocabulary, text comprehension strategies, speech synthesis, etc. It is important that in each step the previous ones are repeated aiming the automation of knowledge and expanding it cumulatively (Ritchey & Goeke, 2006).

Another important element of this method is that it has a dual role: teaching and diagnosis. This is because the teaching process, the teacher is trying to ensure that the

student not only recognizes but also understands what he is being taught. The systematic monitoring of the progress and the difficulties encountered by the student that is visible through his answers, contributes decisively to the planning and implementation of the next lesson (Mpastea, 2014).

In combination, Orton-Gillingham method has been used extensively in the field of education and other OG-based programs have been created, based on the basic principles governing the multisensory O-G method.

## 6.2. Multisensory programs and interventions grounded in the Orton-Gillingham Method

Programs based on the Orton-Gillingham (OG) approach have been developed based on the principles that developed the OG method, which focuses on teaching reading, writing and spelling through a multi-sensory, structured and individual approach. These programs often use techniques that enhance phonetic perception, phonological awareness, reading phonetic rules, and spelling development.

Common points of OG-based programs:

- **Multisensory Teaching**: OG-based programs focus on using multiple sensory channels (sounds, sight, touch) to enhance learning.
- **Structured Approach**: These programs follow structured and systematic teaching methods, often with repeated steps and phases.
- **Individual Approach**: Teaching is based on the individual needs of the student. The instructor adapts the program to the student's levels and difficulties.

### 6.2.1. Alphabetic Phonic

Alphabetic Phonics is another method that originates from the multisensory approach to reading, writing, and spelling developed by Orton-Gillingham. The word “Alphabetic” refers to making use of the letters of the alphabet to teach readers of an alphabetic language the code for pronouncing and writing its linguistic symbols. (Cox, 1985). It is specifically designed for children with dyslexia and is implemented either in small groups or through one-on-one instruction.

This approach places significant emphasis on key aspects of the English alphabet, notably focusing on phonology and the order of letters (Cox, 1985). The method places a strong emphasis on teaching phonics skills for both reading and spelling. Alphabetic Phonics is rooted in Orton's theory, which posits that dyslexia stems from neuropsychological impairments and can be ameliorated through multisensory teaching techniques that establish connections between visual, auditory, and kinesthetic senses (Cox, 1985). It is an extension of it, structured in English. Alphabetic Phonics supports and enhances 95% of every type of learner to master written English. Its original design was aimed exclusively at students with dyslexia. It can be applied to small groups of students with dyslexia or to all students (Cox, 1985). Addresses at both the elementary and secondary levels by simultaneously engaging the visual, auditory, and kinesthetic modalities. This program includes:

1. Teacher manuals, which contain the 4 levels of the curriculum.
2. Student workbooks, which include activities focused on phonemes, graphs, and concepts in the curriculum.
3. Tests, which evaluate the literacy skills of students, and correspond to the first three Schedules of the Alphabet Phonics curriculum.
4. Ancillary Materials, for example reading cards, etc.

The sessions are held for 1 hour daily and are structured alternatively including 10 different activities alphabet, review of letters, review of sounds, multisensory introduction of a new letter, reading, cursive handwriting, spelling, verbal expression, review, and listening (Cox, 1985).

It's important to mention that while this method has undergone enhancements and modern applications, there is a lack of available studies that assess the method's effectiveness.

### 6.2.2. Bangor Dyslexia Teaching System (BDTS)

The BDTS was developed by the University of Bangor in Wales and was designed specifically for children with reading and writing difficulties such as dyslexia. The Bangor Dyslexia Teaching System employs a blend of multi-sensory, auditory, and visual techniques to impart reading and writing abilities. Its primary objective is to

assist children in comprehending the connections between sounds and letters, enhancing phonological aptitude, and boosting their self-assurance in both reading and writing.

Because the Bangor Dyslexia Teaching System is rooted in the OG approach, it adheres to akin principles and instructional methodologies that prioritize letter comprehension and deciphering, fostering phonics proficiencies, and nurturing students' self-assurance in both writing and reading.

The third edition of Bangor Dyslexia Teaching System book written by Elaine Miles, has been revised and updated to take account of recent research, particularly that relating to the developmental stages by which children normally acquire literacy.

This book, which is the homonymous teaching method, is addressed to teachers where they teach one-on-one or in small groups of students. It refers to many pillars of teaching such as: monitoring and assessment, handwriting spelling, national curriculum, and the use of computers etc. (Parkinson, 1993).

This program is designed for students who have learning disabilities and whose literacy skills have not been sufficiently developed given their chronological age. The method is divided into two sections depending on the educational level of the students (primary-secondary). Through the description of the method, it becomes clear that emphasis is placed, among other things in:

a) The aim of the first part is to prepare, equip and provide primary school students with all those necessary academic skills that they will need during their period of secondary education so that they can adequately get above schoolwork.

b) The aim of the second part, which concerns secondary school students, is to provide them with assistance so that they can cope with the demands of their class. For this reason, the book includes spelling material of increased difficulty, study suggestions and strategies, and examination tips (Miles, 1992). It is a multisensory teaching method that uses a variety of materials, such as sand disks, embossed cards, cubes, etc.

However, the main tool of this method is the construction of a notebook by the student himself, which will be a reference point of learning. Words familiar to the student are recorded in it, and lead to a grammatical rule, automatically and spontaneously, thus

bypassing the memorization of the rule itself. Whenever necessary, the student can refer to it to recall what is needed (Miles, 1992).

### 6.2.3. Barton Reading and Spelling System (BRSS)

The Barton program is an O-G based program created by Susan Barton. It is a multisensory program for one-on-one teaching or teaching in very small groups of up to three people, which aims to improve the reading skills of students with dyslexia. This program is designed for students who have difficulty decoding words during the reading process, even though they have been taught phonemes, they are slow readers who make mistakes and whose written speech is often accompanied by mistakes.

When the program takes place one by one, it requires at least 2 hours of teaching per week. If the teaching is addressed to more than one person, it loses its impact and intensity and for this reason the hours must be increased in order to rise from the expected result. Thus, for example, if the group includes 3 students, 6 hours per week at least should be done, in order to give the two hours of intensive and systematic teaching to each student separately. As the number of students in the group increases, so does the completion of the Barton program takes longer. This happens for two reasons, firstly, the lesson must be adjusted and follow the rhythms of the slowest student and secondly, in absence of a team member, leads on to repetition of previous knowledge, as no new material can be presented.

It is worth mentioning that in each lesson the tutor must complete a Fidelity Checklist, in order to ensure that the program will be effective. It can be used by parents, teachers, speech therapists, special educators, etc. if they decide to become trainers. The tutor can be a certified Barton tutor, or if not, he can implement the program by receiving the relevant training about BRSS via DVD, in conjunction with the full course plans provided. According to the official page of the program, one can be certified at the beginning, advanced or masters level of the program by attending and paying for some sessions. On the other hand, there is no suggested cost of providing services through the Barton program, as it is aimed at free market professionals and everyone can cost as much as they want their services (Barton Reading and Spelling System, 2021).

In a study conducted by Wise (2011) that examined the efficacy of the Barton Reading Spelling System (BRSS, 2021) and the perspectives of students, teachers, and parents, several findings emerged. The research revealed that participants perceived a positive connection between the BRSS and enhanced skills in spelling, decoding, print vocabulary, reading fluency, motivation for reading and writing, as well as reading comprehension in cases where comprehension challenges were tied to decoding deficiencies. However, the study did not identify any significant impact on oral vocabulary. Furthermore, Wise's investigation into the factors influencing the effectiveness of BRSS highlighted certain key points. It indicated insufficient support provided to teachers and parents and emphasized the necessity for improved communication and collaboration among educators, teachers, and parents involved in the BRSS program.

### 6.2.4. The Lindamood Phoneme Sequencing (LiPS)

Created by Nanci Bell, Patricia Lindamood, and Phyllis Lindamood, the Lindamood-Bell Foundation is dedicated to aiding students in achieving proficiency in speaking, spelling, and reading. The approach revolves around the integration of sensory input, encompassing auditory, visual, and tactile senses, and utilizing feedback from these sensory modalities to enhance the development of phonological and phonemic awareness (Lindamood & Lindamood, 1998). The method also highlights the significance of the lips in speech, as they play a pivotal role in articulation, which involves the production of speech sounds in the mouth or throat (Harris & Hodges, 1995).

The objective of this approach is to provide training to students who struggle with distinguishing between speech sounds and comprehending the arrangement of sounds within syllables and words. The LiPS method aids students in developing an awareness of the visual, auditory, and tactile aspects involved in producing speech sounds. It prompts them to contemplate phonemes and their utilization within spoken patterns. This program guides students in comprehending the relationship between the act of producing a sound and the visual representation in written form. Throughout the program, the instructor's role extends beyond conveying concepts; it involves continuously posing questions to the students, enabling them to develop the ability to

correct their own speech, spelling, and eventually reading (Lindamood & Lindamood, 1998).

It is another OG based method trying to overcome difficulties arising from dyslexia. This program is individualized, utilizes multiple senses at the same time and is classified as a multisensory intervention. It is designed to teach students the necessary vocabulary and sound recognition skills. The first step of this method is based on exploratory learning. The student is asked to discover the required actions / movements in which the lips, tongue and mouth are involved and the cooperation between them, during the production of specific sounds (WWC Interaction Report, 2008). For instance, in Greek the student should understand that the phoneme / φ / - / f / is produced by resting the teeth of the upper jaw gently on the lower lip. So, being able to perceive, produce and classify sounds, follow activities that emphasize sequencing, reading and spelling using the oral aspects of sounds to recognize and classify them within words (WWC Interaction Report, 2008).

According to research by van der Laan (2006), children who were given the Lindamood-Bell Phoneme Sequencing program improved their phoneme awareness, reading fluency and comprehension.

### 6.2.5. Simultaneously Multisensory Teaching (SMT)

Another O-G based method is SMT. This method is aimed at students of all ages who need a more thorough knowledge of the structure of the written language code and a stable correlation between sounds and written representations of the language before learning language concepts and rules. The aim of this method is to teach the basic skills (reading, writing and spelling) taking special care to enhance the accuracy of the reading skill during the first school years and then, enhance the understanding of the structure of the written word. The material is presented fragmented so that students derive satisfaction through the implementation of small goals each time and move forward at their own pace. The manual that accompanies this method, includes detailed lesson plans so that for each teaching there are pre-pedagogical objectives.

The learning techniques and strategies that enhance phonemic and phonological awareness are:

- visual and auditory discrimination.
- bimanual reading in Braille dots to develop a “tactile vision”.
- direct teaching of non-image words.
- an emphasis on diction.
- the etymology of English words (Brazeau-Ward, 2005).

This program is designed in English and French. Each lesson includes 20 steps:

1. Alphabet (developing literacy skills in a dictionary).
2. Grapheme and keyword review (correlation of letter with sound and memory development associated with the written representation of letters).
3. Phoneme review (graphophoneme matching).
4. Kinesthetic and tactile review (automation of the movements required for writing the letters).
5. Concept review (strengthening the memorization of concepts and rules).
6. Auditory discrimination (development of the ability to distinguish sounds and auditory memory).
7. Visual discrimination (development of the ability to distinguish letters).
8. Laterality and directionality exercises (development of laterality and orientation skills).
9. Introduction to a new letter (interconnection of all the features of the letter: name, sound, written representation, etc. through the use of multiple senses).
10. Handwriting (development of the art of penmanship).
11. One minute health break (concentration boost).
12. Non-image words (strengthening students regarding words that are not visualized).
13. Red words (learning words whose pronunciation does not correspond to their written imprint).
14. Reading (Total development of reading skills).
15. Copying/dictation.
16. Phonological/phoneme awareness.
17. Spelling.
18. Tongue Twisters (diction strengthening).
19. Oral/written expression (enhancement of communication skills).
20. Listening comprehension (Brazeau-Ward, 2005).

According to research by Nirmala et al. (2022), the skill of distinguishing frequently mixed-up letters has started to be successfully acquired, both in the pronunciation during reading and in writing. Likewise, improvements have been observed in reading

and composing words and sentences, a departure from the initial observations that exhibited numerous spelling mistakes. Consequently, it can be inferred that the implementation of the SMT method has the potential to enhance the reading and writing abilities of students with dyslexia.

### 6.2.6. Wilson Reading System (WRS)

The WRS, initially introduced in 1988 and co-founded by Barbara Wilson, integrates five fundamental components essential for achieving reading proficiency (Stebbins et al., 2012). Students are instructed in English language sounds (phonemic awareness) and word structures (phonics principles) using a direct and methodical 12-step multisensory approach aimed at mastering phonemic awareness, decoding, and spelling. The method employs the technique of "audio tapping" (auditory cues associated with finger movements) to assist in recognizing phonemes, with a strong emphasis on cultivating fluency and achieving mastery of each skill before progressing. The system was developed to address the needs of students in grades three through twelve who exhibit reading challenges, qualify for special education services, or have limited proficiency in English (Wilson, 1995).

In research conducted by Wilson (1995) to assess the efficacy of the WRS and its influence on students' reading and spelling abilities, it was revealed that a group of 220 students in grades three through twelve, diagnosed with language impairments, demonstrated enhancements in both word attack skills and reading proficiency. These findings are corroborated by studies carried out by Wood (2002) and Stebbins et al. (2012) which further support the positive outcomes observed among students who underwent the WRS program. As per these investigations, all students who participated in the reading program exhibited notable advancements in word recognition, word attack skills, passage comprehension, fundamental skills, and overall reading abilities. The study documented improvements across all grade levels and cognitive abilities.

### 6.3. Approaches and Programs Aligning with OG Principles, but not explicitly OG-based

There are other approaches which have common characteristics with the OG approach, however they are not considered OG based. These programs may aim to improve reading, but may not follow the same structure and principles that define OG-based programs.

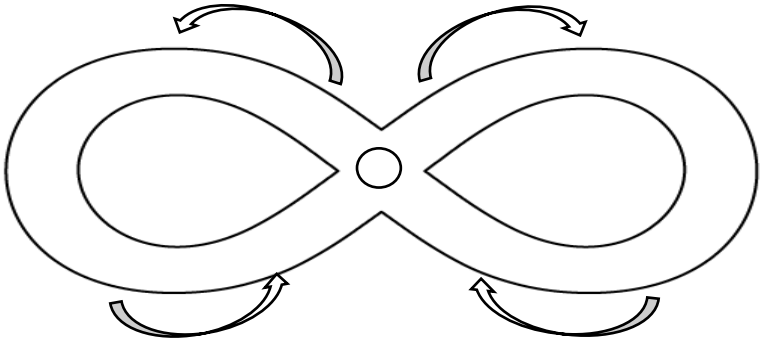
#### 6.3.1. Brain Gym® International (BGI)

This method is highly accepted by people working in the field of special education in the US and beyond (Spaulding et al., 2010). However, for a long time there was not enough research data to confirm the benefits of this intervention. Advances in neuroscience in recent decades have highlighted the interconnection of areas of the brain with a number of physical, psychological, and learning processes (Goswami, 2006). Many times, companies, aiming at profit, take advantage of neurological findings, trying to build methods or tools that can be applied in learning. However, there is no empirical evidence linking the downswing in learning disabilities to neurological behavior (Goswami, 2006), this is because a link like that, would be compromised by simplifying the link between neurology and learning outcome (Ansari, 2008). BGI is also used as an interventional therapy for autism, but according to Watson & Kelso (2014), findings, BGI does not have clear and substantial differences in the academic involvement of children with autism. BGI claims that the approach is based on the science of neurology and "integrated, cross-lateral, balance-requiring movements that mechanically activate both hemispheres of the brain through the motor and sensory cortexes, stimulate the vestibular (balance) system for equilibrium, and decrease the fight or flight mechanism" (Dennison, 2006, p. 8). On the other hand, a recent study by Abduh & Tahar (2018), shows that there is a significant improvement in students' working memory when BGI intervention takes place over four weeks.

A very popular BGI activity in the educational world is the "lazy eight" as shown in the figure 3 below:

**Figure 3**

*Lazy eight by BGI*



At an early stage, the student should follow the movement of the fingers of the special therapist, which form in the air the shape of a "lazy eight", with the urge to move only the eyes and not the head. In the next step, the student is asked to follow the lines of the lying eight, which are imprinted on a piece of paper with his finger or some other object starting from the center, and to repeat the movement several times. He is then asked to change direction and repeat it many times (Spaulding et al., 2010). Then, he can follow the lines with his pencil several times first in the one and then in the other direction. For further movement engagement, the "lazy eight" may be designed on the floor and the student may be asked to run around it, repeating the process in both directions. Finally, the "lazy eight" can be used in writing the alphabet as shown in the image below. According to the BGI the visual-motor coordination, the visual movement, the cross laterality, the concentration, the memory, etc. are enhanced by this relaxing activity.

### 6.3.2. DISTAR method

The Direct Education System for Instruction and Remediation Reading (DISTAR) program was created to meet the educational needs of children from low-income families who lack the language skills necessary to succeed in the educational environment (Stallings & Stipek, 1986).

This specific program was developed by Bereiter and Engelmann (1966). It represents an instructional approach that places a strong emphasis on immediacy, encompassing key components such as dedicated learning time, frequent engagement among students, prompt feedback from educators, and the correction of errors (Rosenshine, 1976). As

outlined by Stallings & Stipek (1986), the concept of direct instruction, as initially conceptualized by its creators, involves a meticulously structured curriculum featuring progressive phases and a rigorously controlled teaching procedure. Beller (1973) characterized the DISTAR curriculum as a language rehabilitation program strategically tailored to aid economically disadvantaged four- and five-year-old children in bridging achievement gaps and attaining academic levels comparable to their middle-class peers.

The program, which is phonic-based, operated under the following framework: The teacher initially imparts information to the student and subsequently poses a straightforward question related to the material. If the response is accurate, the student receives commendation. Conversely, if the answer is incorrect, the teacher provides corrective guidance, and the cycle continues until the student arrives at the correct solution. Only upon successful completion of this process does the teacher and student advance to the subsequent phase. This meticulously designed curriculum, coupled with explicit instructions accompanying every instructional phase, gives rise to a meticulously organized reading program (Sexton, 1989).

Research into the effectiveness of the aforementioned program has yielded diverse outcomes. For instance, Becker (1977) and Meyer et al. (1983) have demonstrated that it proves highly efficacious in imparting reading skills to socioeconomically disadvantaged children. Moreover, Becker & Carnine (1980) noted successful implementation of this approach within specific populations dealing with disabilities, including autistic and hearing-impaired children. DISTAR employs small-group, in-person instruction, guided by a teacher delivering meticulously structured daily reading lessons that underscore the development of decoding abilities (Becker, 1977). Additionally, Sexton's (1989) study revealed its comparable success among children with varying initial language proficiency, suggesting a significant connection between the method of reading instruction and language attainment levels.

Conversely, there exist critics who argue against its apparent efficacy. For instance, a study by Serwer et al. (1973) conducted a comparative analysis of the DISTAR reading program alongside three alternative approaches (perceptual-motor instruction, a combined approach, and no specific instruction). The findings indicated that the DISTAR program did not yield superior results compared to any other method when

enhancing the reading performance of at-risk young children with learning disabilities (LD). Similarly, Kuder's (1990) research demonstrated that students with learning disabilities who received instruction through the DISTAR reading program generally did not exhibit significantly enhanced reading abilities compared to their counterparts who underwent reading instruction via a more conventional core reading program (Kuder, 1990).

### 6.3.3. Dyslexia Box

Dyslexia Box is a tool based on the multisensory approach created by Fotis Papanastasiou, a Greek special educator, and it became available for purchase and use in 2020 in Greece (Papanastasiou, 2020). The purpose of the Dyslexia Box, based in multisensory teaching, is to help students with Dyslexia acquire the skills necessary for their academic progress, to support them in their efforts to overcome the difficulties that hinder their participation in the learning process, to fully develop phonological awareness and to acquire adequate (Gaitanidi et al., 2023).

It consists of 238 cards, 5 pawns, 1 reading aid and the manual with the instructions of the exercises. More specifically: 45 cards with red markings containing two-syllable word images, 45 cards with blue markings containing three-syllable word images, 45 cards with yellow markings containing images of multi-syllable words, 24 green cards with letters of the alphabet, 28 numbered cards with purple markers containing reading lists, 6 cards with a pink display containing words broken down into phonemes, 35 numbered cards with a black mark containing words and sentences for the first reading, 6 cards with orange marking containing word pairs for rhyme recognition, 4 cards with brown mark containing words for rhyme production, 5 pieces, 1 reading assistant and Exercise manual. The included user manual provides detailed instructions and allows its use and application by whoever wants to use it (therapists, special educators, teachers, parents, etc.). The price is quite affordable. It's worth noting that a study by Gaitanidi et al. (2023) highlights the effectiveness of the Dyslexia Box program for children with dyslexia and other challenges in reading and writing.

### 6.3.4. Hickey method

The Hickey system, with its meticulously designed language curriculum and strong emphasis on utilizing multi-sensory approaches, did not find favor among the majority of educators who had been trained in contemporary teaching methods. In fact, certain individuals perceived it as a regression, reminiscent of the more traditional teaching approaches of the 19th century (Augur, 1986).

Kathleen Hickey's approach, as outlined in her work from 1977, is rooted in the foundational principles established by Gillingham/Stillman. This method systematically introduces various language components in a specific sequence, such as phonograms that combine to form complete words, phrases, and sentences. It encompasses guidelines and choices for spelling sounds. Moreover, the Hickey method not only provides educators with a clear path to follow but also challenges them to think holistically about a comprehensive language acquisition strategy. It fosters the creativity and resourcefulness of teachers through suggestions for utilizing materials to reinforce learning and incorporating interactive games that solidify concepts. Rather than avoiding the teaching of rules, the method offers guidance on seamlessly integrating these rules into the learning process using self-correcting tools like games and activities (Augur, 1986).

The approach instills both the educator and the learner with a sense of assurance. Individual progress is closely monitored, and each student advances at a pace that is both expedient and accommodating. While not universally essential, this method is profoundly comprehensive, offering potential advantages to a wide array of learners (Hickey, 1977). Hickey emphasized the necessity of conducting lessons within small groups, typically comprised of three to four individuals. She believed that collaborative work among children, especially those facing challenges, was vital. One-on-one scenarios often introduced stress for the child and consumed valuable teaching time. Within a small group, each child can receive brief, individualized assistance while simultaneously engaging in collaborative activities with peers or the entire group.

It is worth noting that although this method has been improved and used in modern times, no studies have been found to determine the effectiveness of this method.

### 6.3.5. Letterland

The Letterland multisensory approach is an early intervention which is phonic-based and designed for native speakers of english by Wendon (1986). This approach, which is internationally recognized and applied to 50% of all primary schools in England and Ireland (Wendon, 1997), is confirmed in its core areas by the National Reading Panel that the best approach to reading involves explicit teaching in phonic awareness and systematic voice teaching (National Reading Panel, 2000). The central point of teaching is the 6 types of syllables that exist in the English language. Through a variety of activities students improve their skills regarding their phonetic awareness, phonic and executive function (Paeplow, 2015).

There are a total of nine strategies available for teachers to employ when implementing Letterland, as outlined (Freese, 2003). These strategies encompass the sounds trick, capitalization trick, character name trick, action trick, alliteration trick, roller coaster trick, slow speech trick, rhyming trick, and syllable trick. Within the teaching and learning process of Letterland, educators have the flexibility to select the strategies that best suit their instructional goals. Depending on the specific challenges students may face, teachers can opt for the strategies they deem most suitable. Furthermore, teachers are encouraged to bring creativity into their teaching methods and maintain close rapport with their students, allowing them to better understand their students' needs and progress (Julianti et al., 2020).

Letterland serves as a vibrant community where various letters coexist harmoniously. Within this community reside the amiable letters representing both people and animals, collectively known as “Letterlanders” (Freese, 2003). The primary objective of Letterland is to create an enjoyable and engaging English learning experience for young students. Geared towards children aged 3 to 8, the focus is on fostering a sense of enjoyment, allowing young learners to naturally absorb new knowledge. It offers a secure educational setting where young students can joyfully cultivate cognitive, linguistic, and literacy skills (Julianti et al., 2020).

Within the framework of Letterland's strategies, specific methods for instructing young learners are outlined as follows (Julianti et al., 2020):

1. Commence by engaging young minds with Letterland ABC videos corresponding to the letter to be introduced that day.

2. Transition back to the classroom to engage in various other activities.
3. Provide clear instructions and explanations detailing the upcoming tasks for the students.
4. Execute exercises such as workbooks, worksheets, or other activities aligned with the lesson plan.
5. Conduct a comprehensive review of the lessons covered.

Through these activities it is assumed that the number of students who need extra help to cope with reading and spelling is limited (Wendon, 1993). The use of icons and stories helps students with dyslexia in phonological awareness, auditory discrimination, while simultaneously practicing their short-term memory and encouraging the development of the student's imagination and creativity (Manson & Wendon, 2003). Harrison's (2001) research on the effectiveness of Letterland showed that students improved more in their skills in recognizing letters and connecting them to their corresponding sounds (phonics skills) than in their ability to recognize and distinguish the various sounds that form the basis of words and syllables (phonological awareness). Also, according to the research of Julianti et al. (2020), students find teaching using this method attractive.

### 6.3.6. Toe by Toe

It is a multisensory, structured phonic based program aimed at teachers and parents. The name of the program has a symbolic character to be stated by the creators of Cowling and Cowling (1998), that students take steady steps even when they are very small like fingers. This program can be used easily without training of the person who provides it, as it includes a detailed user manual.

Toe by Toe (Cowling & Cowling, 1993) is an extensively structured phonics teaching program characterized by a high level of systemization. Its design aims to facilitate ease of use for both educators and non-professionals. Alongside its application in numerous educational settings, it has also found utility in correctional facilities such as prisons and youth offender institutions. Moreover, dyslexia instructors working with dyslexic adults in community contexts have adopted it as part of their instructional toolkit.

The scientific evidence of Jeffes (2016) research indicates that Toe by Toe is an effective teaching method in secondary age students with severe reading difficulties.

The most significant improvements were found in the primary skills targeted by Toe By Toe (that is, word recognition and phonic decoding accuracy). Importantly, it seems most of the gains were made in areas that tested the students' phonic knowledge and this is no surprise given the emphasis on phonics throughout the Toe by Toe scheme. In a study conducted by MacKay (2006) involving 32 primary schools in Scotland and encompassing 91 year 7 students with reading difficulties, a positive correlation was identified between the utilization of the method and improvements in reading skills. Similarly, Singleton's research (2009) revealed enhanced reading and spelling abilities in students who engaged with this approach.

### 6.3.7. Phonological Relationship Strategy (PRS) and Visual Representation Strategy (VRS)

According to Mihandoost et al. (2012), students with dyslexia need at least two hours of systematic and individualized intervention over a long period of time in order to remove some of the difficulties they face. Traditional teaching includes sound and image, however the literature states that experiencing multiple senses at the same time increases learning opportunities for all students (Giess et al., 2012; Mills, 2018) even for those who do not face any difficulty.

Two of the methods used by teachers who apply a multisensory approach to teaching are PRS and VRS. At this point it is advisable to distinguish phonology from linguistic morphology. The first involves processes that arise as a communicative need of speech and listening, while the second follows rules that emerge historically (Donegan, 2015). Thus, eloquently said that "Phonology, as the system that governs the perception, representation, and production of speech, is inseparable from phonetics, and it emerges from speaker abilities (and inabilities)" (Donegan, 2015, p.49).

The first method (PRS) gives the student the support he needs to hear each letter, letter combination or both in a word and not rely solely on a visual coding strategy so that his brain can properly process the verbal-linguistic information (Mills, 2018). Moreover, there is a strong correlation between phonological representations and reading decoding (Hester & Hodson, 2004). With this method, dyslexic students learn the correct pronunciation of words and gradually their correct spelling. Also, special emphasis is placed on creating pseudowords so that they learn to interpret combinations of sounds

and syllables and then apply the conventions of written language and the rules of spelling that govern the sounds that accompany each word. This method enhances the acoustic processing, pronunciation and spelling. Increasing the effectiveness of the above method can be achieved with kinesthetic involvement of the student (Mills, 2018). The more senses are combined, the more areas of the brain are stimulated and as a result new paths are opened to learning.

More specifically, for instance the teacher could ask the students to “tap out each sound heard in a word with their hands starting at the opposite arm's shoulder for the first sound and moving down the arm for each additional sound” (Mills, 2018, p. 39). A variation could be for the child to count with his fingers every sound he hears (Mills, 2018) or to use another object to capture the number of sounds such as bricks, plastic bottle caps, markers, etc. With this technique, the student separates the words at the sound level and not at the phoneme / letter level. Thus, involving different senses, different parts of the brain are activated.

The VRS method (figure 4) enhances the rapid recall of abstract words, while at the same time helping students with dyslexia to distinguish phonetic words (Bacon & Handley, 2014). But how can teachers apply this approach? The teacher writes the target word on a card and after reading it to the student asks him to draw a picture under the card that he connects with the word. The correlation between drawing and word is very likely to have no mental connection to anyone other than the student himself (Mills, 2018). This association creates a visual-emotional code in his brain in which he will have access the next time he encounters the word (Mills, 2018). The teacher could use the VRS method by showing the student a target word on a surface for several seconds which he then removes and asks him to record it immediately. By systematically applying this strategy, and as the student's reading ability increases, he can make the painting fainter, until it is completely eliminated (Mills, 2018).

**Figure 4**

*VRS method*


*Note:* Mills, 2018, p.40

### 6.3.8. Visualization and Verbalization

According to Faber (2006b), this category includes methods which are based entirely on a complete application of graphs and verbal self-instructions. Knowing that students with dyslexia often having difficulties in recalling and apply spelling rules, the goal of this method improving students' self-regulation skills by focusing on the elements of the algorithmic rule with the help of visualization and verbal formulation. More specifically, it illustrates a spelling rule by highlighting its features and decision criteria as an algorithmic flow chart. The solution of the spelling problem is gradually determined by each algorithmic criterion. Then, after the students have identified the parts of their results with a colored pencil, then with the verbal self-instructions they think until they manage to solve the spelling of the target words. As students' skills improve, so the instructions can be reduced (Faber, 2006a). The results of Faber's research (2006b), using this method, showed that after 40 hours of systematic practice, a significant improvement in student orthography was observed.

It is argued that visual aids such as comics that combine image with text can help to understand such concepts (Sabeti, 2012), to all students even those with dyslexia, as among others include images and words that as a visual metaphor make distinct the meaning of the word (Smith et al., 2019). As Hosler and Boomer (2011) have shown in their research, the association of abstract concepts with visual representation helps

students to understand and retain information in their memory. Going one step further, Dallacqua (2012) claims that graphic novels help students a lot in improving their literary skills.

The findings of the research conducted by Mourao, 2012, show that children are able to successfully use the pictures in a book to interpret and understand a meaning. After all, it is widely accepted that the transmission of a message or information is not a privilege of the language code. Visual strategies for reasoning are often chosen by people with dyslexia, which may indicate that they have a supportive, compensatory and ancillary role in learning (Bacon & Handley, 2010). In the same study, it is reported that visual processes are differentiated between dyslexic and non-dyslexic individuals. More specifically, non-dyslexic individuals are reported to be able to draw conclusions based on a linear arrangement of objects, while dyslexic individuals use additional object information to make comparisons with each other.

### 6.4. Other types of teaching interventions and good practices

#### 6.4.1. Using Colors-Distance between letters

According to Pinna (2006) and Werner et al., (2007), colors may open up new horizons as on the one hand, they allow us to focus on details, and on the other hand, they enhance some emerging properties that would not exist without them. This can be easily understood when different parts and apparent features of objects are displayed through color variations. So firstly, we could imagine a picture with a black and white filter depicting some trees. If the same image is then enriched with colors, various conclusions could be drawn that in the first case would be impossible. For instance, the color of the leaves will allow us to determine the time of year (Pinna & Deiana, 2018) while the color of the sky will allow us to take information about the time (day, midday, evening & night) the photo was taken.

Regarding this, the findings of Pinna & Deiana (2018) research, show that color differentiation can affect the integrity and fragmentation of the word during the reading process as well as the reading speed, noting that color can become very useful tool in the hands of experts in their effort to improve the reading skills of dyslexic and non-dyslexic students. For example, it is reported that when words differ in color from their

first letter, there are better results. On the contrary, there is visual confusion when each letter is a different color, and the reader has difficulty. Regarding the usefulness of colors as an educational tool, research of Sjoblom et al., (2016) reports that colored frames do not appear to affect students' reading skills with dyslexia.

In addition, it is argued that the extra space between letters is supportive for students with dyslexia during the reading process (Sjoblom, et al., 2016; Zorzi, Barbiero et al., 2012). They point out that this method can benefit students with and without dyslexia in reading speed, while improving reading accuracy in dyslexic students (Sjoblom et al., 2016). Zorzi et al. (2012) report that their research findings in French-speaking children suggest that extra space between letters improves reading performance, while noting that the findings were similar when the study was conducted in children in Italian. So, with every reservation, perhaps it could be formulated as a generalization for the graphic depiction of the language code of all languages that the spacing between letters is part of the good practices for children with dyslexia.

### 6.4.2. Simultaneous Text Reading and Pronunciation Exercises by Another Individual

A common way of helping students with special learning difficulties and learning difficulties is by giving them the opportunity to listen to a text that is being read to them at the same time that they are reading it, and very often teachers use this strategy in the classroom to reinforce student participation in reading and comprehension (Bottsford-Miller et al., 2006). Many children with poor reading skills have difficulty decoding words as a result of their difficulty in spelling-phonemic matching. In Greece, as it has already been mentioned, there is a directive to read the instructions of exercises to students with dyslexia in order those written instructions not to stand in the way of understanding language exercises. The relevant research of Kosak-Babuder et al. (2019), confirms the benefit of reading texts to dyslexic students especially when the texts are complex and difficult to understand.

### 6.4.3. Visualization of grammar rules

Another way to improve the comprehension of grammar rules is to visualize them through cards as shown in the images 1 and 2 below.

**Image 1 and 2**

*Visualization of grammar rules*


Note: *Μαθαίνουμε μαζί! Labrianna's class, 2021*

These images represent two inclinations used in the Greek language. The first represents the Imperative as a "shouting" teacher who gives orders, and the second the Subjunctive who is a "sweet" teacher talking by saying wishes or desires. In this way, students can perceive the use of inclinations, to distinguish the style we use and their role in language. In Greek the Imperative Inclination is used primarily to indicate an order, a command, while more rarely it performs other communication functions such as the declaration of request, motivation or concession. On the other hand, the Subjunctive, mainly reveals a wish or desire.

In this direction, teachers having professional and pedagogical responsibility can experiment creatively with various sensory approaches that provide multiple means of material representation. Thus, students can express cognitive content in different ways and have increased learning opportunities (Mills, 2018).

In conclusion, there is a convergence of literature on visual textual representation as an effective educational tool, suggesting that they make it very effective to provide meaning to verbal content that is unknown and difficult to understand. This view is reinforced by recent research by Smith et al. (2019) in a group of dyslexic and non-students, which showed that all children and especially those with dyslexia had educational benefits when they received information in the form of comics by cheating

on questions recalling knowledge from their short-term memory these in their long-term memory especially when the images included metaphorical representations.

### 6.4.4. Digital tools

The value of digital environments as educational tools is undeniable (Merchant et al., 2014). Their advantages are many such as: safe and controlled arrangements with which knowledge is offered (Marshall, 2014), the practice of social skills (Didehbani et al., 2016; Kalyvioti & Mikropoulos 2014), the expression of emotions (Lorenzo et al., 2016; Freina & Ott, 2015). The reasons above make digital environments good teaching practices through which new skills could be acquired or existing ones could be strengthened, behavior could be modified and appropriate behavior could be promoted in real life (Fokides et al., 2019).

In the same vein, Bohil et al. (2011), report that digital environments and treatments with participants' exposure to real conditions have shown equally good results. This is because in both cases individuals are exposed to similar sensory stimuli (images, sounds, etc.), causing similar psychological reactions (Bohil et al., 2011). Fokides et al. (2019), through their research showed that digital environments, and especially software, can significantly help the manifestation of desired behaviors in real school conditions.

It is worth noting the importance of linking skills learned in digital environments with skills or behaviors that take place in students' daily lives and especially with those that can be practiced regularly and quickly (Rizzo et al., 2011). In this way students can make generalizations when faced with similar situations (Blume et al., 2017; Freina & Ott, 2015).

### 6.4.5. Music education

There are scientific reports linking the use of music as an intervention for dyslexia. Music education requires very precise timing skills and can provide a means to develop and improve time processing ability, and therefore help children with dyslexia (Overy, 2000). But what do we mean when we say music education? In social consciousness, music education is related to learning a musical instrument, however, when we talk about music education in the form of intervention at these ages, we mean something

completely different. Music education includes specially designed for the development of auditory, visual and motor skills music lessons, singing with emphasis on rhythm skills, playing instruments, etc. The research of (Habib et al., 2016), which applied to students with dyslexia the method Cognitivo-Musical Training (CMT), which includes a series of visual, auditory and kinesthetic activities, claims that after the intervention students showed improvement in the categorical perception and the acoustic perception of the elements of the language. In addition, there was an improvement in phonological awareness, and in the reading of pseudo-words (Habib et al., 2016).

### 6.5. Summary of the chapter

In conclusion, as mentioned above, there are different types of interventions that aim to improve skills related to reading, writing, spelling. The effectiveness of interventions, based on OG or any other type, has been the subject of many studies aiming findings that may or may not confirm its suitability for students with reading difficulties, but there is absolute convergence of views. Ritchey and Goeke (2006), in their study, sought to consolidate the findings of empirical research on the effectiveness of O-G intervention in students with reading difficulties. The findings of their own aggregate study showed that the research conducted so far did not converge in terms of results, with some of them recording a positive outcome in terms of reading, writing, comprehension and coding of words by students with difficulties in reading, while others show no statistically significant improvement. Thus, they argue that the enthusiasm and popularity of some OG-based interventions is not commensurate with all the scientific findings, so generalizations should be avoided. A more recent study by Giess et al. (2012), report that students receiving O-G intervention made significant progress in word analysis and spelling skills. In the same vein, research by Mihandoost and Elias (2010) showed that students after the BRSS intervention had a statistically significant improvement in their attitudes towards reading and reading comprehension.

Modern scientific data indicate the need for individualized intervention in people with dyslexia as the learning characteristics of these people have a wide range. Professionals involved in special education should be able to evaluate all provided, popular and non-popular interventions by critically analyzing empirical data. Many times, parents and teachers are overwhelmed with the hope and expectation of learning improvement,

aiming to bridge the gap between dyslexic students and their peer group. However, as in any scientific field, and so in the present case in the field of special education, hope and expectation must be accompanied by empirical data and substantiated theories. Thus, professionals should be able to know what works effectively and what does not and can distinguish an effective intervention from an ineffective one (Mostert, 1999).

Teachers are in charge of the continuous search for learning strategies and methods that will be harmonized and complied with, aiming at inclusive education based on "The Convention on the Rights of Persons with Disabilities", which is a commitment to "an inclusive, quality, and free primary education and secondary education on an equal basis with others in the communities in which they live" (United Nation, 2007). The educational policy of each country should include training programs for people involved in special education, thus giving weapons to teachers, therapists and parents to critically examine the literature before choosing to invest time and money in some lack of empirical results (Spaulding et al., 2010). In particular, the various commercial programs that require significant financial consideration for both intervention training and the purchase of appropriate materials should be evaluated (Rose & Zirkel, 2007). Furthermore, the majority of these methods and programs are in English. Only one method can be used in Spanish. In Greece, there was no program or method that could be learnt, used or bought in order to be taught in school, until 2020 when "Dyslexia Box" an intervention program for dyslexic students focusing on reading and writing, was created by Fotis Papanastasiou. Moreover, it is worth noting that a multisensory teaching method was developed only for academic purposes in Greek by Angeliki Mpastea.

# CHAPTER 7

## INCLUSIVE EDUCATION

### 7.1. Clarification of the term

21st century classrooms include more and more students who are heterogeneous in their characteristics. More and more often there are students in the same class who differ in race, religion, nationality, with or without disabilities. The diversity between them escalates the need for inclusion, aiming to provide equal educational opportunities to all students without exception (Ball & Tyson, 2011; Angelidis, 2011). But what is inclusive education?

Inclusive education, or simply inclusion, refers to the educational process where the commodity of education as defined by the curriculum of each country is offered to all students within the regular school (Ferguson, 1999). It does not focus only on special education, as it promotes the provision of equal education to all forms of student diversity. In this regard, Ainscow (2019) points out that the inclusion of students with disabilities should not be considered an independent part of educational policy, but should be part of an overall effort to include inclusion and equality.

It is worth noting that there is a qualitative, conceptual and semantic difference between the concepts of "integration" and "inclusion". It could be said that the concept of integration involves a "pedagogical injustice" as it has a dimension of lack of expected or desired characteristics / behaviors / learning performance of the student, placing him in a special support framework in order to meet the needs of others. In short, it is marginalized and becomes something "different, foreign or different". Certainly, inclusion with students does not mean coexistence without providing educational opportunities that will make the educational process equal for all students based on their age (Loreman et al., 2007). The presence of a special education student in the general classroom alone is not an inclusive practice and as Parekh eloquently put it (2018, par.4), "it is critical to actively explore into what we are including students. How do we ensure the environment, curriculum, and climate are ones which students can experience a sense of belonging, a sense of membership and shared power?".

Inclusive education comes as a response to the above "pedagogical injustice". It does not discern children according to their particularities but promotes the common

education of all children according to their age, but giving to each one of them the means, opportunities and tools to have equal access. It is, therefore, considered a strategy that promotes social cohesion for a fairer society (European Agency, 2015). Still, in this context the problem that a child does not learn shifts from the child himself to the system. The problems that arise are considered to be due to factors such as curricula, inappropriate methods, insufficient training of teachers, lack of educational opportunities, etc. Each member feels accepted and safe and the inclusive culture is dynamically shaped according to the needs of its members. Inclusive education focuses on both the barriers that students face to equal educational opportunities and the development of cultures, policies and practices that will support educational institutions in such a way as to meet the different needs of their students by treating them on an equal footing (Booth & Ainscow, 2002). Promoting inclusive education is considered an imperative for 21st century education (Ball & Tyson, 2011).

Inclusive education-oriented countries emphasize in teacher training programs to be able to provide high quality teaching to all (Guðjónsdóttir & Óskarsdóttir, 2020). Declarations and Conventions have been ratified internationally, such as the Salamanca Declaration (1994) and the United Nations Convention on the Rights of Persons with Disabilities, which defend, accept and promote inclusive education.

In Greek universities so far, there are many courses that promote the acceptance of otherness, such as courses oriented to intercultural education or special education. However, it is observed that inclusive education is not integrated as a compulsory subject in the curricula of pedagogical education and special pedagogical education, which is confirmed by UNICEF (2013). This fact is supported by UNICEF (2013), which states that inclusion courses are not always integrated in university institution.

### 7.2. Inhibitory factors of inclusion

The concept of inclusion seems to be an ideal learning condition at a theoretical level, however there are often factors that act as a deterrent and against its implementation. Despite the efforts (research and policy) made in this direction, it is still a field that is considered problematic and controversial (Allan, 2014). What are the factors that inhibit inclusive education? Reasons for failure vary from country to country. A review of the literature on highlights the following reasons.

Accessibility is considered the main barrier to inclusion in Greece as according to the findings of her research (Genova, 2015), the extent of the issue of accessibility is of such a size that it removes the possibility of people participating in activities. Furthermore, it is reported that teachers generally have a positive attitude towards inclusion (Avramidis & Norwich, 2002), but their attitude is differentiated and directly influenced by the type and severity of the disability (Avramidis & Norwich, 2002; Hofman & Kilimo, 2014). More specifically, research by Avramidis and Kalyva (2007), revealed that teachers believe that students with moderate disabilities should attend a general education facility.

Another obstacle to implementing inclusion is the curriculum, which many children find difficult to follow. Its inelasticity is based on consistent and inalienable content in conjunction with the evaluation and measurement of academic success through specific tests (Zoniou-Sideri, 2010). It is clear that the effective management of the diversity of the student potential, presupposes the flexibility and versatility of the curricula so that the teacher can take advantage of all the opportunities that arise through the dynamic interaction.

In addition, in inhibitory factors can be added the lack of training regarding the management of the heterogeneous classroom creates a feeling of insecurity in teachers (Angelidis, 2011). However, according to Ko & Boswell (2013), in their research, even teachers who had some initial training in inclusive education, however, considered it insufficient. Especially in Greece, inclusion is a concept that was recently introduced so the teaching staff is unfamiliar and approaches it very hesitantly. Hence, there are teachers who do not have the skills to manage all the needs of children and feel lack of self-confidence (Bhatnagar et al., 2014; Angelidis, 2011) or even oppose the implementation of this practice (Angelidis, 2011).

As mentioned, the recent advent of the concept of inclusion in Greece, did not give the necessary fermentation time within the school and society to create inclusive culture, so even today there are prejudices, stereotypes and ignorance (Stylianou, 2017; Stasinos, 2016; Chatzisotiriou, 2013). It is worth noting that according to the research of Genova (2015), in Greece the word disability is negatively charged.

Many countries around the world (including Greece), implement centralized administration, an inhibitory fact in taking initiatives by school leaders and / or teachers

(Gavriilidou-Tsielepi, 2011). Thus, pre-planned and strictly structured educational actions within this framework (Bhatnagar & Das, 2014), hinder inclusion through the consuming procedures that must be followed if a change is proposed by the proper person (Tange, 2016).

The transfer of successful educational systems abroad to the reference country, without further study and adaptation leads to a stalemate in efforts to transform schools into more inclusive ones (Bualar, 2016). This is because there is no one-size-fits-all recipe that meets the needs of all children at the same time. For any transfer or implementation of a good practice, further cultural, social, geographical, economic, etc. characteristics must be taken into account.

The above inhibitory factors appear from country to country to a greater or lesser degree in combination with others related to the particular characteristics of each place and redound to the inability to provide a more inclusive education.

### 7.3. Methods of application of inclusive education

Inclusion is not achieved spontaneously with good will. This is a targeted pedagogical direction that requires methodical movements to be done. Thus, the literature shows that education-oriented schools without exclusions have some common points of reference (McLeskey & Hoppey, 2014; Lyons et al., 2016):

1. A vision that is clearly and accurately captured and supported by all educational staff.
2. Equal coexistence of students and co-teaching within the general classroom.
3. Support for teachers and students.
4. Collaborative approach.
5. Flexible and versatile study programs combined with the provision of a high level of teaching.
6. Appropriate leadership that allows for self-action and joint decision-making.
7. Focus on professional development.

One of the most beneficial inclusive teaching practices is the inclusive education model (Kilanowski-Press et al., 2010). For the success of the model though, it is important that teachers do not function as mere executive bodies but as part of the process of planning and preparing it (Isherwood, & Barger-Anderson, 2008). With this practice, the benefit

for divergent students is twofold. On the one hand, they have access to and are taught what is included in the general education curriculum. On the other hand, they are provided with the appropriate educational tools, such as specialized interventions and strategies in order for co-education to become effective, offering an opportunity to enhance learning rather than further exclusion (Friend et al., 2010).

### 7.4. The role of the teacher in inclusive education

As mentioned above, inclusion is a practice that is achieved when there are coordinated efforts and coordinated movements by the members involved with the school unit. Simply put, it is not something that can be achieved by individual effort alone. An important part of the above effort belongs to the teachers, who have a key role in the process of inclusion through the implementation and implementation of the inclusive program as directly involved with students. Therefore, they should have the know-how to enable them to know and use the appropriate tools and to adapt (when possible) the curricula accordingly so that their teaching meets the needs and interests of the students (Barton, 2004). In inclusive education, individual differences and / or difficulties of students are not treated as an obstacle but as educational opportunities that contribute to the pluralism of the educational process (UNESCO, 2005).

### 7.5. Inclusion models

The implementation of inclusion in each country differs depending on: the inclusion model chosen to be implemented, the educational potential it has, the knowledge and the financial resources. The most prevalent inclusion models according to Norwich (2000, 2002) are the following:

#### 7.5.1. Full inclusion model

This model promotes and fosters equal access for children with disabilities to regular school. Supportive assistance is not preferred in this model, as the regular classroom environment is considered to be the most suitable for all children. Still, there is no differentiation of the legal and institutional framework for children with disabilities.

### 7.5.2. Focus on participating in the same place model

This model, like the previous one, shares the need for all children to participate in the same class. The noticeable difference is that in this case the children could have supportive help from a specialized special education teacher in the regular classroom or in a specially designed space within the wider area of the regular school. Also, in this model, there is special legislation and a flexible curriculum that listens and adapts to the educational needs of children. The application of this model, rejects the existence of separate independent special education units and exclusively promotes support classes, which operate in the context of general education.

### 7.5.3. Focus on individual needs

Special emphasis is given by this model in the evaluation of students' educational needs. Thus, based on the individual needs of each student, it is decided to attend the respective educational program. In cases where students have serious difficulties or it is considered that their attendance in the general class will hinder their progress or will become detrimental to the other students, then it is recommended that they attend - even for a limited period of time - a special education structure (special school). The recommendation for attending in a special education structure is made through a systematic evaluation of his academic progress and social development by specialized educational staff.

### 7.5.4. Choice limited inclusion

In this model, it is assumed that a student who needs special education can benefit more academically attending to the special school and develop more skills. However, the interaction of those children with their classmates in the regular school is also considered very important as this enhances their socialization. Therefore, the decision on where the child will attend is flexible and the final decision of the educational framework is co-decided by the parents and the experts.

Each model approaches special education in a different way and has its pros and cons as Norwich (2000) points out. For example, in the first model, the different needs of students are not taken into account and are taught horizontally without any additional

support and helping and without the necessary legislation that will ensure students' rights. Furthermore, parents do not have the right to codecied the educational framework of their child. The main criticism that this model has received concerns the difficulty of implementing appropriate educational programs that will meet the needs of students with and without disabilities (Kavale & Mostert, 2004). The second model seems to better approach the special educational needs of students and for this it is considered necessary the additional support of students without taking into account the opinion of parents. In the other two models it is observed that academic development overshadows socialization (Patsidou, 2010).

### 7.6. Learning benefits and implications

Inclusion as a practice has gained ground in recent years in many European countries, as more and more people are committed to inclusive human rights and inclusive education (Kefallinou et al., 2020). The changes brought about by its promotion and implementation are not limited to the education and learning of academic knowledge, but there are also the longer-term changes that promote more democratic values at both the humanitarian and social levels (Ainscow, 2004).

Ainscow (2004) argues that inclusive education provides benefits to children with or without disabilities through the changes it brings. He also states that the improvement of the teaching conditions of children with disabilities, cultivates the conditions for the improvement of the teaching conditions of all students overall. Thus, the generally improved educational conditions help in the acquisition of new knowledge for all wholesale the students (Mavropalias, 2019). As reported by Kefallinou et al. (2020), when inclusion is successfully implemented, there are a multitude of benefits such as: providing quality education, improving learning for students with difficulties and their long-term integration into society.

According to research by Mag et al., (2017), all students can benefit from inclusion when done correctly, as each child is given the opportunity to develop their strengths, and, all those factors that dynamically influence learning such as parents, the local context, an inclusive culture is formed promoting concepts such as respect and “belonging”, etc. can be involved in promoting this practice. Through this process, the enhancement of the sense of “belonging”, which is reflected as a right and not as a

privilege, there are benefits on an emotional level as well, which according to Shaffner and Buswell (2004), is an important condition for learning.

Regarding students with disabilities, many teachers argue that their inclusion in the general classroom offers benefits at the academic and social levels (Sileo & Gardener, 2010; Koegel et al., 2012). Social behaviors that develop in the classroom function as social role models for students with disabilities and they learn to recognize and apply socially acceptable behaviors themselves (Anderson et al., 2007).

Students without disabilities benefit from this connection as, through inclusion, they learn to interact, coexist harmoniously and accept diversity, while being given the opportunity to further develop and cultivate their social skills to communicate and support more effectively with their classmates with disabilities (Anderson, et al. 2007).

On the contrary, it should be noted that the inability of education systems to respond inclusively, effectively and adequately to the needs of students with disabilities raises concerns and doubts among researchers about the successful implementation of inclusion. Also, according to the findings of a study conducted in Australia on primary school teachers, showed that the main problematic points of the application of inclusion that they identify are the following: (a) time constraints imposed on teachers; (b) timeconstraints imposed on non-disabled children; (c) behavioural difficul-ties in the classroom and (d) disadvantages relating to learning (Anderson et al., 2007, p.138).

Another disadvantage is the case of the presence of a very disruptive and disturbing student so that the teacher cannot teach. In this teaching context, students of typical development are disserved as they do not learn at the pace they could (McCarty 2005). Parents and educators are concerned that full inclusion will greatly lower educational standards by prioritizing socialization (Irmsher, 1995) while other important skills will not be able to be taught (Berg, 2005).

Finally, it is worth mentioning that children who are included in special education often need specialized therapies, speech therapies, occupational therapies, specially designed rooms with limited distractions, etc., in order to develop their skills once they are out of school. However, these treatments are not included in the regular school (McCarty, 2005). Inclusion can also have a disadvantage in the psychology of children with disabilities as, in the context of typical education they may experience frustration, low self-confidence and self-esteem and be stigmatized instead of being more socialized

especially in cases of children with inappropriate and disruptive behavior (Irmsher, 1995). In such cases it is argued that their attendance at regular schools is in vain as it exacerbates their behavioral problems (Patsidou, 2010).

# RESEARCH PART

# CHAPTER 8

## RESEARCH METHODOLOGY

### 8.1. Purpose and objectives of the research

This research employs a quantitative approach to explore connections and relationships among various factors. Quantitative research involves the systematic examination of phenomena through statistical methods and numerical data analysis. In quantitative research, one of the structured instruments commonly employed for data collection is the questionnaire (Zafeiropoulos, 2015).

More specifically, the aim of this research is to assess the perspectives of typical and special education teachers and kindergarten teachers in the Heraklion prefecture of Greece, concerning multisensory education and its implementation in both dyslexic students' and standard education students' classrooms.

The main objectives of the research are to study the opinions of the teachers and kindergarten teachers in question regarding:

1. Describe the know-how of the teachers about multisensory teaching methods/programs, as well as identify the frequency of use of depending on the subject.
2. Identify the barriers to the use of multisensory practices and the factors that influence the choice of a multisensory method/program the choice of a specific or not a multisensory method/program.
3. Identify the effectiveness of using multisensory teaching methods/programs for students with dyslexia and non-dyslexic students, depending on the type of school (kindergarten, primary school), the specialization in special education, the number of students and students with dyslexia.
4. Identify teachers' interest in receiving training and their beliefs about the need for specific training to implement multisensory teaching methods/programs.

5. Identify the educators' viewpoints about the inclusion of students with dyslexia through multisensory teaching methods/programs

Based on these objectives, the following research questions are investigated in this study, according to the opinions of teachers and kindergarten teachers -both in typical and special education- of the prefecture of Heraklion:

- How often is a multisensory teaching method/program used?
- Which multisensory method/program is most often chosen?
- What factors contribute to the selection of a multisensory teaching method/program?
- When a teacher chooses to teach multisensory does he choose a particular method or not?
- Which are the barriers to using multisensory teaching?
- When a teacher chooses to teach multisensory does he choose a particular method or not?
- Do teachers' viewpoints differ on the effectiveness and frequency of using multisensory teaching in students with dyslexia depending on the subject?
- Do teachers' viewpoints differ on the effectiveness of using multisensory teaching in students with dyslexia?
- Do teachers' viewpoints on the effectiveness of the use of multisensory teaching differ depending on the type of school (Kindergarten, Elementary) and educator's specialty?
- Do teachers' viewpoints on the effectiveness, frequency and ease of use of multisensory teaching differ according to the number of students taught per hour?
- Do teachers' viewpoints differ on their desire to be trained in multisensory teaching methods?
- Does the cost impact teachers' willingness to undergo training in multisensory teaching methods?
- Do teachers believe that multisensory teaching contributes to equal educational opportunities to students with dyslexia?

- Do teachers' viewpoints on the effectiveness, ease of use, frequency of multisensory teaching and the necessary multisensory background differ according to if they are specialized in special education?
- Do teachers have a clear understanding of what multisensory teaching is, how to effectively implement it and who is the appropriate teacher to implement it?

### 8.2. Means of data collection

The questionnaire served as the primary tool for gathering research data, representing a fundamental method extensively employed in social science research (Pappas, 2002). The selection criteria for the questionnaire also included its suitability for administration to a broad subject sample, offering diversity in terms of factors such as gender, age, years of prior service, and more.

The selection of questions has been designed ad-hoc to achieve the objectives of this research. The questionnaire is divided into two sections. The first section covers individual and demographic characteristics, including age, gender, education, and more. The second section consists of 43 specific closed-ended questions that probe teachers' opinions related to the study's subject matter. The formulation of these questions took into consideration relevant literature, aligning with the research's objectives and inquiries, as detailed in the subsequent sub-chapter. All questions within the questionnaire were mandatory.

Regarding the type of questions used in the questionnaire:

- The questions pertaining to individual and demographic data are designed as closed-ended questions, offering dichotomous choices or multiple-choice options with both single and multiple answers.
- The special questions are exclusively closed-ended in nature. These include dichotomous questions, multiple-choice questions with single-choice answers, and one multiple-choice question that allows for the selection of multiple options/answers.

Prior to the official distribution of the questionnaire, a pilot test was conducted with a sample of 20 teachers to assess various aspects, including the clarity of the questions, their comprehensiveness in terms of addressing potential responses, the overall appeal,

length, and the time required for completion (Cohen et al., 2008). Following necessary revisions and adjustments, the final version of the questionnaire was then formulated and administered for example, in some question the term teacher was replaced by the term educator which is more general in Greece.

The distribution of the questionnaires occurred during the school year 2022-2023, spanning from January 2022 to June 2023. This timeframe was chosen as it allowed teachers to gain a more comprehensive understanding of their students' needs and to develop teaching methods and programs accordingly. The questions were tailored to this specific school year and the particular school where teachers were employed. This approach was necessary to establish a focused framework for study and observation.

The questionnaires were disseminated to primary education teachers in the Heraklion prefecture, including general and special education teachers, as well as kindergarten teachers. The questions were designed to capture teachers' formed opinions.

To ensure a representative sample and mitigate bias, the questionnaires were distributed online to all primary and kindergarten schools in the Heraklion prefecture. Heraklion is a sizable and diverse prefecture in Greece, characterized by both geographical and cultural heterogeneity. The objective was to obtain insights from teachers covering a broad spectrum of the Heraklion prefecture.

It is important to note that the questionnaire responses were collected anonymously for ethical reasons, a fact that was emphasized to inform participating teachers. The online distribution method ensured that even teachers in remote schools had the opportunity to respond, providing them with a greater sense of anonymity compared to traditional paper questionnaires.

The questions of the questionnaire were designed and formulated so that results could be obtained regarding the research questions.

At the onset of the questionnaire, participants were provided with information regarding the research's objectives, along with a declaration of confidentiality and anonymity from the researcher. The questionnaire's questions were strategically crafted to address the research questions posed. In some cases, certain questions were designed to provide insights for multiple research questions. Below in the table 8.2. are the research questions that the questionnaire aimed to address.

**Table 8.2.**

*Number and type of questions and the corresponding objective*

| Objectives | Question number of questionnaire | Type of question |
|---|---|---|
| 1. Describe the know-how of the teachers about multisensory teaching methods/programs, as well as identify the frequency of use of depending on the subject. | 1 | multiple-choice question (multiple answers were allowed) |
| | 4, 5, 9, 10, 11, 12, 14, 15, 17, 21, 22, 23, 28, 29, 43 | five-point scale question (one answer was allowed) |
| | 24 | multiple-choice question (one answer was allowed) |
| | 26, 27 | matrix multiple-choice question with a four-point scale (one answer per row was allowed) |
| 2. Identify the barriers to the use of multisensory practices and the factors that influence the choice of a multisensory method/program, the choice of a specific or not multisensory method/program. | 6, 13, 14, 15, 17, 20, 21, 22, 23, 24 | five-point scale question (one answer was allowed) |
| | 25, 31 | matrix multiple-choice question with a four-point scale (one answer per row was allowed) |
| 3. Identify the effectiveness of using multisensory teaching methods/programs for students with dyslexia and non-dyslexic students, depending on the type of school (kindergarten, primary school), the specialization in special education, the number of students and students with dyslexia. | 2, 3, 7, 8, 17, 18, 19, 20, 30, 34, 35, 36, 37, 38 | five-point scale question (one answer was allowed) |
| | 16 | multiple-choice question (one answer was allowed) |
| 4. Identify teachers' interest in receiving training and their beliefs about the need for specific training to implement multisensory teaching methods/programs. | 17, 33, 40, 41, 42 | five-point scale question (one answer was allowed) |

| | | |
|---|---|---|
| 5. Identify the educators' viewpoints about the inclusion of students with dyslexia through multisensory teaching methods/programs | 6, 36, 37, 38, 39 | five-point scale question (one answer was allowed) |

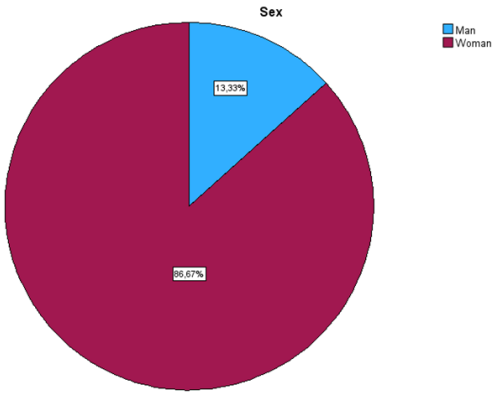
### 8.3. The research sample

A total of 285 teachers participated in the completion of the questionnaire, with 38 being male and 247 female. The surveyed teachers exclusively belonged to the fields of standard and special education, either as primary school teachers or kindergarten teachers.

To determine the sample size, given the inability to accurately ascertain the total number of teachers in the prefecture within the research timeframe, an approximate calculation was made based on the organization of each school. The number of active teachers can fluctuate, with some going on long-term leaves during the year and being replaced when the Ministry conducts new recruitments. To achieve a representative sample, it was estimated that more than 270 educators, including both teachers and kindergarten teachers, should participate, which roughly corresponds to approximately 10% of the educational population relevant to this research.

Graph 8.3.1. illustrates the distribution of respondents by gender. Among all the teachers who participated in the research, 13,33% were male, while 86,67% were female. This notable gender disparity in the participant pool was anticipated, given that the teaching profession, particularly at the primary education level, is predominantly comprised of women. Consequently, male teachers in primary education constitute a minority. In light of these circumstances, the sample can be considered representative.

**Graph 8.3.1.**




Graph 8.3.2. presents the age distribution of the respondents in percentages. Of the total participants, 4,91% are 21-25 years old, 19,30% are 26-30 years old, 28,07% are 31-35 years old, 22,46% are 36-40 years old, and 25,26% are 41 and over. Although the 21-25 age group represents only 4,91% of the sample, it can still be considered representative, as there are very few teachers in this age range working.

**Graph 8.3.2.**

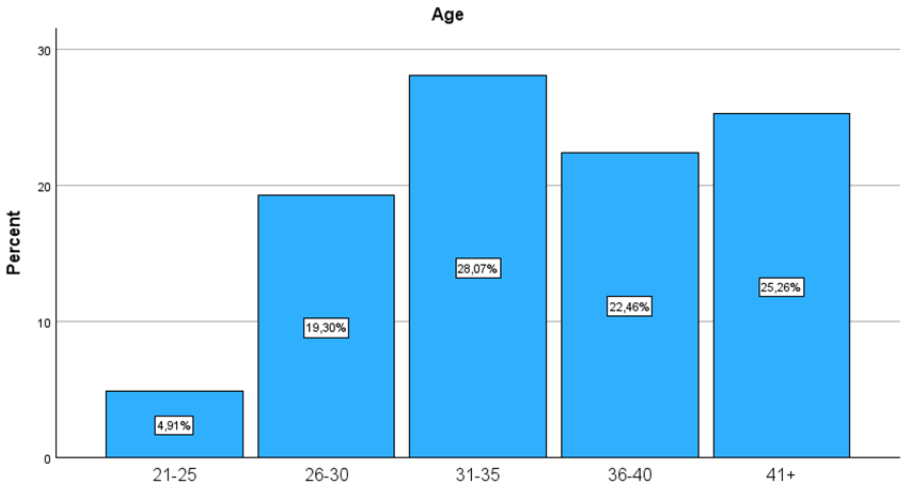



Table 8.3.1 presents the distribution of the respondents regarding their years of service. The first column shows the years of service, the second column the number of participants, and the third column the percentage of respondents' responses. More specifically, it is observed that 48 people have experience from 1 to 5 years, 43 people have experience from 6 to 10 years, 79 people have experience from 11 to 15 years, 67 people have experience from 16 to 20 years, and 48 people have experience of 21 years and above.

**Table 8.3.1.**

*Absolute and percentage distribution of the sample of teachers by year of prior service*

| Years of prior service | Frequency (N) | Percentage % |
|---|---|---|
| **1-5** | 48 | 16,8 |
| **6-10** | 43 | 15,1 |
| **11-15** | 79 | 27,7 |
| **16-20** | 67 | 23,5 |
| **21+** | 48 | 16,8 |
| **Total** | **285** | **100,0** |

Table 8.3.2. presents the distribution of the participants' responses regarding their specialty. More specifically, 69 kindergarten teachers and 216 teachers took part in the research. This large difference in the number of participants regarding specialty was expected, as kindergartens in Greece have a maximum of 2 classes, while elementary schools have 6 grades, so elementary schools typically have at least three times as many teachers.

**Table 8.3.2.**

*Absolute and percentage distribution of the sample of teachers by specialty*

| Specialty | Frequency (N) | Percentage % |
|---|---|---|
| **Kindergarten teacher** | 69 | 24,2 |
| **Teacher** | 216 | 75,8 |
| **Total** | **285** | **100,0** |

Graph 8.3.3. presents the distribution of respondents' answers regarding the further identification of the participating teachers' specialty in percentages. More specifically, 59,30% of the teachers who took part in the survey were general education teachers, 19,65% were general education kindergarten teachers, 17,54% were special education teachers, and 3,51% were special education kindergarten teachers. The percentage difference between teachers and kindergarten teachers exists for the same reasons mentioned in Table 8.3.1.

**Graph 8.3.3.**

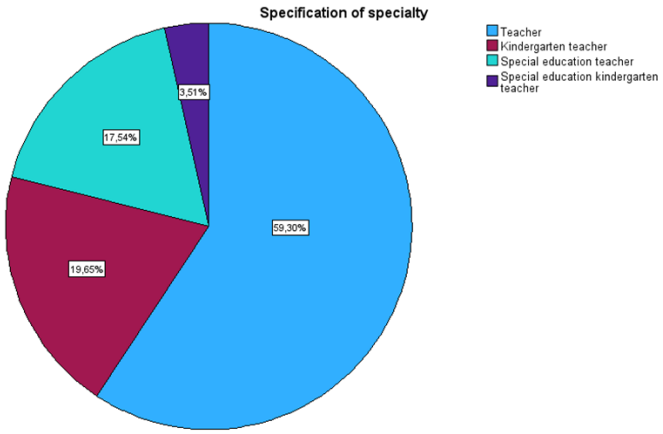



Table 8.3.3. displays the distribution of responses from participating teachers, categorized based on whether they work in typical or special education. Specifically, the left column delineates between typical and special education, the second column denotes the number of responses, and the third column represents the corresponding percentage of responses. Out of the 285 teachers who participated in the survey, 206 are employed as typical education teachers, while 79 work in special education. The notable disparity in response numbers can be attributed to the relatively smaller population of special education students, resulting in fewer teachers specializing in this field compared to typical education.

**Table 8.3.3.**

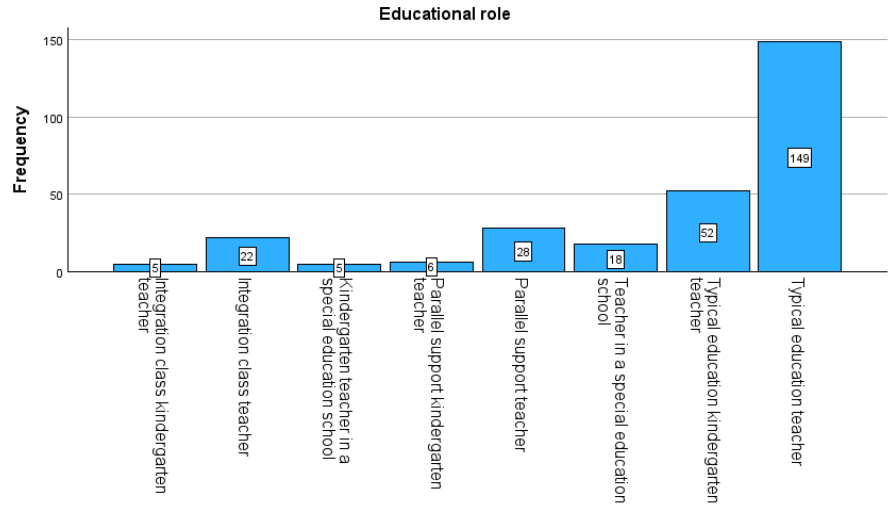
*Absolute and percentage distribution of the sample of educators by work in a typical or special education structure*

| Typical education or special education | Frequency (N) | Percentage % |
|---|---|---|
| Typical Education | 206 | 72,3 |
| Special Education | 79 | 27,7 |
| **Total** | **285** | **100,0** |

Graph 8.3.4. showcases the distribution of respondents' educational roles. Specifically, 5 respondents work as kindergarten teachers in an integration class, 22 respondents are teachers in an integration class, 5 respondents work as kindergarten teachers in a special school, 6 respondents work as parallel support kindergarten teachers, 28 respondents work as parallel support teachers, 18 respondents work as teachers in special schools,

while 52 respondents work as kindergarten teachers in typical education, and 149 respondents are teachers in typical education.

**Graph 8.3.4.**




Graph 8.3.5. displays the distribution of respondents based on their highest level of education. Specifically, 42,81% of the respondents have a bachelor's degree, while the majority, constituting 57,19%, hold a master's degree.

**Graph 8.3.5.**

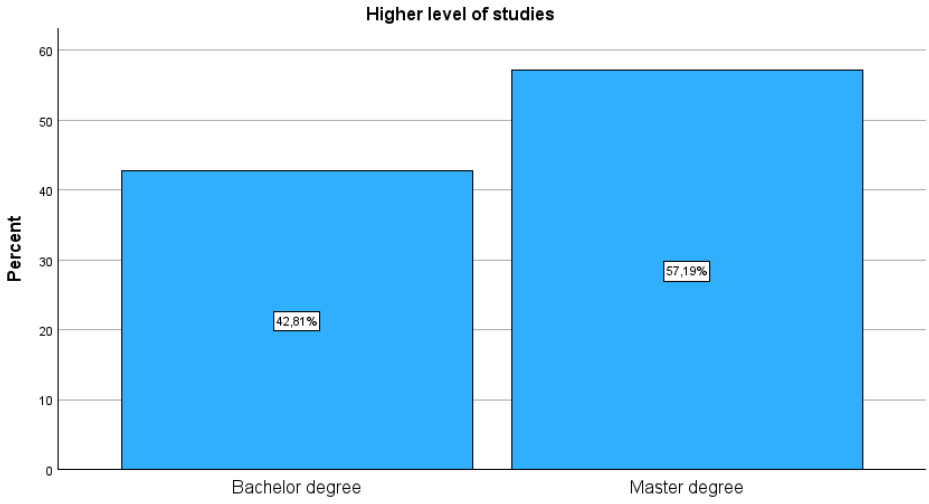



Table 8.3.4. illustrates the percentage distribution of respondents' answers concerning their expertise in special education. The first column specifies the specialization in special education, the second column indicates the number of responses, and the third

column represents the responses as a percentage Approximately 50,9% of the respondents indicated that they possess expertise in special education, while the remaining 49,1% responded negatively.

**Table 8.3.4.**

*Absolute and percentage distribution of the sample of teachers by specialization in special education*

| Specialization in special education | Frequency (N) | Percentage % |
|---|---|---|
| No | 140 | 49,1 |
| Yes | 145 | 50,9 |
| **Total** | **285** | **100,0** |

Table 8.3.5. displays the distribution of respondents' answers regarding the type of school they were employed in during the year when the survey was conducted. The first column specifies the type of school, the second column indicates the number of responses, and the third column represents the responses as a percentage. It is evident that 90,9% of the participants worked in standard education schools, while 9,1% were employed in special schools.

**Table 8.3.5.**

*Absolute and percentage distribution of the sample of teachers by school type*

| Type of school you are working in the current school year | Frequency (N) | Percentage % |
|---|---|---|
| Typical education school | 259 | 90,9 |
| Special education school | 26 | 9,1 |
| **Total** | **285** | **100,0** |

Graph 8.3.6. shows the distribution of the number of respondents' answers regarding the employment relationship. More specifically, 193 of the respondents are permanent and 92 of the respondents are temporary (deputy).

**Graph 8.3.6.**

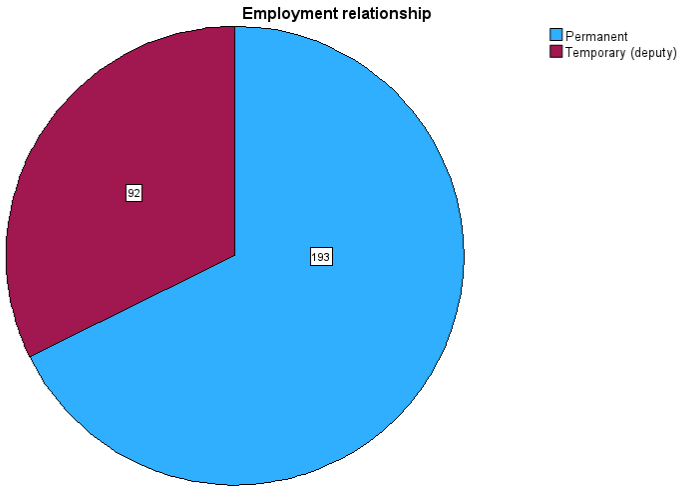



Table 8.3.6. presents the number of students per hour according to the responses of the respondents. The first column shows a grouping of the number of students, the second column shows the distribution of respondents' answers and the third column shows the percentage of answers. More specifically, 9,5% of respondents stated that they teach 1 student per hour, 14,4% 2-4 students, 15,1% 5-7 students and 61,0% 8 or more students.

**Table 8.3.6.**

*Absolute and percentage distribution of the Sample of teachers by number of students they teach in the current school year*

| **Number of students taught per hour the current school year** | **Frequency (N)** | **Percentage %** |
|---|---|---|
| 1 | 27 | 9,5 |
| 2-4 | 41 | 14,4 |
| 5-7 | 43 | 15,1 |
| 8+ | 174 | 61,0 |
| **Total** | **285** | **100** |

## 8.4. Method of statistical analysis of the data

The statistical analysis of the data is both descriptive and inductive. In presenting the research results, we provide an overview of the distribution of absolute and relative frequencies of responses from the sampled teachers to the various questions.

The data collected from the survey were analyzed using the SPSS 29. software program. Descriptive analysis and correlation measures were employed to determine the nature and strength of relationships among the variables under investigation. The aim was to ascertain whether the observed relationships were applicable solely to the sample of 285 respondents or if they could be generalized to the broader population (Gnardellis, 2022). To achieve this, the Chi-Square test was utilized for the *r* x *c* correlation matrices.

The Pearson Chi-Square test is a deductive method employed to explore the relationship between two categorical variables within a correlation matrix. It tests the hypothesis that the two variables are independent of each other, indicating no mutual influence. When two variables are deemed independent, the expected frequencies for table cells are calculated by multiplying each cell's respective frequency ranges and then dividing by the total number of observations in the table.

In this analysis, pairs of variables were systematically tested against each other to investigate potential relationships. The results are presented in two tables. The first is a correlation table that arranges observations biaxially based on the two variables being examined. The second table provides the outcomes of the Chi-Square test and related procedures.

The first row of the table displays the results of the Pearson Chi-Square test, along with the corresponding p-value (Asymp. Sig. 2-sided). It's important to note that SPSS rounds the p-value to three decimal places, so a p-value that is actually less than 0.0005 is displayed as <0.001.

Towards the end of the Chi-Square Tests tables, the number and percentage of cells with expected frequencies lower than 5, as well as the lowest expected frequency in the table, are presented (Gnardellis, 2022).

In this study, statistical significance was defined when a≤0,05. All questions were analyzed quantitatively, except for question 1 (When I hear the phrase multisensory teaching I think…), for which a qualitative analysis was conducted. In this question, respondents could choose more than one answer in order to explore the range of their knowledge about multisensory teaching.

## 8.5. Research reliability-validity

The reliability of the research concerns the fidelity of the measurement of the subject under study. There are three basic types of reliability, stability, internal reliability, and interrater consistency (Cohen et al., 2008).

For the reliability of the research on the five-point scale questions in order to understand whether the questions in this questionnaire all reliably measure Cronbach's alpha was run. A Cronbach's alpha value above 0.7 is generally considered acceptable for most research purposes, indicator also adopted in the current research. At this point it should be noted that the test was not run for the demographic questions because it was not deemed necessary for question 1 “When I hear the phrase multisensory teaching I think...” as the question was in string format. From the assessment of the Cronbach index, it follows that for the present research the value of the index is very high, making the tool reliable.

For questions 2-43 (Although there were 42 questions, a total of N=84 appears, because some questions had more than one variable as they were in the form of a grid and had sub-questions) the Cronbach's alpha test gives the results shown in table 8.6.1.:

**Table 8.6.1.**

*Cronbach's Alpha of the Questionnaire*

| **Reliability Statistics** | | |
|---|---|---|
| **Cronbach's Alpha** | Cronbach's Alpha Based on Standardized Items | N of Items |
| **,840** | .904 | 84 |

The Cronbach's alpha coefficient of 0,840 suggests a high level of internal consistency for the scale used in the current study with the specific sample. This indicates that the items within the scale are reliably measuring the same underlying construct or concept, and the responses from the teachers and kindergarten teachers -both in typical and special education- of the Heraklion prefecture are consistent in their assessment of that construct.

The following criteria are used to examine the validity of the research:

k) Objectivity: the conduct of the research and the analysis and interpretation of its data must not be influenced by the personality of the researcher.
l) Methodology/Systematic Approach: The research is conducted systematically, following a predetermined plan, employing appropriate methods and techniques, and aiming to gather the necessary data for comprehending and addressing the subject under investigation.
m) Reproducibility: All essential information is presented transparently, enabling other researchers to replicate the study.
n) Empiricism: This implies that the research subject is observable and measurable, and that terms are defined with clarity and precision in all their aspects.
o) Public Accessibility: Access to the research design and results is granted. (Vamvoukas, 2010)

In this research, based on the criteria mentioned, its validity is ensured:

- The collection, analysis, and interpretation of research data are not contingent upon the researcher's personal biases but are grounded in the relevant literature, ensuring research objectivity.
- The research was meticulously conducted with a well-defined plan and appropriate methodologies and techniques selected after a thorough review of the pertinent literature, thereby guaranteeing research methodology.
- This research provides comprehensive and transparent descriptions of all its aspects, allowing another researcher to replicate it, ensuring research repeatability.
- The study elucidates pertinent concepts and theoretical frameworks concerning multisensory education, underscoring its empirical nature.
- Both the research design and its findings are openly accessible to anyone interested, ensuring research transparency and public access.

# CHAPTER 9

## RESEARCH RESULTS

### 9.1. Descriptive statistical

The research findings for each question are presented in a descriptive manner below. Table 9.1.1. provides the distribution of respondents' answers to the question "When I hear the phrase multisensory teaching I think...," allowing for more than one multiple-choice selection. The first column displays the possible answers, the second column indicates the number of respondents who selected each answer, and the third column represents the percentage of respondents who chose each answer. Based on this, it appears that the most popular response among the participants is "simultaneous activation of multiple senses", chosen by 263 individuals. This is followed by the response "an attractive course", which was selected by 203 people. The answers "rich logistical infrastructure" and "visual aids" were chosen by 174 and 170 individuals, respectively. Finally, the responses "a specific teaching method" and "Syllabus" were selected by 62 and 49 people, respectively.

**Table 9.1.1.**

*Absolute and percentage distribution of the sample of teachers regarding the question "When I hear the phrase multisensory teaching I think…"*

| When I hear the phrase multisensory teaching I think… | Frequency (N) | Percentage % |
|---|---|---|
| Special education students | 107 | 37,5 |
| Rich logistical infrastructure | 174 | 61,1 |
| Attractive course | 203 | 71,2 |
| Simultaneous activation of multiple senses | 263 | 92,3 |
| Visual aids | 170 | 59,7 |
| A specific teaching method | 62 | 21,8 |
| Syllabus | 49 | 17,2 |
| None of the above | 0 | 0,0 |

Graph 9.1.1. presents on a percentage scale the distribution of respondents' answers regarding the statement “Multisensory teaching helps students with dyslexia better understand the teaching objective”. More specifically, 12,28% stated that they disagree/strongly disagree, 9.47% neither agree nor disagree and 78,24% stated that they agree/strongly agree.

**Graph 9.1.1.**

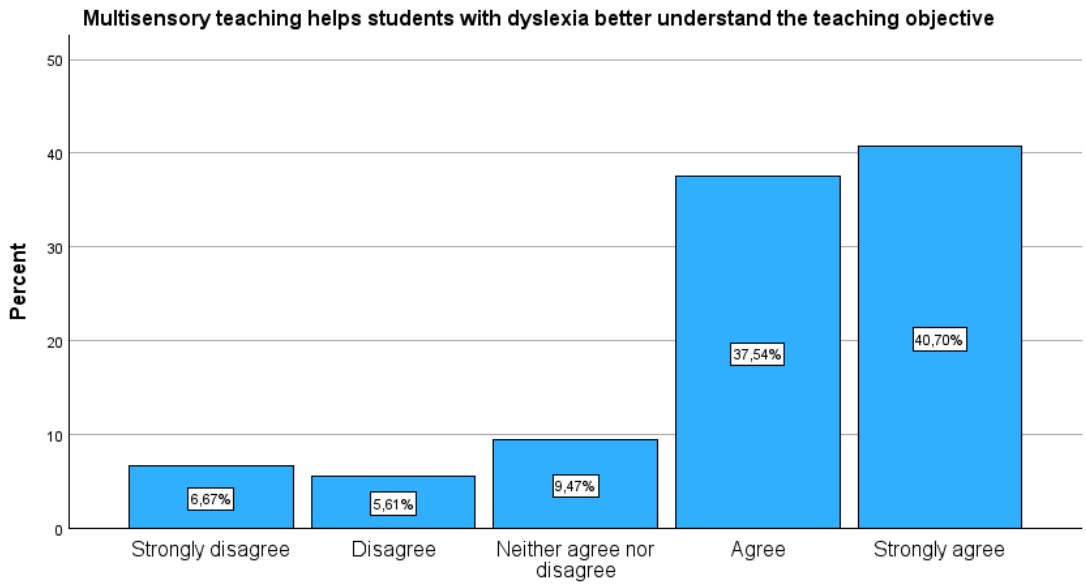



Table 9.1.2. shows the percentage distribution of respondents' answers regarding the statement “Multisensory teaching helps all students to better understand the teaching objective”. The first column shows the possible answers, the second column shows the distribution of respondents' answers and the third column shows the percentage of answers. More specifically, 7,4% strongly disagree, 11,2% disagree, 12,7% neither agree nor disagree, 33,3% agree and 35,4% strongly agree.

**Table 9.1.2**

*Absolute and percentage distribution of the sample of teachers regarding the question “Multisensory teaching helps all students to better understand the teaching objective”*

| **Multisensory teaching helps all students to better understand the teaching objective** | **Frequency (N)** | **Percentage %** |
|---|---|---|
| Strongly disagree | 21 | 7,4 |
| Disagree | 32 | 11,2 |
| Neither agree nor disagree | 36 | 12,7 |
| Agree | 95 | 33,3 |

| | | |
|---|---|---|
| Strongly agree | 101 | 35,4 |
| **Total** | **285** | **100,0** |

Table 9.1.3. presents the distribution of respondents' answers regarding if they have the necessary knowledge to teach their students multisensorily. The first column shows the possible answers, the second column the number of each answer and the third column the number of answers as a percentage. More specifically. Out of a total of 285 teachers, 35 stated that they strongly disagree, 58 that they disagree, 87 that neither agree nor disagree, 65 that they agree and 40 that they strongly agree.

**Table 9.1.3.**

*Absolute and percentage distribution of the sample of teachers regarding the question "I have the necessary knowledge to teach my students multisensorily"*

| **I have the necessary knowledge to teach my students multisensorily** | **Frequency (N)** | **Percentage %** |
|---|---|---|
| Strongly disagree | 35 | 12,3 |
| Disagree | 58 | 20,4 |
| Neither agree nor disagree | 87 | 30,5 |
| Agree | 65 | 22,8 |
| Strongly agree | 40 | 14,0 |
| **Total** | **285** | **100,0** |

Table 9.1.4. shows the percentage of the distribution of respondents' answers regarding the statement "I have the professional confidence to teach my students multisensorily". The first column shows the possible answers, the second column the number of each answer and the third column the number of answers as a percentage. As shown below, 11,2% of respondents answered that they strongly disagree, 22,5% that they disagree, 22,8% that neither agrees nor disagrees, 30,5% that they agree and 13,0% that they strongly agree.

**Table 9.1.4.**

*Absolute and percentage distribution of the sample of teachers regarding the question "I have professional confidence to teach my students multisensorily"*

| **I have professional confidence to teach my students multisensorily** | **Frequency (N)** | **Percentage %** |
|---|---|---|

| | | |
|---|---|---|
| Strongly disagree | 32 | 11,2 |
| Disagree | 64 | 22,5 |
| Neither agree nor disagree | 65 | 22,8 |
| Agree | 87 | 30,5 |
| Strongly agree | 37 | 13,0 |
| **Total** | **285** | **100,0** |

Graph 9.1.2. shows the distribution of respondents' answers regarding the statement "The school I work has the necessary resources to be able to teach my students multisensorily". More specifically, 142 of the 285 respondents gave a negative answer, 81 gave a positive answer and 62 neither agreed nor disagreed.

**Graph 9.1.2.**

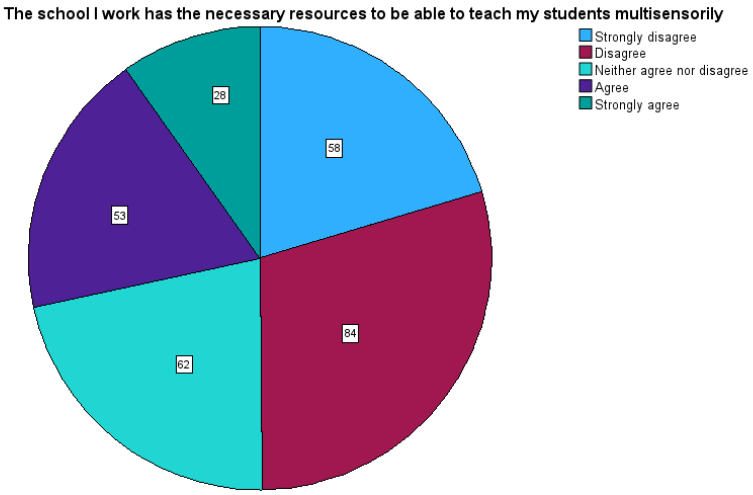



Table 9.1.5. shows the distribution of respondents' answers based on the statement "Multisensory teaching helps students with dyslexia to achieve learning goals in subjects related to language". The first column shows the possible answers, the second column the number of each answer and the third column the number of answers as a percentage. More specifically, 31 answered that they strongly disagree, 38 that they disagree, 44 that neither agree nor disagree, 104 that they agree and 68 that they strongly agree.

**Table 9.1.5.**

*Absolute and percentage distribution of the sample of teachers regarding the question "Multisensory teaching helps students with dyslexia to achieve learning goals in subjects related to language"*

| **Multisensory teaching helps students with dyslexia to achieve learning goals in subjects related to language** | **Frequency (N)** | **Percentage %** |
|---|---|---|
| Strongly disagree | 31 | 10,9 |
| Disagree | 38 | 13,3 |
| Neither agree nor disagree | 44 | 15,4 |
| Agree | 104 | 36,5 |
| Strongly agree | 68 | 23,9 |
| **Total** | **285** | **100,0** |

Table 9.1.6. illustrates the distribution of respondents' responses in percentage regarding the statement "Multisensory teaching helps students with dyslexia to achieve learning goals in subjects related to science". The first column shows the possible answers, the second column the number of each answer and the third column the number of answers as a percentage. The majority of respondents agree with the above statement and more specifically 16,5% strongly agree and 39,3% agree. Of the rest, 17,9% neither agree nor disagree, while the rest 17,2% and 9,1% strongly disagree and disagree respectively.

**Table 9.1.6.**

*Absolute and percentage distribution of the sample of teachers regarding the question "multisensory teaching helps students with dyslexia achieve learning goals in subjects related to science"*

| **Multisensory teaching helps students with dyslexia achieve learning goals in subjects related to science** | **Frequency (N)** | **Percentage %** |
|---|---|---|
| Strongly disagree | 26 | 9,1 |
| Disagree | 49 | 17,2 |
| Neither agree nor disagree | 51 | 17,9 |
| Agree | 112 | 39,3 |
| Strongly agree | 47 | 16,5 |
| **Total** | **285** | **100,0** |

Table 9.1.7. shows the distribution of respondents' answers regarding the statement "I use multisensory activities/teaching methods in subjects related to language". In the

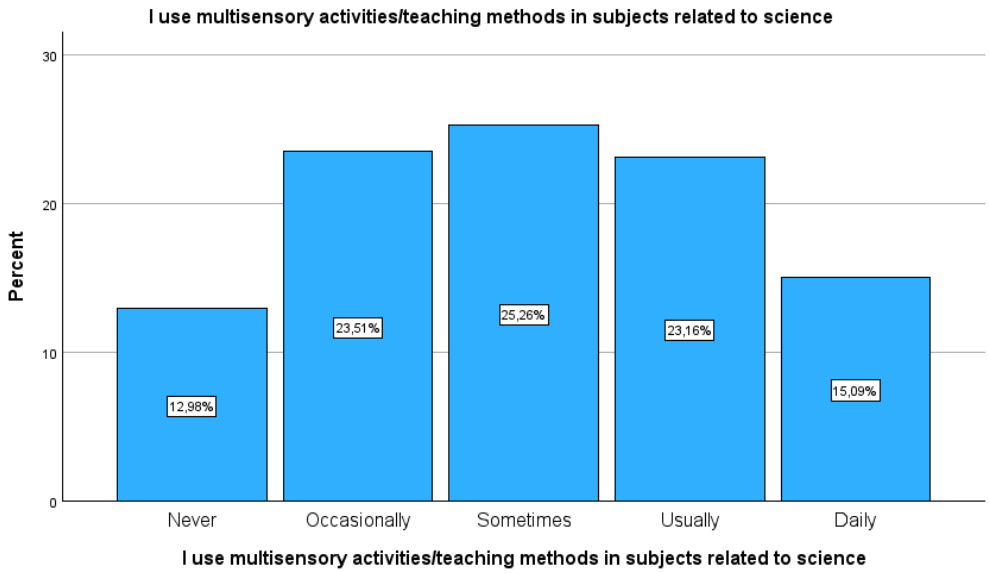
first column from the left, the possible answers are displayed regarding the frequency of use, in the second column the number in each answer and in the third column the number of answers in percentage. According to table 9.1.7., 12,6% declare that they never use, 20,4% that they use occasionally, 24,9% that they use sometimes, 28,1% that they use often and 14% that they use daily.

**Table 9.1.7.**

*Absolute and percentage distribution of the sample of teachers regarding the question "I use multisensory activities / teaching methods in subjects related to language"*

| **I use multisensory activities / teaching methods in subjects related to language** | **Frequency (N)** | **Percentage %** |
|---|---|---|
| Never | 36 | 12,6 |
| Occasionally | 58 | 20,4 |
| Sometimes | 71 | 24,9 |
| Usually | 80 | 28,1 |
| Daily | 40 | 14,0 |
| **Total** | **285** | **100,0** |

Graph 9.1.3. presents the distribution of respondents' responses in percentage regarding the statement "I use multisensory activities/teaching methods in subjects related to science". According to this graph, 12,98% say that they never use, 23,51% that they use occasionally, 25,26% that they use sometimes, 23,16% that they use often and 15,09% that he uses daily.



In Table 9.1.8., the distribution of respondents' answers regarding the statement “I use multisensory activities/teaching methods regardless of the teaching subject” is depicted. In the first column from the left, the possible answers are displayed regarding the frequency of use, in the second column the number in each answer and in the third column the number of answers in percentage. More precisely, out of a total of 285 respondents, 30 answered “never”, 69 answered “occasionally”, 77 answered “sometimes”, 67 answered “usually”, and 42 answered “daily”.

**Table 9.1.8.**

*Absolute and percentage distribution of the sample of teachers regarding the question “I use multisensory activities / teaching methods regardless of the teaching subject”*

| **I use multisensory activities / teaching methods regardless of the teaching subject** | **Frequency (N)** | **Percentage %** |
|---|---|---|
| Never | 30 | 10,5 |
| Rarely | 69 | 24,2 |
| Occasionaly | 77 | 27,0 |
| Often | 67 | 23,5 |
| Daily | 42 | 14,7 |
| **Total** | **285** | **100,0** |

The distribution of respondents' answers to the statement “I use multisensory teaching” is shown in table 9.1.9. The first column from the left shows the possible answers regarding the frequency of use, the second column the frequency of answers and the third column, the percentages answers. As can be seen, only 7,4% of respondents stated that they never use, 25,3% that they use occasionally, 31,2% that they use sometimes, 22,1% that they use usually, and 14,0 % that he uses daily.

**Table 9.1.9.**

*Absolute and percentage distribution of the sample of teachers regarding the question “I use multisensory teaching”*

| **I use multisensory teaching** | **Frequency (N)** | **Percentage %** |
|---|---|---|
| Never | 21 | 7,4 |
| Occasionally | 72 | 25,3 |

| | | |
|---|---|---|
| Sometimes | 89 | 31,2 |
| Usually | 63 | 22,1 |
| Daily | 40 | 14,0 |
| **Total** | **285** | **100,0** |

Graph 9.1.4. shows the distribution of respondents' answers regarding the statement “Multisensory teaching requires more teaching time than I can spare”. According to this, of the 285 respondents, 77 gave a negative answer and 129 gave a positive answer. The remaining 79 stated that they neither agree nor disagree.

**Graph 9.1.4.**

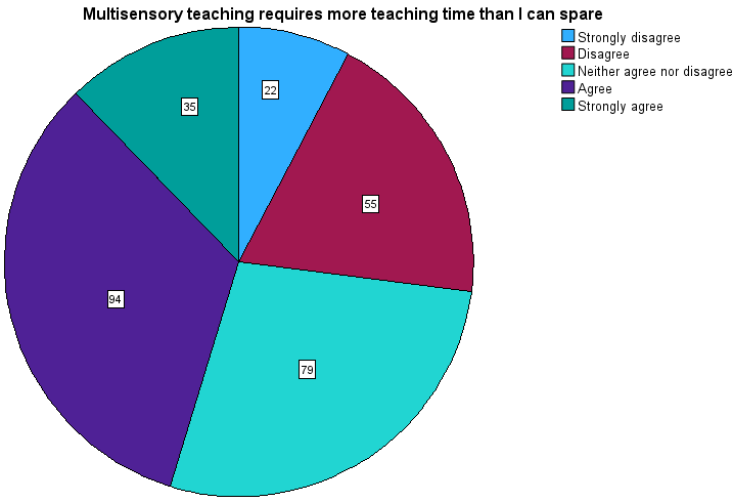



Table 9.1.10. presents the distribution of respondents' responses on a percentage scale regarding the statement “The syllabus is very stressful and I don't have time to implement multisensory activities with my students”. The first column from the left shows the possible answers, the second column the frequency of answers and the third column, the percentages answers. As can be seen, 11,2% declare that it is not stressful at all, 20,7% that it is slightly stressful, 27,0% that it is probably stressful, 29,1% that it is very much stressful and 11,9% that it is extremely stressful.

**Table 9.1.10.**

*Absolute (N) and percentage (%) distribution of the sample of teachers regarding the question "The syllabus is very stressful and I don't have time to implement multisensory activities with my students"*

| The syllabus is very stressful and I don't have time to implement multisensory activities with my students | Frequency (N) | Percentage % |
|---|---|---|
| Not at all | 32 | 11,2 |
| Slightly | 59 | 20,7 |
| Probably | 77 | 27,0 |
| Very much | 83 | 29,1 |
| Extremely | 34 | 11,9 |
| **Total** | **285** | **100,0** |

Table 9.1.11. presents the distribution of respondents' answers regarding the statement "I would like to become more familiar with the use of multisensory teaching methods before applying it to my students". The first column from the left shows the possible answers, the second column the number of responses received by each answer and the third column the number of responses in percentage. According to this, it is observed that 28 people stated that they strongly disagree, 34 people that they disagree, 65 people that neither agree nor disagree, 89 people that they agree, and 69 people that they strongly agree.

**Table 9.1.11**

*Absolute and percentage distribution of the sample of teachers regarding the statement "I would like to become more familiar with the use of multisensory teaching methods before applying it to my students"*

| I would like to become more familiar with the use of multisensory teaching methods before applying it to my students | Frequency (N) | Percentage % |
|---|---|---|
| Strongly disagree | 28 | 9,9 |
| Disagree | 34 | 11,9 |
| Neither agree nor disagree | 65 | 22,8 |
| Agree | 89 | 31,2 |
| Strongly agree | 69 | 24,2 |
| **Total** | **285** | **100,0** |

Table 9.1.12. shows the distribution of respondents' responses on a percentage scale regarding the statement "During the current academic year I have in my class ... students

with dyslexia". 28,07% of the respondents stated that they do not have any students with dyslexia in their class, 26,67 that they have 1, 33,33% that they have 2-3, 9,12% that they have 4-6, and 2,81% that it has 7 or more.

**Table 9.1.12**

*Absolute and percentage distribution of the sample of teachers regarding the question "During the current academic year I have in my class students with dyslexia"*

| **During the current academic year I have in my class students with dyslexia** | **Frequency (N)** | **Percentage %** |
|---|---|---|
| None | 80 | 28,1 |
| 1 | 76 | 26,7 |
| 2-3 | 95 | 33,3 |
| 4-6 | 26 | 9,1 |
| **7+** | 8 | 2,8 |
| **Total** | **285** | **100,0** |

Graph 9.1.5. presents the distribution of respondents' answers regarding the statement "Multisensory teaching can only be implemented by a special educator". As can be seen below, 54,39% of the respondents answered negatively, specifically 20,35% strongly disagreed and 34,04% disagreed. Of the remaining 45,61%, 18,95% stated that they neither agreed nor disagreed and 26,67% gave a positive answer.

**Graph 9.1.5.**

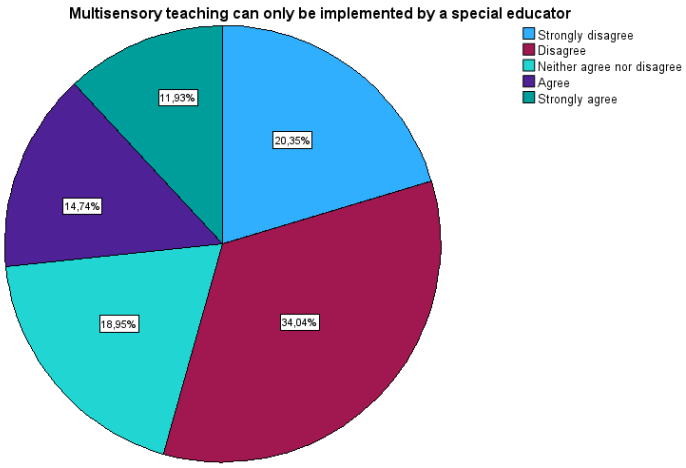


Table 9.1.13. presents the distribution of respondents' answers regarding the statement "Multisensory teaching is effectively implemented one-on-one". The first column from the left shows the possible answers, the second column the number of answers each category received, and the third column the number each category received on a percentage scale. According to table 9.1.13., 12,6% of the sample strongly disagreed, 17,9% disagreed, 17,5% neither agreed nor disagreed, 24,6% agreed, and 27,4% strongly agreed.

**Table 9.1.13.**

*Absolute and percentage distribution of the sample of teachers regarding the question "Multisensory teaching is effectively implemented one-on-one"*

| **Multisensory teaching is effectively implemented one-on-one** | **Frequency (N)** | **Percentage %** |
|---|---|---|
| Strongly disagree | 36 | 12,6 |
| Disagree | 51 | 17,9 |
| Neither agree nor disagree | 50 | 17,5 |
| Agree | 70 | 24,6 |
| Strongly agree | 78 | 27,4 |
| **Total** | **285** | **100,0** |

Table 9.1.14. shows the distribution of respondents' answers regarding the statement "Multisensory teaching is implemented effectively in a small group of students". The first column from the left shows the possible answers, the second column the number of answers each category received, and the third column the number each category received on a percentage scale. As shown below, 70 of the respondents gave a negative answer, 44 said neither agreed nor disagreed and the rest gave a positive answer.

**Table 9.1.14.**

*Absolute and percentage distribution of the sample of teachers regarding the question "Multisensory teaching is implemented effectively in a small group of students"*

| **Multisensory teaching is implemented effectively in a small group of students** | **Frequency (N)** | **Percentage %** |
|---|---|---|
| Strongly disagree | 31 | 10,9 |

| | | |
|---|---|---|
| Disagree | 39 | 13,7 |
| Neither agree nor disagree | 44 | 15,4 |
| Agree | 91 | 31,9 |
| Strongly agree | 80 | 28,1 |
| **Total** | **285** | **100,0** |

Graph 9.1.6. presents the distribution of respondents' answers regarding the statement “Multisensory teaching is implemented effectively in the whole class”. Of the total sample, 34 strongly disagreed, 64 disagreed, 84 neither agreed nor disagreed, 62 agreed, and 41 strongly agreed.

**Graph 10.1.6.**

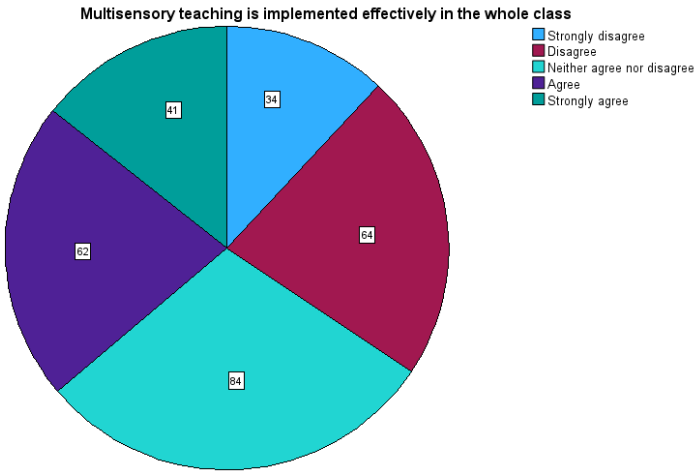



Table 9.1.15. shows the percentage distribution of respondents' answers regarding the statement “Multisensory teaching is easily implemented one-on-one”. The first column from the left shows the possible answers, the second column the number of answers each category received, and the third column the number each category received on a percentage scale. According to this, 10,2% strongly disagreed, 13,3% disagreed, 16,1% neither agreed nor disagreed. 27,4% and 33,0% answered agreed and strongly agreed respectively.

**Table 9.1.15.**

*Absolute and percentage distribution of the sample of teachers regarding the question "Multisensory teaching is easily implemented one-on-one"*

| Multisensory teaching is easily implemented one-on-one | Frequency (N) | Percentage % |
|---|---|---|
| Strongly disagree | 29 | 10,2 |
| Disagree | 38 | 13,3 |
| Neither agree nor disagree | 46 | 16,1 |
| Agree | 78 | 27,4 |
| Strongly agree | 94 | 33,0 |
| **Total** | **285** | **100,0** |

Table 9.1.16. shows the distribution of respondents' answers regarding the statement "Multisensory teaching is easily implemented in a small group of students". The first column from the left shows the possible answers that someone could give, the second column shows the number of the sample that each category received, and the third column shows the number that each category received as a percentage. As shown below, 53 people gave a negative answer, 185 people gave a positive answer and the remaining 47 stated that they neither agree nor disagree.

**Table 9.1.16.**

*Absolute and percentage distribution of the sample of teachers regarding the question "Multisensory teaching is easily implemented in a small group of students"*

| Multisensory teaching is easily implemented in a small group of students | Frequency (N) | Percentage % |
|---|---|---|
| Strongly disagree | 19 | 6,7 |
| Disagree | 34 | 11,9 |
| Neither agree nor disagree | 47 | 16,5 |
| Agree | 111 | 38,9 |
| Strongly agree | 74 | 26,0 |
| **Total** | **285** | **100,0** |

Table 9.1.17 presents the percentage distribution of respondents' answers regarding the statement "Multisensory teaching is easily implemented in the whole class". The first

column from the left shows the possible answers that someone could give, the second column shows the number of the sample that each category received, and the third column shows the number that each category received as a percentage. As shown in table 9.1.17, 20,0% of the respondents stated that they "strongly disagree", 30,5% that they disagreed, 23,5% that neither agreed nor disagreed, 18,6% that they agreed, and 7,4% that strongly agreed.

**Table 9.1.17.**

*Absolute and percentage distribution of the sample of teachers regarding the question "Multisensory teaching is easily implemented in the whole class"*

| **Multisensory teaching is easily implemented in the whole class** | **Frequency (N)** | **Percentage %** |
|---|---|---|
| Strongly disagree | 57 | 20,0 |
| Disagree | 87 | 30,5 |
| Neither agree nor disagree | 67 | 23,5 |
| Agree | 53 | 18,6 |
| Strongly agree | 21 | 7,4 |
| **Total** | **285** | **100,0** |

Graph 9.1.7. illustrates the percentage distribution of respondents' answers regarding the statement "I use a specific method of multisensory teaching". According to this, 79,65% of the respondents stated that they do not use a specific method, while 20,35% that they do.

**Graph 9.1.7.**

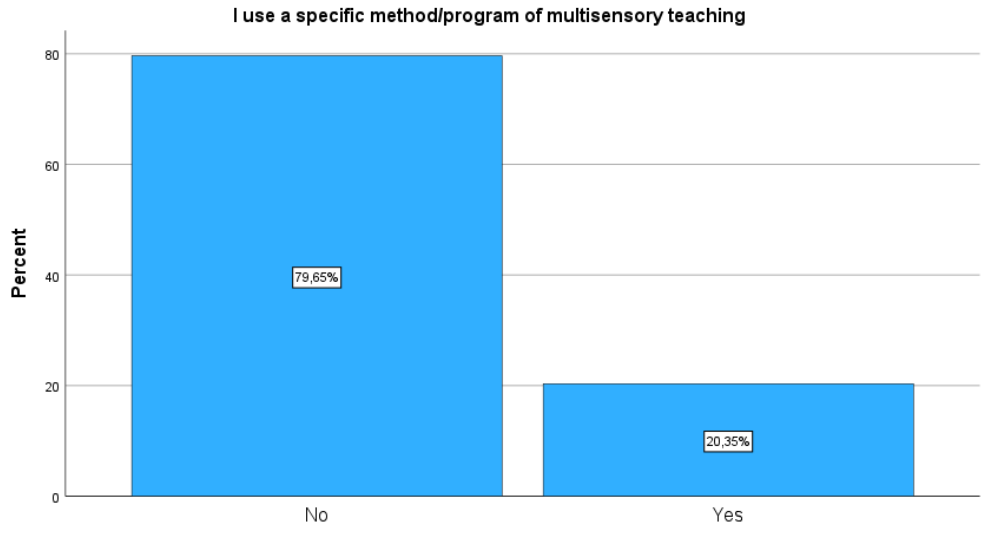


Table 9.1.18. presents the distribution of respondents' answers regarding the statement "Choosing or not to use multisensory teaching depends on the lesson". The first column from the left shows the possible responses, the second column shows the number of responses each category received, and the third column shows the number of responses as a percentage. According to this table, it is observed that 97 people consider it "not important at all" and "of little importance", while 188 people characterize it as "very importart" and "absolutely essential".

**Table 9.1.18.**

*Absolute and percentage distribution of the sample of teachers regarding the question "Choosing to use multisensory teaching depends on: [The lesson]"*

| **Choosing to use multisensory teaching depends on: [The lesson]** | **Frequency (N)** | **Percentage %** |
|---|---|---|
| Not important at all | 38 | 13,3 |
| Of little importance | 59 | 20,7 |
| Very important | 134 | 47,0 |
| Absolutely essential | 54 | 19,0 |
| **Total** | **285** | **100,0** |

Table 9.1.19. shows the percentage distribution of respondents' answers regarding the statement "Choosing or not to use multisensory teaching depends on the teaching objective". The first column from the left shows the possible responses, the second column shows the number of responses each category received, and the third column shows the number of responses as a percentage. According to this table, 10,5% characterize it as "not important at all", 16,8% as "of little importance", 40,0% as "very important", and 32,63% as "absolutely essential".

**Table 9.1.19.**

*Absolute and percentage distribution of the sample of teachers regarding the question "Choosing to use multisensory teaching depends on: [The teaching objective]"*

| **Choosing to use multisensory teaching depends on: [The teaching objective]** | **Frequency (N)** | **Percentage %** |
|---|---|---|
| Not important at all | 30 | 10,5 |

| | | |
|---|---|---|
| Of little importance | 48 | 16,8 |
| Very important | 114 | 40,0 |
| Absolutely essential | 93 | 32,6 |
| **Total** | **285** | **99,9** |

Table 9.1.20. shows the distribution of respondents' answers regarding the statement "Choosing or not to use multisensory teaching depends on the time I can spare". The first column from the left shows the possible responses, the second column shows the number of responses each category received, and the third column shows the number of responses as a percentage. As can be seen below, of the total sample, 27 considered it "not important at all", 57 "of little importance", 117 "very important", and 84 "absolutely essential".

**Table 9.1.20.**

*Absolute and percentage distribution of the sample of teachers regarding the question "Choosing to use multisensory teaching depends on: [The time I can spare]"*

| **Choosing to use multisensory teaching depends on: [The time I can spare]** | **Frequency (N)** | **Percentage %** |
|---|---|---|
| Not important at all | 27 | 9,5 |
| Of little importance | 57 | 20,0 |
| Very important | 117 | 41,0 |
| Absolutely essential | 84 | 29,5 |
| **Total** | **285** | **100,0** |

Table 9.1.21. presents the distribution of respondents' answers regarding the statement "Choosing or not to use multisensory teaching depends on my background knowledge". The first column from the left shows the possible responses, the second column shows the number of responses each category received, and the third column shows the number of responses as a percentage. As shown below, 42 respondents said they do not consider it important at all, 67 said they consider it of little importance, 103 said they consider it very important, and 73 said they consider it absolutely essential.

**Table 9.1.21.**

*Absolute and percentage distribution of the sample of teachers regarding the question "Choosing to use multisensory teaching depends on: [My background knowledge]"*

| **Choosing to use multisensory teaching depends on: [My background knowledge]** | **Frequency (N)** | **Percentage %** |
|---|---|---|
| Not important at all | 42 | 14,7 |
| Of little importance | 67 | 23,5 |
| Very important | 103 | 36,1 |
| Absolutely essential | 73 | 25,6 |
| **Total** | **285** | **100,0** |

Table 9.1.22. shows the distribution of the responses of the interviewed teachers regarding the statement "choosing or not to use multisensory teaching depends on inclusion". In the first column from the left, the categories are shown, in the second column the number of votes collected by each category and in the third column the number of votes collected by each category on a percentage scale. As can be seen, only 87 people consider it "not important at all" or "of little importance", while the remaining 198 consider it very important or "absolutely essential".

**Table 9.1.22.**

*Absolute and percentage distribution of the sample of teachers regarding the question "Choosing to use multisensory teaching depends on: [Inclusion of all students]"*

| **Choosing or not to use multisensory teaching depends on: [Inclusion of all students]** | **Frequency (N)** | **Percentage %** |
|---|---|---|
| Not important at all | 32 | 11,2 |
| Of little importance | 55 | 19,3 |
| Very important | 96 | 33,7 |
| Absolutely essential | 102 | 35,8 |
| **Total** | **285** | **100,0** |

Table 9.1.23. presents the percentage distribution of respondents' answers regarding the statement "Choosing or not to use multisensory teaching depends on the technological

equipment I have". In the first column from the left, the categories are shown, in the second column the number of votes collected by each category and in the third column the number of votes collected by each category on a percentage scale. As shown below, 10,5% of the sample considers that it is not important at all, 24,2% that it is of little importance, 35,1% that it is very important, and 30,2% that it is absolutely essential.

**Table 9.1.23.**

*Absolute and percentage distribution of the sample of teachers regarding the question "Choosing to use multisensory teaching depends on: [The technological equipment I have]"*

| **Choosing to use multisensory teaching depends on: [The technological equipment I have]** | **Frequency (N)** | **Percentage %** |
|---|---|---|
| Not important at all | 30 | 10,5 |
| Of little importance | 69 | 24,2 |
| Very important | 100 | 35,1 |
| Absolutely essential | 86 | 30,2 |
| **Total** | **285** | **100,0** |

Graph 9.1.8. presents the percentage distribution of respondents' answers regarding the statement "I am familiar with the Orton-Gillingham teaching method". As shown below, 50,88% of the sample stated that they do not know it at all, 27,02% that they know it slightly, 18,25% that they know it quite a bit, and 3,86% extremely.

**Graph 9.1.8.**

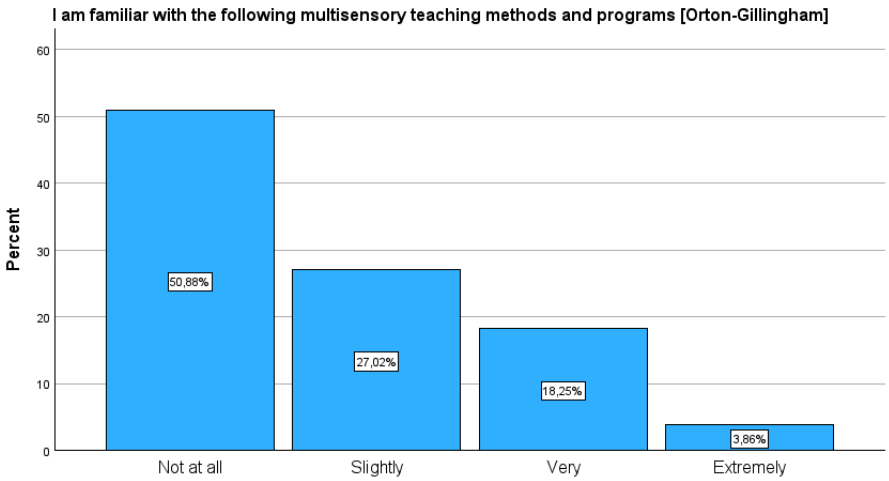


Table 9.1.24. illustrates the percentage distribution of respondents' answers to the statement “I am familiar with the Lindamood Phoneme Sequencing® Program (LiPS)”. The leftmost column displays the possible responses, the second column indicates the number of responses within each category, and the third column represents the percentage of responses in each category. Among the respondents, 78,2% indicated that they have no knowledge of it, 19,0% mentioned having slight familiarity, 2,5% claimed to know it quite well, and 0,4% reported being highly familiar with it.

**Table 9.1.24.**

*Absolute and percentage distribution of the sample of teachers regarding the question “I am familiar with the following multisensory teaching methods and programs [LiPS]”*

| **I am familiar with the following multisensory teaching methods and programs [LiPS]** | **Frequency (N)** | **Percentage %** |
|---|---|---|
| Not at all | 223 | 78,2 |
| Slightly | 54 | 18,9 |
| Very | 7 | 2,5 |
| Extremely | 1 | 0,4 |
| **Total** | **285** | **100,0** |

Table 9.1.25. illustrates the percentage distribution of respondents' answers regarding their familiarity with the Bangor Dyslexia Teaching System. The leftmost column displays the possible responses, the second column indicates the number of responses within each category, and the third column represents the percentage of responses in each category. According to this chart, 75,09% stated that they are not familiar with it at all, 21,40% mentioned they have slight familiarity with it, and 3,51% reported that they are very familiar with it.

**Table 9.1.25.**

*Absolute and percentage distribution of the sample of teachers regarding the question “I am familiar with the following multisensory teaching methods and programs [BDTS]”*

| **I am familiar with the following multisensory teaching methods and programs [BDTS]** | **Frequency (N)** | **Percentage %** |
|---|---|---|
| Not at all | 214 | 75,1 |
| Slightly | 61 | 21,4 |

| | | |
|---|---|---|
| Very | 10 | 3,5 |
| Extremely | 0 | 0,0 |
| **Total** | **285** | **100,0** |

Table 9.1.26. provides the distribution of respondents' answers regarding their familiarity with the Barton Reading and Spelling System. The leftmost column displays the possible responses, the second column indicates the number of responses within each category, and the third column represents the percentage of responses in each category. The majority of respondents, specifically 228 individuals, indicated that they are not familiar with it at all, while 49 respondents mentioned slight familiarity, 6 reported being very familiar, and 2 claimed to be extremely familiar with it.

**Table 9.1.26.**

*Absolute and percentage distribution of the sample of teachers regarding the question "I am familiar with the following multisensory teaching methods and programs [BRSS]"*

| **I am familiar with the following multisensory teaching methods and programs [BRSS]** | **Frequency (N)** | **Percentage %** |
|---|---|---|
| Not at all | 228 | 80,0 |
| Slightly | 49 | 17,2 |
| Very | 6 | 2,1 |
| Extremely | 2 | 0,7 |
| **Total** | **285** | **100,0** |

Graph 9.1.9. illustrates the distribution of respondents' familiarity with the Jolly Phonics teaching method. According to the graph, 209 respondents indicated that they are not familiar with it at all, 61 mentioned slight familiarity, 12 claimed to be very familiar, and 3 reported being extremely familiar with it.

**Graph 9.1.9.**

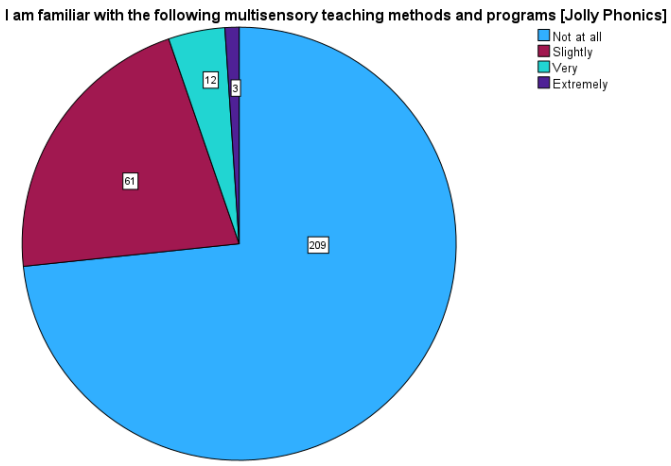



Table 9.1.27. displays the percentage distribution of respondents' familiarity with the Alphabetic Phonics multisensory program. The leftmost column displays the possible responses, the second column indicates the number of responses within each category, and the third column represents the percentage of responses in each category. According to this table, 72,6% of the respondents reported not knowing it at all, 21,0% mentioned slight familiarity, 5,6% claimed to know it a lot, and 0,7% stated that they are extremely familiar with it.

**Table 9.1.27.**

*Absolute and percentage distribution of the sample of teachers regarding the question "I am familiar with the following multisensory teaching methods and programs [Alphabetic Phonics]"*

| **I am familiar with the following multisensory teaching methods and programs [Alphabetic Phonics]** | **Frequency (N)** | **Percentage %** |
|---|---|---|
| Not at all | 207 | 72,6 |
| Slightly | 60 | 21,1 |
| Very | 16 | 5,6 |
| Extremely | 2 | 0,7 |
| **Total** | **285** | **100,0** |

Table 9.1.28. presents the distribution of respondents' familiarity with the PRS and VRS teaching methods. In the table, the leftmost column lists the possible responses, the

second column indicates the number of responses in each category, and the third column represents the percentage of responses. Specifically, 164 teachers reported being completely unfamiliar with these methods, 81 indicated slight familiarity, 9 claimed to be very familiar, and 1 mentioned being extremely familiar.

**Table 9.1.28.**

*Absolute and percentage distribution of the sample of teachers regarding the question "I am familiar with the following multisensory teaching methods and programs [PRS VRS]"*

| **I am familiar with the following multisensory teaching methods and programs [PRS VRS]** | **Frequency (N)** | **Percentage %** |
|---|---|---|
| Not at all | 194 | 68,1 |
| Slightly | 81 | 28,4 |
| Very | 9 | 3,3 |
| Extremely | 1 | 0,4 |
| **Total** | **285** | **100,0** |

Graph 9.1.10 displays the distribution of respondents' familiarity with the visualization-verbalization teaching methods. In the graph, it is evident that out of the total 285 teachers surveyed, 230 indicated that they have no knowledge of it at all, 46 mentioned slight familiarity, and 9 claimed to know it very well.

**Graph 9.1.10.**

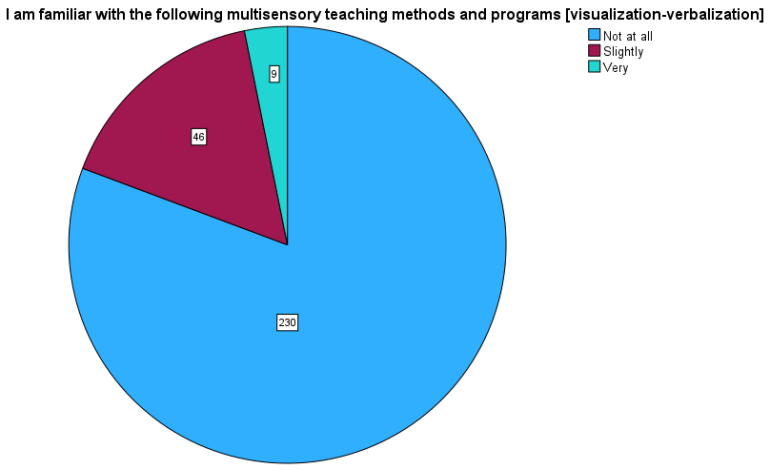


Table 9.1.29. presents the percentage distribution of respondents' answers regarding the statement “I am familiar with the Letterland program”. In the table, the leftmost column lists the possible responses, the second column indicates the number of responses in each category, and the third column represents the percentage of responses. According to this, 96,4% of the sample stated that they do not know it at all or know it slightly. Of the rest, 3,2% of the sample stated that they know it a lot and 0,4% that they know it extremely.

**Table 9.1.29.**

*Absolute (N) and percentage (%) distribution of the sample of teachers regarding the question “I am familiar with the following multisensory teaching methods and programs [Letterland]”*

| **I am familiar with the following multisensory teaching methods and programs [Letterland]** | **Frequency (N)** | **Percentage %** |
|---|---|---|
| Not at all | 221 | 77,5 |
| Slightly | 54 | 18,9 |
| Very | 9 | 3,2 |
| Extremely | 1 | 0,4 |
| **Total** | **285** | **100,0** |

Table 9.1.30 presents the distribution of respondents' answers regarding the statement “I am familiar with the Simultaneous Multisensory Teaching method”. The first column from the left shows the possible answers, the second column shows the number of answers per category and the third column the percentage number of answers. Out of a total of 285 teachers, 238 stated that they do not know it at all, 43 that they know it slightly and only 4 teachers stated that they know it very or extremely.

**Table 9.1.30.**

*Absolute and percentage distribution of the sample of teachers regarding the question “I am familiar with the following multisensory teaching methods and programs [SMT]”*

| **I am familiar with the following multisensory teaching methods and programs [SMT]** | **Frequency (N)** | **Percentage %** |
|---|---|---|
| Not at all | 238 | 83,5 |
| Slightly | 43 | 15,1 |

| | | |
|---|---|---|
| Very | 3 | 1,0 |
| Extremely | 1 | 0,4 |
| **Total** | **285** | **100,0** |

Table 9.1.31. presents the distribution of teachers' responses regarding the statement “I am familiar with the Wilson Reading System”. The first column from the left shows the possible answers, the second column shows the number of answers per category and the third column the percentage number of answers. As shown below, the 237 teachers stated that they do not know it at all, 42 that they know it slightly, 6 that they know it very much. None of the respondents answered that they know it extremely.

**Table 9.1.31.**

*Absolute and percentage distribution of the sample of teachers regarding the question “I am familiar with the following multisensory teaching methods and programs [Wilson Reading System]”*

| **I am familiar with the following multisensory teaching methods and programs [Wilson Reading System]** | **Frequency (N)** | **Percentage %** |
|---|---|---|
| Not at all | 237 | 83,2 |
| Slightly | 42 | 14,7 |
| Very | 6 | 2,1 |
| Extremely | 0 | 0,0 |
| **Total** | **285** | **100,0** |

Table 9.1.32. displays the distribution of respondents' familiarity with the Brain Gym® International program. In this table, the leftmost column lists possible responses, the second column presents the number of responses in each category, and the third column provides these responses as percentages. According to the table, 73,7% of respondents reported no familiarity with the program at all, 22,1% mentioned slight familiarity, and 4,2% claimed to be very familiar with it. Notably, no respondents indicated that they are extremely familiar with the program, resulting in 0% for this category.

**Table 9.1.32.**

*Absolute and percentage distribution of the sample of teachers regarding the question “I am familiar with the following multisensory teaching methods and programs [BGI]”*

| I am familiar with the following multisensory teaching methods and programs [BGI] | Frequency (N) | Percentage % |
|---|---|---|
| Not at all | 210 | 73,7 |
| Slightly | 63 | 22,1 |
| Very | 12 | 4,2 |
| Extremely | 0 | 0,0 |
| **Total** | **285** | **100,0** |

Table 9.1.33. presents the distribution of respondents' answers regarding the statement" I am familiar with the Hickey method". In this table, the leftmost column lists possible responses, the second column presents the number of responses in each category, and the third column provides these responses as percentages. As shown below, 245 of the respondents answered that they do not know it at all, 35 that they know it slightly, and 5 that they know it very much.

**Table 9.1.33.**

*Absolute and percentage distribution of the sample of teachers regarding the question "I am familiar with the following multisensory teaching methods and programs [Hickey]"*

| I am familiar with the following multisensory teaching methods and programs [Hickey] | Frequency (N) | Percentage % |
|---|---|---|
| Not at all | 245 | 86,0 |
| Slightly | 35 | 12,3 |
| Very | 5 | 1,8 |
| Extremely | 0 | 0,0 |
| **Total** | **285** | **100,0** |

Table 9.1.34. illustrates the percentage distribution of respondents' familiarity with the Direct Education System for Instruction and Remediation Reading program. In this table, the leftmost column lists possible responses, the second column presents the number of responses in each category, and the third column provides these responses as percentages. The data reveals that 79,65% of respondents reported no knowledge of it at all, 19,30% indicated slight familiarity, and 1,05% claimed to know it very well.

**Table 9.1.34.**

*Absolute and percentage distribution of the sample of teachers regarding the question "I am familiar with the following multisensory teaching methods and programs [D.I.S.T.A.R.]"*

| I am familiar with the following multisensory teaching methods and programs [D.I.S.T.A.R.] | Frequency (N) | Percentage % |
|---|---|---|
| Not at all | 227 | 79,7 |
| Slightly | 55 | 19,3 |
| Very | 3 | 1,1 |
| Extremely | 0 | 0,0 |
| **Total** | **285** | **100,0** |

Table 9.1.35. presents the distribution of respondents' answers regarding the statement "I am familiar with the Toe by Toe teaching method". The first column from the left shows the possible answers, the second column the number of answers per category and the third column the number of answers on a percentage scale. According to this, 213 respondents said that they do not know it at all, 62 that they know it slightly, 10 that they know it a lot while none answered that they know it extremely.

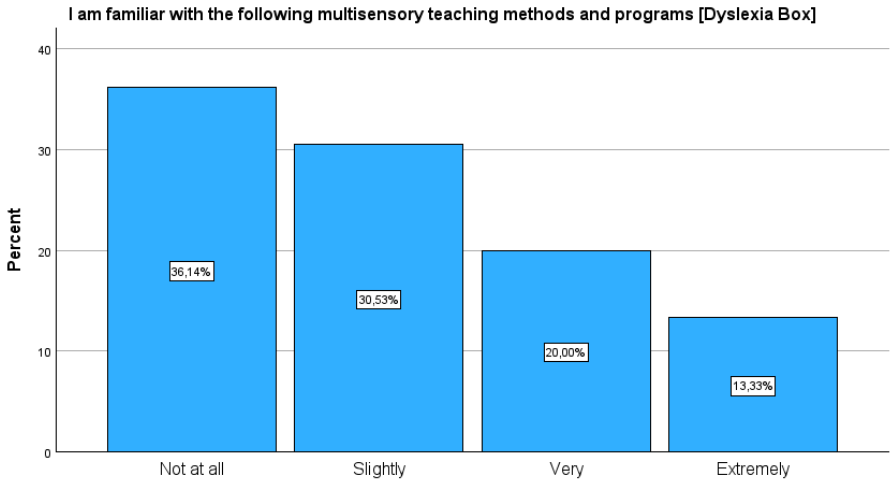
**Table 9.1.35.**

*Absolute and percentage distribution of the sample of teachers regarding the question "I am familiar with the following multisensory teaching methods and programs [Toe by Toe]"*

| I am familiar with the following multisensory teaching methods and programs [Toe by Toe] | Frequency (N) | Percentage % |
|---|---|---|
| Not at all | 213 | 74,7 |
| Slightly | 62 | 21,8 |
| Very | 10 | 3,5 |
| Extremely | 0 | 0,0 |
| **Total** | **285** | **100,0** |

Graph 9.1.11. reveals varying levels of familiarity among respondents with the Dyslexia Box program. About 36,14% had no knowledge of it, 30,53% were slightly familiar, 20,00% knew it well, and 13,33% were extremely familiar with it.

**Graph 9.1.11.**




Graph 9.1.12. illustrates the usage of the Orton-Gillingham method among respondents. It indicates that 172 respondents never use it, 80 use it rarely, 31 use it frequently, and 2 use it always.

**Graph 9.1.12.**

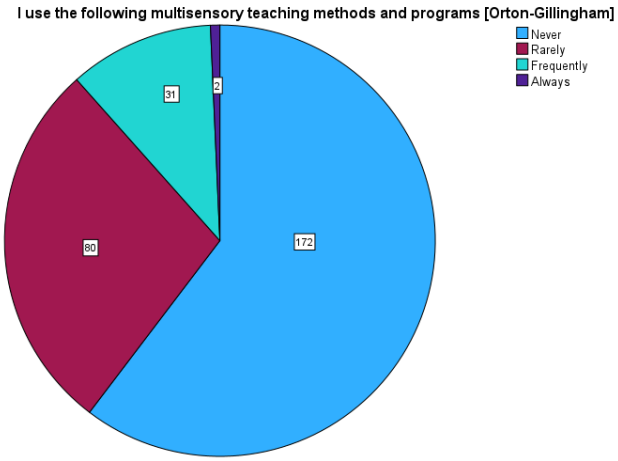



Table 9.1.36. presents the distribution of respondents' answers regarding their usage of the Lindamood Phoneme Sequencing® Program (LiPS). The first column from the left shows the possible answers, the second column the number of answers per category and the third column the number of answers on a percentage scale. Out of the total sample, 282 respondents either never use it or use it rarely, while 3 respondents use it often. None of the respondents selected the option “always”.

**Table 9.1.36.**

*Absolute and percentage distribution of the sample of teachers regarding the question "I am familiar with the following multisensory teaching methods and programs [LiPS]"*

| **I use the following multisensory teaching methods and programs [LiPS]** | **Frequency (N)** | **Percentage %** |
|---|---|---|
| Never | 269 | 94,4 |
| Rarely | 13 | 4,6 |
| Frequently | 3 | 1,1 |
| Always | 0 | 0,0 |
| **Total** | **285** | **100,0** |

Table 9.1.37 illustrates the distribution of respondents' answers concerning their usage of the Bangor Dyslexia Teaching System. The first column from the left shows the possible answers, the second column the number of answers per category and the third column the number of answers on a percentage scale. Among the teachers surveyed, 270 stated that they never use it, 12 reported using it rarely, and 3 indicated frequent use.

**Table 9.1.37.**

*Absolute and percentage distribution of the sample of teachers regarding the question "I am familiar with the following multisensory teaching methods and programs [BDTS]"*

| **I use the following multisensory teaching methods and programs [BDTS]** | **Frequency (N)** | **Percentage %** |
|---|---|---|
| Never | 270 | 94,7 |
| Rarely | 12 | 4,2 |
| Frequently | 3 | 1,1 |
| Always | 0 | 0,0 |
| **Total** | **285** | **100,0** |

Table 9.1.38 displays the percentage distribution of the sample teachers' responses regarding their usage of the Barton Reading and Spelling System. The first column from the left shows the possible answers, the second column the number of answers per category and the third column the number of answers on a percentage scale. The

majority, comprising 93,0%, reported that they never use it. Additionally, 4,2% stated that they use it rarely, while 2,8% reported using it often.

**Table 9.1.38.**

*Absolute and percentage distribution of the sample of teachers regarding the question "I am familiar with the following multisensory teaching methods and programs [BRSS]"*

| **I use the following multisensory teaching methods and programs [BRSS]** | **Frequency (N)** | **Percentage %** |
|---|---|---|
| Never | 265 | 93,0 |
| Rarely | 12 | 4,2 |
| Frequently | 8 | 2,8 |
| Always | 0 | 0,0 |
| **Total** | **285** | **100,0** |

Table 9.1.39. illustrates the percentage distribution of respondents' answers regarding their use of the Jolly Phonics teaching method. The first column from the left shows the possible answers, the second column the number of answers per category and the third column the number of answers on a percentage scale. The majority, constituting 94,39% of the sample, indicated that they never use it. Additionally, 4,21% reported using it rarely, while 1,05% stated they use it frequently, and 0,35% claimed to use it always.

**Table 9.1.39.**

*Absolute and percentage distribution of the sample of teachers regarding the question "I am familiar with the following multisensory teaching methods and programs [Jolly Phonics]"*

| **I use the following multisensory teaching methods and programs [Jolly Phonics]** | **Frequency (N)** | **Percentage %** |
|---|---|---|
| Never | 269 | 94,4 |
| Rarely | 12 | 4,2 |
| Frequently | 3 | 1,1 |
| Always | 1 | 0,4 |
| **Total** | **285** | **100,0** |

Table 9.1.40 presents the distribution of respondents' answers regarding the statement "I use the Alphabetic Phonics multisensory program". In the first column from the left there are the possible answers, in the second column the number of answers per category and in the third column the number of answers on a percentage scale. As shown below, 255 of the total sample said that they never use it, 19 that they use it rarely, 10 that they use it frequently and 1 that they use it always.

**Table 9.1.40.**

*Absolute and percentage distribution of the sample of teachers regarding the question "I am familiar with the following multisensory teaching methods and programs [Alphabetic Phonics]"*

| **I use the following multisensory teaching methods and programs [Alphabetic Phonics]** | **Frequency (N)** | **Percentage %** |
|---|---|---|
| Never | 255 | 89,5 |
| Rarely | 19 | 6,7 |
| Frequently | 10 | 3,5 |
| Always | 1 | 0,4 |
| **Total** | **285** | **100,0** |

Table 9.1.41. presents the percentage distribution of respondents' answers regarding the statement "I use the PRS and VRS teaching methods". In the first column from the left there are the possible answers, in the second column the number of answers per category and in the third column the number of answers on a percentage scale. More specifically, 90,9% of the sample said that they never use it, 8,4% that they use it rarely and 0,7% that they use it frequently.

**Table 9.1.41.**

*Absolute and percentage distribution of the sample of teachers regarding the question "I am familiar with the following multisensory teaching methods and programs [PRS VRS]"*

| I use the following multisensory teaching methods and programs [PRS VRS] | Frequency (N) | Percentage % |
|---|---|---|
| Never | 259 | 90,9 |
| Rarely | 24 | 8,4 |
| Frequently | 2 | 0,7 |
| Always | 0 | 0,0 |
| **Total** | **285** | **100,0** |

Graph 9.1.13. provides an overview of respondents' usage of Visualization-Verbalization teaching methods. The data reveals that 272 individuals reported never using these methods, while 9 indicated rare usage, and 4 mentioned frequent usage.

**Graph 9.1.13.**

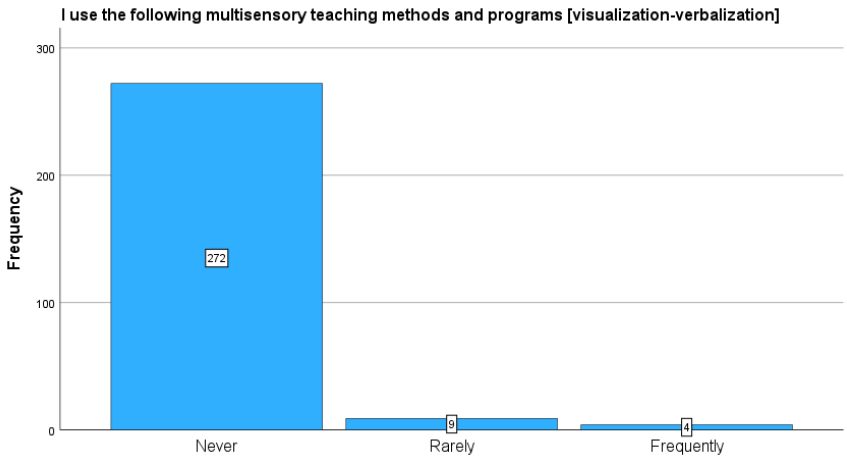



Table 9.1.42. presents the distribution of respondents' answers regarding the statement "I use the Letterland program". The first column from the left shows the possible answers, the second column the number of answers per category and the third column the number of answers as a percentage. 98,6% of the sample stated that they use it either not at all or rarely and 1,5% stated that they use it frequently or always.

**Table 9.1.42.**

*Absolute and percentage distribution of the sample of teachers regarding the question "I am familiar with the following multisensory teaching methods and programs [Letterland]"*

| **I use the following multisensory methods and teaching programs [Letterland]** | **Frequency (N)** | **Percentage %** |
|---|---|---|
| Never | 269 | 94,4 |
| Rarely | 12 | 4,2 |
| Frequently | 3 | 1,0 |
| Always | 1 | 0,4 |
| **Total** | **285** | **100,0** |

Table 9.1.43. shows the distribution of respondents' answers regarding the statement "I use the Simultaneous Multisensory Teaching method". The first column from the left shows the possible answers, the second column the number of answers per category and the third column the number of answers as a percentage. More specifically, as shown below, 273 people out of a total of 285 answered that they never use it, 8 that they use it rarely, and 4 that they use it frequently.

**Table 9.1.43.**

*Absolute and percentage distribution of the sample of teachers regarding the question "I am familiar with the following multisensory teaching methods and programs [SMT]"*

| **I use the following multisensory teaching methods and programs [SMT]** | **Frequency (N)** | **Percentage %** |
|---|---|---|
| Never | 273 | 95,8 |
| Rarely | 8 | 2,8 |
| Frequently | 4 | 1,4 |
| Always | 0 | 0,0 |
| **Total** | **285** | **100,0** |

Table 9.1.44. presents the percentage distribution of respondents' responses regarding the statement "I use the Wilson Reading System". The first column from the left shows the possible answers, the second column the number of answers per category and the third column the number of answers as a percentage. According to this, 94,7% of the

respondents said that they never use it, 4,6% that they use it rarely, and 0,7% that they use it frequently.

**Table 9.1.44.**

*Absolute and percentage distribution of the sample of teachers regarding the question "I am familiar with the following multisensory teaching methods and programs [Wilson Reading System]"*

| **I use the following multisensory teaching methods and programs [Wilson Reading System]** | **Frequency (N)** | **Percentage %** |
|---|---|---|
| Never | 270 | 94,7 |
| Rarely | 13 | 4,6 |
| Frequently | 2 | 0,7 |
| Always | 0 | 0,0 |
| **Total** | **285** | **100,0** |

Table 9.1.45. outlines the responses of the participants regarding their usage of the Brain Gym® International Program. The table includes three columns: the leftmost column lists the possible responses, the second column displays the number of responses for each category, and the third column presents the corresponding percentages. The data illustrates that 96,9% of the respondents reported either "never" or "rarely" using the program, while the remaining 3,2% stated they use it frequently.

**Table 9.1.45.**

*Absolute and percentage distribution of the sample of teachers regarding the question "I am familiar with the following multisensory teaching methods and programs [BGI]"*

| **I use the following multisensory teaching methods and programs [BGI]** | **Frequency (N)** | **Percentage %** |
|---|---|---|
| Never | 263 | 92,3 |
| Rarely | 13 | 4,6 |
| Frequently | 9 | 3,2 |
| Always | 0 | 0,0 |
| **Total** | **285** | **100,0** |

Graph 9.1.14. displays the distribution of respondents' answers in relation to their usage of the Hickey method. Out of all the respondents, 272 individuals stated that they never use this method, 11 reported using it rarely, and 2 indicated that they use it frequently.

**Graph 9.1.14.**

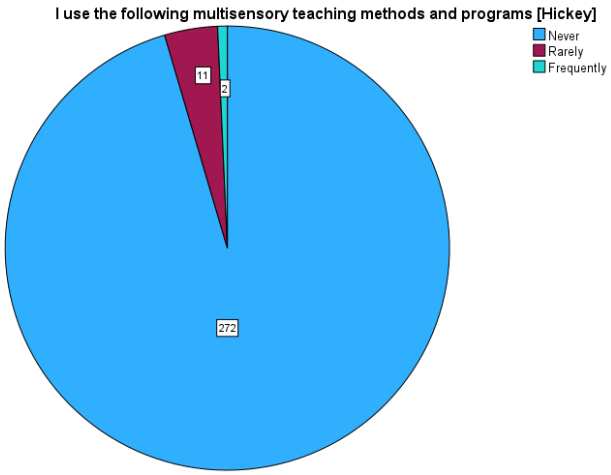



Table 9.1.46. outlines the responses of the participants regarding their usage of D.I.S.T.A.R. The table includes three columns: the leftmost column lists the possible responses, the second column displays the number of responses for each category, and the third column presents the corresponding percentages. The data illustrates that 99% of the respondents reported either "never" or "rarely" using the program, while the 0,7% stated they use it frequently and the 0,4% that they always use it.

**Table 9.1.46.**

*Absolute and percentage distribution of the sample of teachers regarding the question "I am familiar with the following multisensory teaching methods and programs [D.I.S.T.A.R.]"*

| **I use the following multisensory teaching methods and programs [D.I.S.T.A.R.]** | **Frequency (N)** | **Percentage %** |
|---|---|---|
| Never | 273 | 95,8 |
| Rarely | 9 | 3,2 |
| Frequently | 2 | 0,7 |
| Always | 1 | 0,4 |
| **Total** | **285** | **100,0** |

Table 9.1.47. shows the distribution of respondents' answers regarding the statement “I use the Toe by Toe teaching method”. The table includes three columns: the leftmost column lists the possible responses, the second column displays the number of responses for each category, and the third column presents the corresponding percentages. As shown below, 92,28% of the sample stated that they never use it, 6,32% that they use it rarely and 1,40% that they use it frequently.

**Table 9.1.47.**

*Absolute and percentage distribution of the sample of teachers regarding the question “I am familiar with the following multisensory teaching methods and programs [Toe by Toe]”*

| **I use the following multisensory teaching methods and programs [Toe by Toe]** | **Frequency (N)** | **Percentage %** |
|---|---|---|
| Never | 263 | 92,3 |
| Rarely | 18 | 6,3 |
| Frequently | 4 | 1,4 |
| Always | 0 | 0,0 |
| **Total** | **285** | **100,0** |

Graph 9.1.15. illustrates the distribution of respondents' answers regarding their use of the Dyslexia Box program. The data reveals that 50,53% of the respondents never use it, 23,86% use it rarely, 17,54% use it frequently, and 8,07% always use it.

**Graph 9.1.15.**

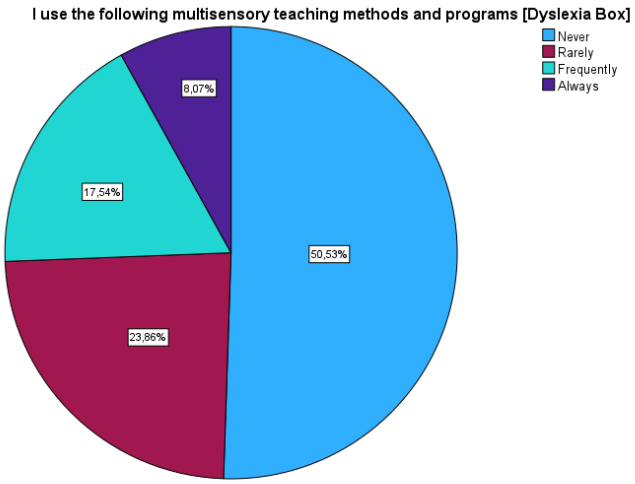


Table 9.1.48. displays the distribution of responses from the participants concerning the statement “The more students I teach per hour, the less I use multisensory teaching methods”. The table consists of three columns: the first leftmost indicating the possible responses, the second showing the number of responses in each category, and the third presenting the percentage distribution. Within the entire sample, 77 respondents either strongly disagree or disagree with the statement, while 130 agree or strongly agree, and 78 neither agree nor disagree.

**Table 9.1.48.**

*Absolute and percentage distribution of the sample of teachers regarding the question “The more students I teach per hour, the less I use multisensory teaching methods”*

| **The more students I teach per hour, the less I use multisensory teaching methods** | **Frequency (N)** | **Percentage %** |
|---|---|---|
| Strongly disagree | 32 | 11,2 |
| Disagree | 45 | 15,8 |
| Neither agree nor disagree | 78 | 27,4 |
| Agree | 76 | 26,7 |
| Strongly agree | 54 | 18,9 |
| **Total** | **285** | **100,0** |

Table 9.1.49. presents the percentage distribution of teachers' responses regarding the statement “The fewer students I teach per hour, the more I use multisensory teaching methods”. The table consists of three columns: the first leftmost indicating the possible responses, the second showing the number of responses in each category, and the third presenting the percentage distribution. More specifically, it is observed that 10,88% stated that they strongly disagreed, 18,25% that they disagreed, 24,91% that neither agreed nor agreed, 29,47% that they agreed and 16,49% that they strongly agreed with the above statement.

**Table 9.1.49.**

*Absolute and percentage distribution of the sample of teachers regarding the question "The more students I teach per hour, the less I use multisensory teaching methods"*

| **The fewer students I teach per hour, the more I use multisensory teaching methods** | **Frequency (N)** | **Percentage %** |
|---|---|---|
| Strongly disagree | 31 | 10,9 |
| Disagree | 52 | 18,2 |
| Neither agree nor disagree | 71 | 24,9 |
| Agree | 84 | 29,5 |
| Strongly agree | 47 | 16,5 |
| **Total** | **285** | **100** |

Table 9.1.50. shows the distribution of respondents' answers regarding the statement "Through multisensory activities, I give students with dyslexia equal educational opportunities with their typical classmates". The table consists of three columns: the first leftmost indicating the possible responses, the second showing the number of responses in each category, and the third presenting the percentage distribution. As shown below, 60 stated that they strongly disagreed or disagreed, 54 that neither agreed nor disagreed, 92 agreed, and 79 strongly agreed.

**Table 9.1.50.**

*Absolute and percentage distribution of the sample of teachers regarding the question "Through multisensory activities, I give students with dyslexia equal educational opportunities with their typical classmates"*

| **Through multisensory activities, I give students with dyslexia equal educational opportunities with their typical classmates** | **Frequency (N)** | **Percentage %** |
|---|---|---|
| Strongly disagree | 25 | 8,8 |
| Disagree | 35 | 12,3 |
| Neither agree nor disagree | 54 | 18,9 |
| Agree | 92 | 32,3 |
| Strongly agree | 79 | 27,7 |
| **Total** | **285** | **100,0** |

Table 9.1.51. shows the distribution of the answers of the interviewed teachers regarding the statement “The participation of students with dyslexia in the lesson increases when I involve multisensory activities”. More specifically, as shown below, 19 stated that they strongly disagreed, 31 that they disagreed, 68 that neither agreed nor disagreed, 94 that they agreed, and 73 that they strongly agreed.

**Table 9.1.51.**

*Absolute and percentage distribution of the sample of teachers regarding the question “The participation of students with dyslexia in the lesson increases when I involve multisensory activities”*

| **The participation of students with dyslexia in the lesson increases when I involve multisensory activities** | **Frequency (N)** | **Percentage %** |
|---|---|---|
| Strongly disagree | 19 | 6,7 |
| Disagree | 31 | 10,9 |
| Neither agree nor disagree | 68 | 23,9 |
| Agree | 94 | 33,0 |
| Strongly agree | 73 | 25,6 |
| **Total** | **285** | **100,0** |

Table 9.1.52. illustrates the distribution of responses from the surveyed teachers regarding the statement “Barrier to using multisensory teaching is the syllabus”. The table includes three columns: the first presenting the potential responses, the second indicating the number of responses, and the third displaying the percentage distribution. Within the respondent group, 105 individuals strongly disagreed or disagreed with the statement, while the remaining 180 individuals agreed or strongly agreed with it.

**Table 9.1.52.**

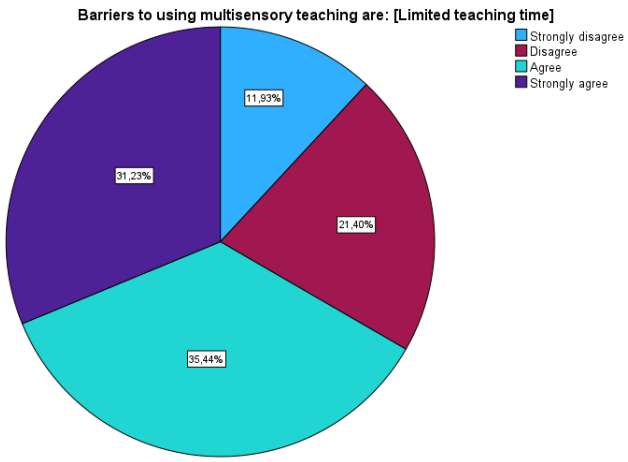
*Absolute (N) and percentage (%) distribution of the sample of teachers regarding the question “Barrier to using multisensory teaching is the syllabus”*

| **Barrier to using multisensory teaching is the syllabus** | **Frequency (N)** | **Percentage %** |
|---|---|---|
| Strongly disagree | 31 | 10,9 |
| Disagree | 74 | 26,0 |

| | | |
|---|---|---|
| Agree | 98 | 34,4 |
| Strongly agree | 82 | 28,8 |
| **Total** | **285** | **100,0** |

Graph 9.1.16. presents the distribution of respondents' responses on a percentage scale regarding the statement “Barrier in using multisensory teaching is the limited teaching time”. More specifically, 11,93% of respondents stated that they strongly disagreed, 21,40% that they disagreed, 35,44% that they agreed, and 31,23% that they strongly agreed.

**Graph 9.1.16.**




Graph 9.1.17. illustrates the percentage distribution of the responses of the teachers interviewed regarding the statement “Barrier in using multisensory teaching is my background knowledge”. As shown below, 45,97% of the sample answered negatively stating strongly disagree or disagree and 54,73% answered positively stating agree or strongly agree.

**Graph 9.1.17.**

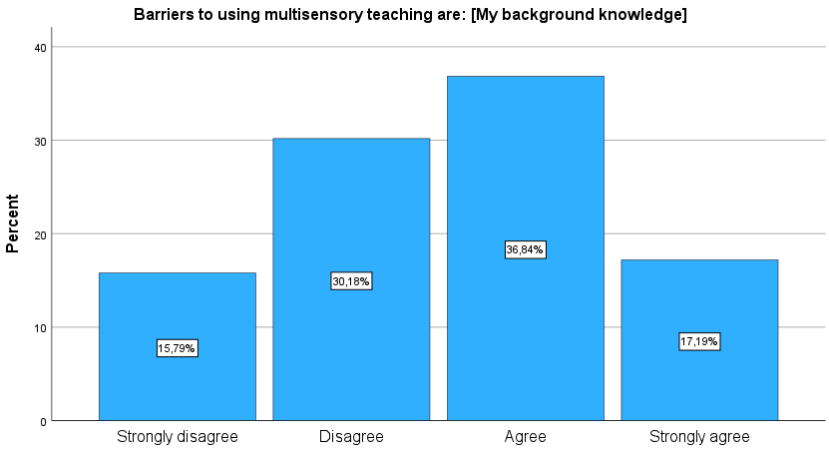



Table 9.1.53. shows the distribution of respondents' answers regarding the statement "Barrier to using multisensory teaching is the number of the students". The first column from the left shows the possible options, in the second column, the number of answers per category and in the third column the number of answers on a percentage scale. Out of a total of 285 people, 107 answered negatively and 178 positively.

**Table 9.1.53.**

*Absolute and percentage distribution of the sample of teachers regarding the question "Barrier to using multisensory teaching is the number of students"*

| **Barrier to using multisensory teaching is the number of students** | **Frequency (N)** | **Percentage %** |
|---|---|---|
| Strongly disagree | 32 | 11,2 |
| Disagree | 75 | 26,3 |
| Agree | 101 | 35,4 |
| Strongly agree | 77 | 27,0 |
| **Total** | **285** | **100,0** |

Graph 9.1.18. presents the distribution of respondents' answers regarding the statement "Barrier to using multisensory teaching is the class size". More comparatively, as shown below, 50 people said that they strongly disagreed, 77 disagreed, 99 agreed, and 59 strongly agreed.

**Graph 9.1.18.**

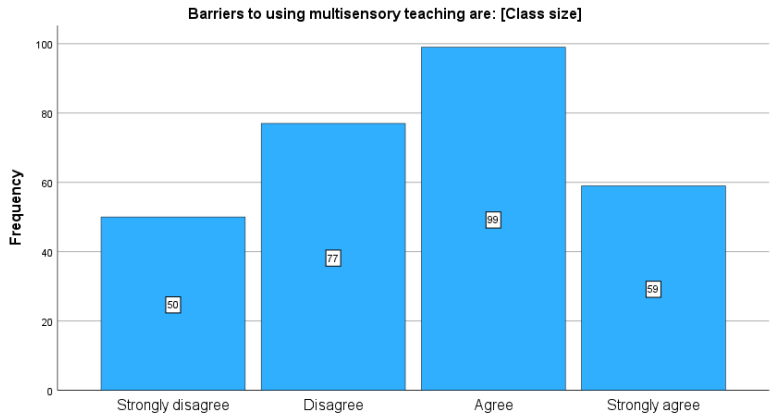



Table 9.1.54. presents the distribution of respondents' answers regarding the statement "Barrier to using multisensory teaching is the lack of logistical infrastructure". The first column from the left shows the possible answers, the second column the number of answers per category, and the third column the number of answers on a percentage scale. More specifically, 8,4% of the sample stated that they strongly disagreed, 16,9% that they disagreed and the remaining 74,7% responded positively stating that they agree or strongly agree.

**Table 9.1.54.**

*Absolute and percentage distribution of the sample of teachers regarding the question "Barrier to using multisensory teaching is the lack of logistical infrastructure"*

| **Barrier to using multisensory teaching is the lack of logistical infrastructure** | **Frequency (N)** | **Percentage %** |
|---|---|---|
| Strongly disagree | 24 | 8,4 |
| Disagree | 48 | 16,9 |
| Agree | 97 | 34,0 |
| Strongly agree | 116 | 40,7 |
| **Total** | **285** | **100,0** |

Table 9.1.55. presents the distribution of respondents' answers regarding the statement "Barrier to using multisensory teaching is the lack of interest on my part". The first column from the left shows the possible answers, the second column the number of answers per category, and the third column the number of answers on a percentage

scale. More specifically, as shown in this graph, 211 people out of a total of 285 respondents answered negatively and the remaining 74 gave a positive answer stating agree or strongly agree.

**Table 9.1.55.**

*Absolute and percentage distribution of the sample of teachers regarding the question "Barriers to using multisensory teaching is the lack of interest on my part"*

| **Barrier to using multisensory teaching is the lack of interest on my part** | **Frequency (N)** | **Percentage %** |
|---|---|---|
| Strongly disagree | 109 | 38,2 |
| Disagree | 102 | 35,8 |
| Agree | 46 | 16,1 |
| Strongly agree | 28 | 9,8 |
| **Total** | **285** | **100,0** |

Graph 9.1.19. shows on a percentage scale the distribution of respondents' answers regarding the statement "Barrier to using multisensory teaching students' lack of interest". According to this, 80,7% of the sample gave a negative answer, stating that they strongly disagree or disagree, 17,89% stated that they agree, while only 1,40% stated that they strongly agree.

**Graph 9.1.19.**

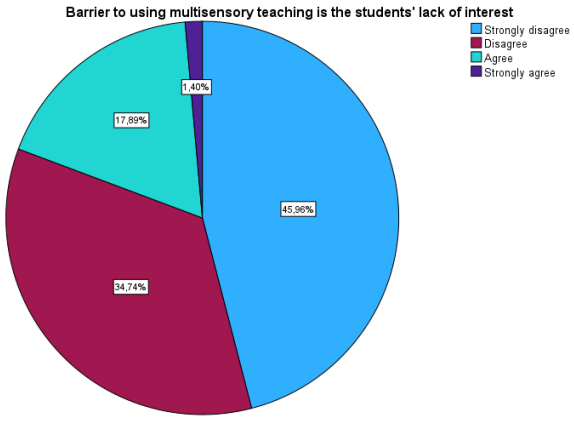



Table 9.1.56. presents the distribution of respondents' answers regarding the statement "I adapt my teaching multisensorily without following any specific method". The first column from the left shows the possible options, the second column shows the number of responses per category and the third column shows the number of responses in

percentage. More specifically, it appears that 60 of the respondents answered negatively by stating strongly disagree or disagree, 166 answered positively by stating agree or strongly agree and the remaining 59 stated that neither agree nor disagree.

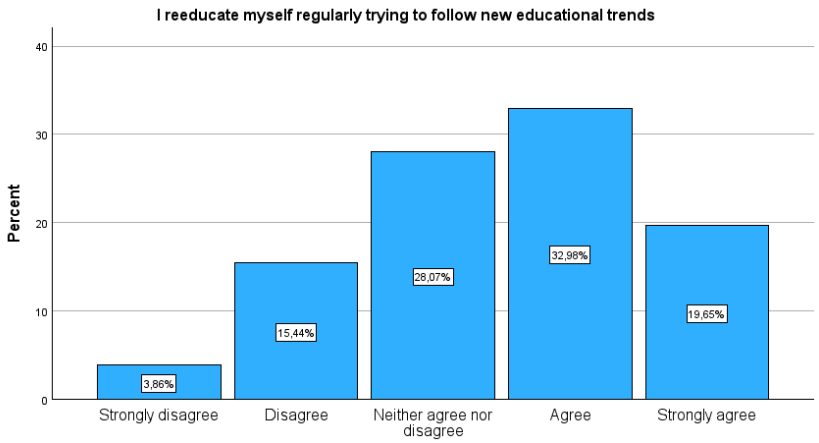
**Table 9.1.56.**

*Absolute and percentage distribution of the sample of teachers regarding the question "I adapt my teaching multisensorily without following any specific method"*

| **I adapt my teaching multisensorily without following any specific method** | **Frequency (N)** | **Percentage %** |
|---|---|---|
| Strongly disagree | 10 | 3,5 |
| Disagree | 50 | 17,5 |
| Neither agree nor disagree | 59 | 20,7 |
| Agree | 112 | 39,3 |
| Strongly agree | 54 | 19,0 |
| **Total** | **285** | **100,0** |

Graph 9.1.20. presents the percentage distribution of respondents' answers regarding the statement "I reeducate myself regularly trying to follow new educational trends". More specifically, 3,86% stated that they strongly disagree, 15,44% that they disagree, 28,07% that they neither agree nor disagree, 32,98% that they agree and 19,65% that they strongly agree.

**Graph 9.1.20.**



Graph 9.1.21. shows the distribution of the responses of the interviewed teachers regarding the statement “The use of multisensory teaching works adequately for kindergarten students (3-5 years old)”. According to this, 8 people from all the respondents stated that they strongly disagree, 38 that they disagree, 69 that neither agree nor disagree, 69 that they agree and 101 that they strongly agree.

**Graph 9.1.21.**

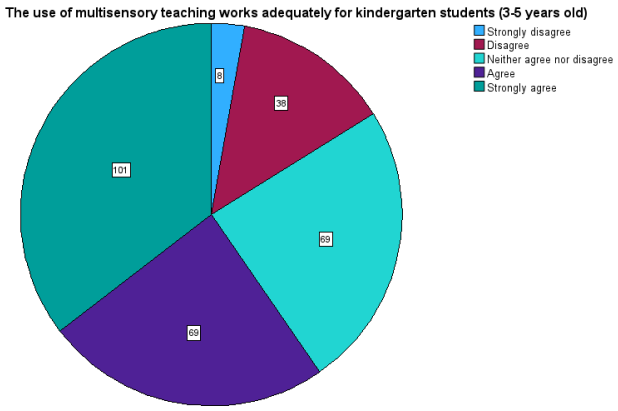



Table 9.1.57. presents the distribution of teachers' responses regarding the statement “The use of multisensory teaching works adequately for students in the first Grades of Elementary school (6-8 years old)”. The first column from the left shows the possible options, the second column shows the number of responses per category and the third column shows the number of responses in percentage. More specifically, 11,6% of the sample gave a negative answer stating strongly disagree or disagree, 67% answered positively stating agree or strongly agree, and the remaining 21,4% stated neither agree nor disagree.

**Table 9.1.57.**

*Absolute and percentage distribution of the sample of teachers regarding the question “The use of multisensory teaching works adequately for students in the first Grades of Elementary school (6-8 years old)”*

| **The use of multisensory teaching works adequately for students in the first Grades of Elementary school (6-8 years old)** | **Frequency (N)** | **Percentage %** |
|---|---|---|
| Strongly disagree | 6 | 2,1 |
| Disagree | 27 | 9,5 |

| | | |
|---|---|---|
| Neither agree nor disagree | 61 | 21,4 |
| Agree | 99 | 34,7 |
| Strongly agree | 92 | 32,3 |
| **Total** | **285** | **100,0** |

Table 9.1.58. presents the distribution of respondents' answers regarding the statement "The use of multisensory teaching works adequately for students in the last grades of Elementary school (9-11 years old)". The first column from the left shows the possible options, the second column shows the number of responses per category and the third column shows the number of responses in percentage. As shown below, 12 people answered that they strongly disagree, 59 that they disagree, 88 that neither agree nor disagree, 84 that they agree and 42 that they strongly agree.

**Table 9.1.58.**

*Absolute and percentage distribution of the sample of teachers regarding the question "The use of multisensory teaching works adequately for students in the last grades of primary school (9-11 years old)"*

| **The use of multisensory teaching works adequately for students in the last grades of primary school (9-11 years old)** | **Frequency (N)** | **Percentage %** |
|---|---|---|
| Strongly disagree | 12 | 4,2 |
| Disagree | 59 | 20,7 |
| Neither agree nor disagree | 88 | 30,9 |
| Agree | 84 | 29,5 |
| Strongly agree | 42 | 14,7 |
| **Total** | **285** | **100,0** |

Graph 9.1.22. shows the percentage distribution of respondents' answers regarding the statement "Students with dyslexia can adequately master graphophonemic matching through multisensory activities". More specifically, it is observed that 3,86% of the respondents answered that they strongly disagree, 6,32% that they disagree, 15,09% that neither agrees nor disagrees, 43,16% that they agree, and 31,58% that strongly agrees.

**Graph 10.1.22.**

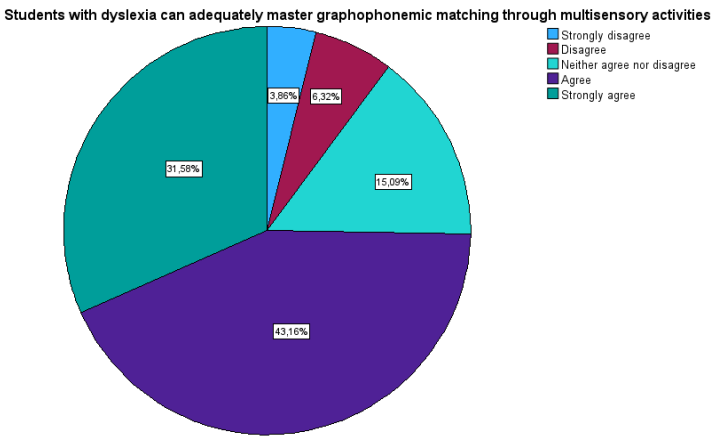



Table 9.1.59. presents the distribution of respondents' answers regarding the statement "Students with dyslexia can adequately master the reading skill through multisensory activities". The first column from the left shows the possible answers, the second column the number of answers per category and the third column the percentage of the number of answers. More specifically, it is observed that 41 answered negatively stating strongly disagree or disagree, 165 answered positively stating agree or strongly agree and the remaining 79 answered neither agree nor disagree.

**Table 9.1.59.**

*Absolute (N) and percentage (%) distribution of the sample of teachers regarding the question "Students with dyslexia can adequately master the reading skill through multisensory activities"*

| **Students with dyslexia can adequately master the reading skill through multisensory activities** | **Frequency (N)** | **Percentage %** |
|---|---|---|
| Strongly disagree | 8 | 2,8 |
| Disagree | 33 | 11,6 |
| Neither agree nor disagree | 79 | 27,7 |
| Agree | 117 | 41,1 |
| Strongly agree | 48 | 16,8 |
| **Total** | **285** | **100,0** |

Graph 9.1.23 presents the percentage distribution of respondents' answers regarding the statement "I would be interested in learning some multisensory method". More

specifically, 9,82% of the sample answered “not at all”, 13,68% answered “slightly”, 15,09% answered “indifferent”, 30,18% answered “very”, and 31,23% answered that “extremely”.

**Graph 9.1.23.**

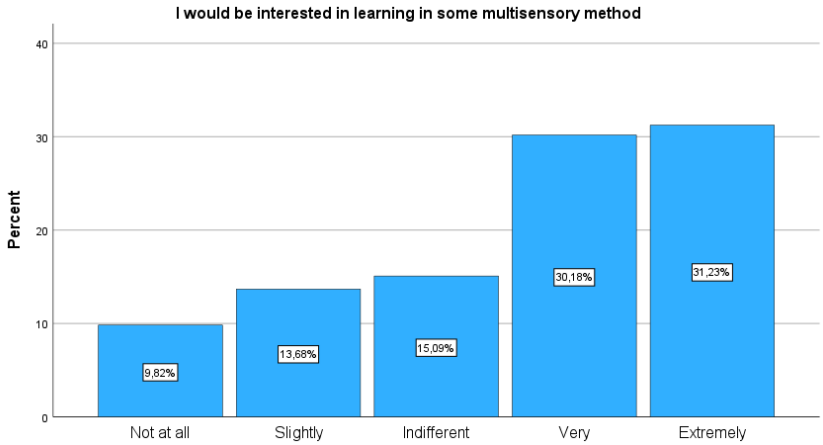



Table 9.1.60. shows the distribution of respondents' answers regarding the statement “Learning a multisensory method/program is provided free of charge by the Greek State”. The first column from the left shows the possible answers, the second column the number of answers per category and the third column the percentage of the number of answers. According to this table, 98 people strongly disagreed, 76 disagreed, 50 neither agreed nor disagreed, 35 agreed, and 26 strongly agreed.

**Table 9.1.60.**

*Absolute and percentage distribution of the sample of teachers regarding the question “Learning a multisensory teaching method is provided free of charge by the state”*

| **Learning a multisensory teaching method is provided free of charge by the state** | **Frequency (N)** | **Percentage %** |
|---|---|---|
| Strongly disagree | 98 | 34,4 |
| Disagree | 76 | 26,7 |
| Neither agree nor disagree | 50 | 17,5 |
| Agree | 35 | 12,3 |
| Strongly agree | 26 | 9,1 |
| **Total** | **285** | **100,0** |

Table 9.1.61. shows the distribution of respondents' answers regarding the statement "Learning a multisensory method/program will burden me financially". The first column from the left shows the possible answers, the second column the number of answers per category and the third column the percentage of the number of answers. According to this, it is observed that 20,3% express their opposition to the above statement, 57,9% responded positively and 21,8% responded that they neither agree nor disagree.

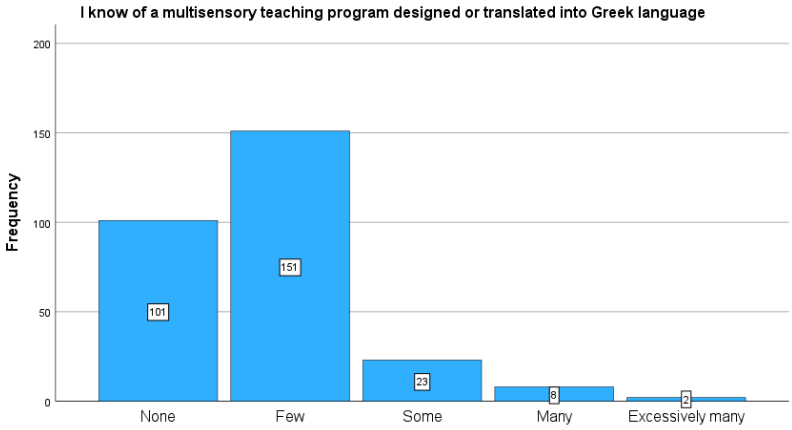
**Table 9.1.61.**

*Absolute and percentage distribution of the sample of teachers regarding the question "Learning a multisensory method/program will burden me financially"*

| **Learning a multisensory method/program will burden me financially** | **Frequency (N)** | **Percentage %** |
|---|---|---|
| Strongly disagree | 24 | 8,4 |
| Disagree | 34 | 11,9 |
| Neither agree nor disagree | 62 | 21,8 |
| Agree | 76 | 26,7 |
| Strongly agree | 89 | 31,2 |
| **Total** | **285** | **100,0** |

Graph 9.1.24. shows the distribution of respondents' answers regarding the statement "I know of a multisensory teaching program/method designed or translated into Greek language". More specifically, it is observed that 101 people from the interviewed teachers answered that they do not know any, 151 stated that they know few, 23 that they know some, 8 that they know many, 2 that they know excessively many.

**Graph 9.1.24.**




## 9.2. Descriptive statistical analysis crossing other variables

The question “When I hear the phrase multisensory teaching I think” is not analyzed quantitatively, but was included in the questionnaire to be used for qualitative analysis of the answers. Through the answers it seems that most educators driven by the etymology of the word, the first thing they think of when they hear the phrase multisensory teaching is simultaneous activation of multiple senses. The next most popular answers are attractive course, rich logistical infrastructure and visual aids. This possibly indicates that, based on teachers' views, multisensory teaching is associated with engaging teaching and rich material and technical infrastructure. The phrase “special education students” follows with a fairly large difference, which possibly indicates that teachers do not necessarily associate multisensory education with special education students. The last popular answers were “a specific teaching method” and “syllabus”. This may suggest that those who incorporate multisensory practices do not necessarily follow a particular methodology and that they do not associate the syllabus with choosing to teach multisensory.

A chi-square test of independence was performed to examine the relation between “Multisensory teaching helps students with dyslexia better understand the teaching objective” and “Specialization in special education” (table 9.2.2). The relation between these variables was significant, $x^2(4)=11.432$, $p=0.022<0.05$.

From reading the content of the table 9.2.1., it appears that the teachers and kindergarten teachers of typical and special education of the prefecture of Heraklion, whether they

are specialized in special education or not tend to agree that multisensory teaching helps students with dyslexia. However, almost twice as many special education majors strongly agree with this statement.

**Table 9.2.1.**

*Crosstabulation: Multisensory teaching helps students with dyslexia better understand the teaching objective * Specialization in special education*

| | | Specialization in special education | | |
|---|---|---|---|---|
| **Crosstab** | | No | Yes | Total |
| **Multisensory teaching helps students with dyslexia better understand the teaching objective** | Strongly disagree | 10 | 9 | 19 |
| | Disagree | 7 | 9 | 16 |
| | Neither agree nor disagree | 15 | 12 | 27 |
| | Agree | 64 | 43 | 107 |
| | Strongly agree | 44 | 72 | 116 |
| **Total** | | 140 | 145 | 285 |

**Table 9.2.2.**

*Chi-Square Tests for variables: Multisensory teaching helps students with dyslexia better understand the teaching objective * Specialization in special education*

| Chi-Square Tests | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| **Pearson Chi-Square** | 11.432[a] | 4 | .022 |
| **Likelihood Ratio** | 11.524 | 4 | .021 |
| **Linear-by-Linear Association** | 2.373 | 1 | .123 |
| **N of Valid Cases** | 285 | | |

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 7,86.

A chi-square test of independence was performed to examine the relation between "Multisensory teaching helps all students to better understand the teaching objective" and "Highest level of studies" (table 9.2.4.). The relation between these variables was significant, $x^2(4)=17.099$, $p=0.002<0.05$.

From reading the content of the table 9.2.3., it appears that the teachers and kindergarten teachers of typical and special education of the prefecture of Heraklion, regardless of their level of studies tend to agree that multisensory teaching helps all students to better

understand the teaching objective. However, approximately twice as many individuals with master degrees agree or strongly agree with this statement.

**Table 9.2.3.**

*Crosstabulation: Multisensory teaching helps all students to better understand the teaching objective * Highest level of studies*

| Crosstab | | Highest level of studies | | Total |
|---|---|---|---|---|
| | | Bachelor degree | Master degree | |
| **Multisensory teaching helps all students to better understand the teaching objective** | Strongly disagree | 11 | 10 | 21 |
| | Disagree | 22 | 10 | 32 |
| | Neither agree nor disagree | 20 | 16 | 36 |
| | Agree | 31 | 64 | 95 |
| | Strongly agree | 38 | 63 | 101 |
| **Total** | | 122 | 163 | 285 |

**Table 9.2.4.**

*Chi-Square Tests for variables: Multisensory teaching helps all students to better understand the teaching objective * Highest level of studies*

| Chi-Square Tests | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| **Pearson Chi-Square** | 17.099[a] | 4 | .002 |
| **Likelihood Ratio** | 17.145 | 4 | .002 |
| **Linear-by-Linear Association** | 9.735 | 1 | .002 |
| **N of Valid Cases** | 285 | | |

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 8,99.

A chi-square test of independence was performed to examine the relation between "Multisensory teaching helps all students to better understand the teaching objective" and "Specialization in special education" (table 9.2.6.). The relation between these variables was significant, $x^2(4)=10.899$, $p=0.028<0.05$.

From reading the content of the table 9.2.5., it appears that the teachers and kindergarten teachers of typical and special education of the prefecture of Heraklion, whether they are specialized in special education or not tend to agree tend to agree that multisensory

teaching helps all students to better understand the teaching objective. However, approximately twice as many individuals specialized in special education tend to strongly agree with this statement.

**Table 9.2.5.**

*Crosstabulation: Multisensory teaching helps all students to better understand the teaching objective * Specialization in special education*

| Crosstab | | Specialization in special education | | Total |
|---|---|---|---|---|
| | | No | Yes | |
| **Multisensory teaching helps all students to better understand the teaching objective** | Strongly disagree | 10 | 11 | 21 |
| | Disagree | 20 | 12 | 32 |
| | Neither agree nor disagree | 20 | 16 | 36 |
| | Agree | 53 | 42 | 95 |
| | Strongly agree | 37 | 64 | 101 |
| **Total** | | 140 | 145 | 285 |

**Table 9.2.6.**

*Chi-Square Tests for variables: Multisensory teaching helps all students to better understand the teaching objective * Specialization in special education*

| Chi-Square Tests | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| **Pearson Chi-Square** | 10,899[a] | 4 | .028 |
| **Likelihood Ratio** | 11,010 | 4 | .026 |
| **Linear-by-Linear Association** | 4,600 | 1 | .032 |
| **N of Valid Cases** | 285 | | |

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 10,32.

A chi-square test of independence was performed to examine the relation between "Multisensory teaching helps all students better understand the teaching objective" and "Choosing to use multisensory teaching depends on inclusion of all students" (table 9.2.8.). The relation between these variables was significant, $x^2(12)=64.211$, $p<0.001<0.05$.

From reading the content of the table, it appears that the teachers and kindergarten teachers of typical and special education of the prefecture of Heraklion who agree or

strongly agree that multisensory teaching helps all students to better understand the teaching objective, also consider that the inclusion of all students is a very important or an absolutely essential factor regarding the choice of using multisensory teaching. This is probably because, they consider that apart from inclusive reasons, multisensory education helps all students equally.

**Table 9.2.7.**

*Crosstabulation: Multisensory teaching helps all students to better understand the teaching objective * Choosing to use multisensory teaching depends on inclusion of all students*

| | | **Choosing to use multisensory teaching depends on inclusion of all students** | | | | |
|---|---|---|---|---|---|---|
| **Crosstab** | | Not important at all | Of little importance | Very important | Absolutely essential | Total |
| **Multisensory teaching helps all students to better understand the teaching objective** | Strongly disagree | 8 | 4 | 5 | 4 | 21 |
| | Disagree | 3 | 16 | 3 | 10 | 32 |
| | Neither agree nor disagree | 5 | 13 | 12 | 6 | 36 |
| | Agree | 9 | 15 | 39 | 32 | 95 |
| | Strongly agree | 7 | 7 | 37 | 50 | 101 |
| **Total** | | 32 | 55 | 96 | 102 | 285 |

**Table 9.2.8.**

*Chi-Square Tests for variables: Multisensory teaching helps all students to better understand the teaching objective * Choosing to use multisensory teaching depends on inclusion of all students*

| **Chi-Square Tests** | **Value** | **df** | **Asymptotic Significance (2-sided)** |
|---|---|---|---|
| **Pearson Chi-Square** | 64.211[a] | 12 | **<.**001 |
| **Likelihood Ratio** | 58.953 | 12 | <,001 |
| **Linear-by-Linear Association** | 29.660 | 1 | <,001 |
| **N of Valid Cases** | 285 | | |

a. 4 cells (20,0%) have expected count less than 5. The minimum expected count is 2,36.

A chi-square test of independence was performed to examine the relation between "I have the necessary knowledge to teach my students multisensorily" and "Highest level

of studies" (table 9.2.10.). The relation between these variables was significant, $x^2(4)=10.250$, $p=0.036<0.05$.

From reading the content of the table 9.2.9., it appears that the teachers and kindergarten teachers of typical and special education of the prefecture of Heraklion, are divided regarding whether they consider that they have the necessary knowledge to teach their students multisensorily. Nonetheless, it seems that individuals with postgraduate degrees are more inclined to agree or strongly with this statement.

**Table 9.2.9.**

*Crosstabulation: I have the necessary knowledge to teach my students multisensorily * Highest level of studies*

| | | Highest level of studies | | |
|---|---|---|---|---|
| **Crosstab** | | Bachelor degree | Master degree | Total |
| **I have the necessary knowledge to teach my students multisensorily** | Strongly disagree | 23 | 12 | 35 |
| | Disagree | 27 | 31 | 58 |
| | Neither agree nor disagree | 34 | 53 | 87 |
| | Agree | 23 | 42 | 65 |
| | Strongly agree | 15 | 25 | 40 |
| **Total** | | 122 | 163 | 285 |

**Table 9.2.10.**

*Chi-Square Tests for variables: I have the necessary knowledge to teach my students multisensorily * Highest level of studies*

| **Chi-Square Tests** | **Value** | **df** | **Asymptotic Significance (2-sided)** |
|---|---|---|---|
| **Pearson Chi-Square** | 10.250[a] | 4 | .036 |
| **Likelihood Ratio** | 10.219 | 4 | .037 |
| **Linear-by-Linear Association** | 7.177 | 1 | .007 |
| **N of Valid Cases** | 285 | | |

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 14,98.

A chi-square test of independence was performed to examine the relation between "I have the necessary knowledge to teach my students multisensorily" and "Specialization

in special education" (table 9.2.12.). The relation between these variables was significant, $x^2(4)=17.236$, $p=0.002<0.05$.

From reading the content of the table 9.2.11., it appears that the teachers and kindergarten teachers of typical and special education of the prefecture of Heraklion, are divided regarding whether they have the necessary knowledge to teach their students multisensorily. However, individuals who agree or strongly agree with the aforementioned statement and have specialization in special education are twice as numerous as those who do not have this specialization.

**Table 9.2.11.**

*Crosstabulation: I have the necessary knowledge to teach my students multisensorily * Specialization in special education*

| Crosstab | | Specialization in special education | | Total |
|---|---|---|---|---|
| | | No | Yes | |
| **I have the necessary knowledge to teach my students multisensorily** | Strongly disagree | 25 | 10 | 35 |
| | Disagree | 34 | 24 | 58 |
| | Neither agree nor disagree | 44 | 43 | 87 |
| | Agree | 23 | 42 | 65 |
| | Strongly agree | 14 | 26 | 40 |
| **Total** | | 140 | 145 | 285 |

**Table 9.2.12.**

*Chi-Square Tests for variables: I have the necessary knowledge to teach my students multisensorily * Specialization in special education*

| Chi-Square Tests | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| **Pearson Chi-Square** | 17.236[a] | 4 | .002 |
| **Likelihood Ratio** | 17.590 | 4 | .001 |
| **Linear-by-Linear Association** | 16.156 | 1 | <.001 |
| **N of Valid Cases** | 285 | | |

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 17,19.

A Wallis test (table 9.2.13.) showed that there was a statistically significant difference in the statement "I have the necessary knowledge to teach my students multisensorily" over the specialty, Kruskal Wallis (1)= 4,386, p =.036, with a mean rank of the dependent variable 160,60 for kindergarten teachers and 137,38 for teachers. According to this, more kindergarten teachers (M=160,60) consider that they have the necessary knowledge to teach their students multisensorily compared to teachers.

**Table 9.2.13.**

*Overviews of the sample teachers regarding the statement "I have the necessary knowledge to teach my students multisensorily" over number of students taught per hour the current school year*

| Specialty | N | Mean Rank | Kruskal-Wallis Test | p-value |
|---|---|---|---|---|
| **Kindergarten teacher** | 69 | **160,60** | 4,386 | 0.036 |
| **Teacher** | 216 | **137,38** | | Kindergarten teacher vs teacher |
| Total | 285 | | | |

A chi-square test of independence was performed to examine the relation between "I have the necessary knowledge to teach my students multisensorily" and "I use multisensory activities/teaching methods in subjects related to language" (table 9.2.15.). The relation between these variables was significant, $x^2(16)=92.579$, $p<0.001<0.05$.

From reading the content of the table 9.2.14., it generally appears that most teachers and kindergarten teachers of typical and special education in Heraklion prefecture who agree that they have the necessary knowledge to teach their students multisensorily frequently opt for multisensory teaching in language courses. However, it seems that most teachers who do not have relevant training either seldom or never choose this approach. Their attitude may be attributed to a lack of knowledge rather than a lack of willingness to employ multisensory methods.

**Table 9.2.14.**

*Crosstabulation: I have the necessary knowledge to teach my students multisensorily * I use multisensory activities/teaching methods in subjects related to language*

| Crosstab | | I use multisensory activities/teaching methods in subjects related to language | | | | | |
|---|---|---|---|---|---|---|---|
| | | Never | Rarely | Occasionally | Often | Daily | Total |
| **I have the necessary knowledge to teach my students multisensorily** | Strongly disagree | 10 | 14 | 6 | 3 | 2 | 35 |
| | Disagree | 9 | 21 | 18 | 10 | 0 | 58 |
| | Neither agree nor disagree | 6 | 16 | 27 | 29 | 9 | 87 |
| | Agree | 7 | 2 | 13 | 31 | 12 | 65 |
| | Strongly agree | 4 | 5 | 7 | 7 | 17 | 40 |
| **Total** | | 36 | 58 | 71 | 80 | 40 | 285 |

**Table 9.2.15.**

*Chi-Square Tests for variables: I have the necessary knowledge to teach my students multisensorily * Specialization in special education*

| Chi-Square Tests | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| **Pearson Chi-Square** | 92.579[a] | 16 | <.001 |
| **Likelihood Ratio** | 95.261 | 16 | <.001 |
| **Linear-by-Linear Association** | 47.619 | 1 | <.001 |
| **N of Valid Cases** | 285 | | |

a. 2 cells (8,0%) have expected count less than 5. The minimum expected count is 4,42.

A chi-square test of independence was performed to examine the relation between "I have the necessary knowledge to teach my students multisensorily" and "I use multisensory activities/teaching methods in subjects related to science" (table 9.2.17.). The relation between these variables was significant, $x^2(16)=82.152$, $p=0.001<0.05$.

From reading the content of the table 9.2.16., it appears in general that several teachers and kindergarten teachers of typical and special education in the prefecture of Heraklion who strongly disagree with the statement that "have the necessary knowledge to teach their students multisensorily", do not choose multisensory teaching in courses related to science. However, most of them rarely use it. At the same time, it seems that most of

those who declare that they are well qualified include it in their teaching every day. This may be due to the fact that both recognize its educational benefit.

**Table 9.2.16.**

*Crosstabulation: I have the necessary knowledge to teach my students multisensorily * I use multisensory activities/teaching methods in subjects related to science*

| | | **I use multisensory activities/teaching methods in subjects related to science** | | | | | |
|---|---|---|---|---|---|---|---|
| **Crosstab** | | Never | Rarely | Occasionally | Often | Daily | Total |
| **I have the necessary knowledge to teach my students multisensorily** | Strongly disagree | 11 | 13 | 3 | 3 | 5 | 35 |
| | Disagree | 9 | 23 | 12 | 9 | 5 | 58 |
| | Neither agree nor disagree | 6 | 19 | 27 | 24 | 11 | 87 |
| | Agree | 6 | 10 | 22 | 20 | 7 | 65 |
| | Strongly agree | 5 | 2 | 8 | 10 | 15 | 40 |
| **Total** | | 37 | 67 | 72 | 66 | 43 | 285 |

**Table 9.2.17.**

*Chi-Square Tests for variables: I have the necessary knowledge to teach my students multisensorily * I use multisensory activities/teaching methods in subjects related to science*

| **Chi-Square Tests** | **Value** | **df** | **Asymptotic Significance (2-sided)** |
|---|---|---|---|
| **Pearson Chi-Square** | 82.152[a] | 16 | <.001 |
| **Likelihood Ratio** | 7.092 | 16 | <.001 |
| **Linear-by-Linear Association** | 33,363 | 1 | <.001 |
| **N of Valid Cases** | 285 | | |

a. 2 cells (8,0%) have expected count less than 5. The minimum expected count is 3,68.

A chi-square test of independence was performed to examine the relation between "I have the necessary knowledge to teach my students multisensorily" and "Through multisensory activities, I give students with dyslexia equal educational opportunities

with their typical classmates" (table 9.2.19.). The relation between these variables was significant, $x^2(16)=69.538$, $p=0.001<0.05$.

From reading the content of the table 9.2.18., it generally appears that most teachers and kindergarten teachers of typical and special education in Heraklion prefecture acknowledge that through multisensory activities, they provide their dyslexic students with equal educational opportunities. Remarkably, a substantial number of those who neither agree nor disagree with the statement "I have the necessary knowledge to teach my students multisensorily" strongly support the idea of ensuring equal opportunities through multisensory teaching. This belief likely stems from the understanding that an unconventional teaching method can significantly contribute to the academic success of dyslexic students.

**Table 9.2.18.**

*Crosstabulation: I have the necessary knowledge to teach my students multisensorily * Through multisensory activities, I give students with dyslexia equal educational opportunities with their typical classmates*

| | | **Through multisensory activities, I give students with dyslexia equal educational opportunities with their typical classmates** | | | | | |
|---|---|---|---|---|---|---|---|
| **Crosstab** | | Strongly disagree | Disagree | Neither agree nor disagree | Agree | Strongly agree | Total |
| **I have the necessary knowledge to teach my students multisensorily** | Strongly disagree | 6 | 11 | 8 | 6 | 4 | 35 |
| | Disagree | 5 | 4 | 19 | 21 | 9 | 58 |
| | Neither agree nor disagree | 4 | 11 | 18 | 25 | 29 | 87 |
| | Agree | 0 | 3 | 5 | 29 | 28 | 65 |
| | Strongly agree | 10 | 6 | 4 | 11 | 9 | 40 |
| **Total** | | 25 | 35 | 54 | 92 | 79 | 285 |

**Table 9.2.19.**

*Chi-Square Tests for variables: I have the necessary knowledge to teach my students multisensorily * Through multisensory activities, I give students with dyslexia equal educational opportunities with their typical classmates*

| Chi-Square Tests | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| **Pearson Chi-Square** | 69.538[a] | 16 | <.001 |
| **Likelihood Ratio** | 70.469 | 16 | <.001 |
| **Linear-by-Linear Association** | 7.616 | 1 | .006 |
| **N of Valid Cases** | 285 | | |

a. 4 cells (16,0%) have expected count less than 5. The minimum expected count is 3,07.

A chi-square test of independence was performed to examine the relation between "I have professional confidence to teach my students multisensorily" and "Highest level of studies" (table 9.2.21.). The relation between these variables was significant, $x^2(4)=15.543$, $p=0.004<0.05$.

From reading the content of the table 9.2.20., it generally appears that most teachers and kindergarten teachers of typical and special education in Heraklion prefecture, who hold a master's degree tend to agree or strongly agree more when it comes to having professional confidence in teaching their students multisensorily, compared to those who only have a bachelor's degree.

**Table 9.2.20.**

*Crosstabulation: I have professional confidence to teach my students multisensorily * Highest level of studies*

| Crosstab | | Highest level of studies | | Total |
|---|---|---|---|---|
| | | Bachelor degree | Master degree | |
| **I have professional confidence to teach my students multisensorily** | Strongly disagree | 24 | 8 | 32 |
| | Disagree | 26 | 38 | 64 |
| | Neither agree nor disagree | 26 | 39 | 65 |
| | Agree | 32 | 55 | 87 |
| | Strongly agree | 14 | 23 | 37 |
| **Total** | | 122 | 163 | 285 |

**Table 9.2.21.**

*Chi-Square Tests for variables: I have professional confidence to teach my students multisensorily * Highest level of studies*

| Chi-Square Tests | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| **Pearson Chi-Square** | 15.543[a] | 4 | .004 |
| **Likelihood Ratio** | 15.699 | 4 | .003 |
| **Linear-by-Linear Association** | 7.609 | 1 | .006 |
| **N of Valid Cases** | 285 | | |

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 13,70.

A chi-square test of independence was performed to examine the relation between "I have professional confidence to teach my students multisensorily" and "I use multisensory activities/teaching methods in subjects related to language" (table 9.2.23.). The relation between these variables was significant, $x^2(16)=76.687$, $p=0.001<0.05$.

From reading the content of the table 9.2.22., it generally appears that most teachers and kindergarten teachers of typical and special education in Heraklion prefecture are in agreement with the statement "I have professional confidence to teach my students multisensorily". In fact, a majority of those who express agreement frequently opt for multisensory teaching in language-related courses. Additionally, there is an upward trend in the utilization of multisensory teaching in language courses among those who report having complete professional confidence. These observations likely stem from the idea that specialized training in multisensory methods encourages their implementation into the educational process.

**Table 9.2.22.**

*Crosstabulation: I have professional confidence to teach my students multisensorily * I use multisensory activities/teaching methods in subjects related to language*

| Crosstab | | I use multisensory activities/teaching methods in subjects related to language | | | | | |
|---|---|---|---|---|---|---|---|
| | | Never | Rarely | Occasionally | Often | Daily | Total |
| | Strongly disagree | 10 | 13 | 7 | 1 | 1 | 32 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **I have professional confidence to teach my students multisensorily** | Disagree | 5 | 20 | 24 | 13 | 2 | 64 |
| | Neither agree nor disagree | 3 | 12 | 17 | 23 | 10 | 65 |
| | Agree | 11 | 10 | 17 | 36 | 13 | 87 |
| | Strongly agree | 7 | 3 | 6 | 7 | 14 | 37 |
| **Total** | | 36 | 58 | 71 | 80 | 40 | 285 |

**Table 9.2.23.**

*Chi-Square Tests for variables: I have professional confidence to teach my students multisensorily * I use multisensory activities/teaching methods in subjects related to language*

| Chi-Square Tests | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| **Pearson Chi-Square** | 76.687[a] | 16 | <.001 |
| **Likelihood Ratio** | 77.335 | 16 | <.001 |
| **Linear-by-Linear Association** | 28.089 | 1 | <.001 |
| **N of Valid Cases** | 285 | | |

a. 3 cells (12,0%) have expected count less than 5. The minimum expected count is 4,04.

A chi-square test of independence was performed to examine the relation between "I have professional confidence to teach my students multisensorily" and "I use multisensory activities/teaching methods in subjects related to science" (table 9.2.25.). The relation between these variables was significant, $x^2(16)=42.201$, $p<0.001<0.05$.

From reading the content of the table 9.2.24., it generally appears that most teachers and kindergarten teachers of typical and special education in Heraklion prefecture are in agreement with the statement "I have professional confidence to teach my students multisensorily". Notably, a significant portion of those who express agreement indicates that they often choose multisensory teaching in science-related courses. These findings likely stem from the notion that specialized training in multisensory methods promotes their integration into the educational process.

**Table 9.2.24.**

*Crosstabulation: I have professional confidence to teach my students multisensorily * I use multisensory activities/teaching methods in subjects related to science*

| Crosstab | | I use multisensory activities/teaching methods in subjects related to science | | | | | Total |
|---|---|---|---|---|---|---|---|
| | | Never | Rarely | Occasionally | Often | Daily | |
| **I have professional confidence to teach my students multisensorily** | Strongly disagree | 6 | 14 | 4 | 2 | 6 | 32 |
| | Disagree | 11 | 20 | 18 | 10 | 5 | 64 |
| | Neither agree nor disagree | 7 | 12 | 21 | 18 | 7 | 65 |
| | Agree | 8 | 17 | 25 | 25 | 12 | 87 |
| | Strongly agree | 5 | 4 | 4 | 11 | 13 | 37 |
| **Total** | | 37 | 67 | 72 | 66 | 43 | 285 |

**Table 9.2.25.**

*Chi-Square Tests for variables: I have professional confidence to teach my students multisensorily * I use multisensory activities/teaching methods in subjects related to science*

| Chi-Square Tests | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| **Pearson Chi-Square** | 42.201[a] | 16 | <.001 |
| **Likelihood Ratio** | 42.285 | 16 | <.001 |
| **Linear-by-Linear Association** | 16.891 | 1 | <.001 |
| **N of Valid Cases** | 285 | | |

a. 3 cells (12,0%) have expected count less than 5. The minimum expected count is 4,15.

A chi-square test of independence was performed to examine the relation between "I have professional confidence to teach my students multisensorily" and "Specialization in special education" (table 9.2.27.). The relation between these variables was significant, $x^2(4)=17.236$, $p=0.001<0.05$.

From reading the content of the table 9.2.26., it generally appears that teachers and kindergarten teachers opinions of typical and special education in Heraklion prefecture are divided regarding the statement "I have professional confidence to teach my students multisensorily". However, there is an observed trend indicating that individuals specializing in special education are less likely to strongly disagree or

disagree with the aforementioned statement, while those without specialization in special education are more inclined to do so. This pattern may be attributed to the specialized knowledge that individuals in the field of special education acquire, either through formal education or specialized training programs (such as postgraduate studies or seminars), which may foster a greater appreciation for multisensory teaching.

**Table 9.2.26.**

*Crosstabulation: Specialization in special education * I have the necessary knowledge to teach my students multisensorily*

| Crosstab | | I have the necessary knowledge to teach my students multisensorily | | | | | |
|---|---|---|---|---|---|---|---|
| | | Strongly disagree | Disagree | Neither agree nor disagree | Agree | Strongly agree | Total |
| **Specialization in special education** | No | 25 | 34 | 44 | 23 | 14 | 140 |
| | Yes | 10 | 24 | 43 | 42 | 26 | 145 |
| **Total** | | 35 | 58 | 87 | 65 | 40 | 285 |

**Table 9.2.27.**

*Chi-Square Tests for variables: Specialization in special education * I have the necessary knowledge to teach my students multisensorily*

| Chi-Square Tests | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| **Pearson Chi-Square** | 17,236a | 4 | .002 |
| **Likelihood Ratio** | 17,590 | 4 | .001 |
| **Linear-by-Linear Association** | 16,156 | 1 | <.001 |
| **N of Valid Cases** | 285 | | |

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 17,19.

A chi-square test of independence was performed to examine the relation between "Multisensory teaching helps students with dyslexia to achieve learning goals in subjects related to language" and "Specialization in special education" (table 9.2.29.). The relation between these variables was significant, $x^2(4)=10.366$, $p=0.035<0.05$.

From reading the content of the table 9.2.28., it generally appears that most teachers and kindergarten teachers of typical and special education in Heraklion prefecture are

in agreement with the statement “Multisensory teaching helps students with dyslexia to achieve learning goals in subjects related to language”. Also, there is a slight trend that those who are specialized in special education tend to agree more strongly than those who are not. This may be due to the fact that those who specialize in special education are better informed about multisensory teaching and its benefits.

**Table 9.2.28.**

*Crosstabulation: Specialization in special education * Multisensory teaching helps students with dyslexia to achieve learning goals in subjects related to language*

| | | **Multisensory teaching helps students with dyslexia to achieve learning goals in subjects related to language** | | | | | |
|---|---|---|---|---|---|---|---|
| **Crosstab** | | Strongly disagree | Disagree | Neither agree nor disagree | Agree | Strongly agree | Total |
| **Specialization in special education** | No | 18 | 14 | 24 | 59 | 25 | 140 |
| | Yes | 13 | 24 | 20 | 45 | 43 | 145 |
| **Total** | | 31 | 38 | 44 | 104 | 68 | 285 |

**Table 9.2.29.**

*Chi-Square Tests for variables: Specialization in special education * Multisensory teaching helps students with dyslexia to achieve learning goals in subjects related to language*

| **Chi-Square Tests** | **Value** | **df** | **Asymptotic Significance (2-sided)** |
|---|---|---|---|
| **Pearson Chi-Square** | 10,366a | 4 | .035 |
| **Likelihood Ratio** | 10,462 | 4 | .033 |
| **Linear-by-Linear Association** | ,811 | 1 | .368 |
| **N of Valid Cases** | 285 | | |

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 15,23.

A chi-square test of independence was performed to examine the relation between “Multisensory teaching helps students with dyslexia to achieve learning goals in

subjects related to language" and "Specialization in special education" (table 9.2.31.). The relation between these variables was significant, $x^2(4)=9.927$, $p=0.042<0.05$.

From reading the content of the table 9.2.30., it generally appears that most teachers and kindergarten teachers of typical and special education in Heraklion prefecture are in agreement with the statement "Multisensory teaching helps students with dyslexia to achieve learning goals in subjects related to science". Also, there is a slight trend that those who are specialized in special education tend be in agreement strongly or not with this statement than those who are not. This may be due to the fact that those who specialize in special education are better informed about multisensory teaching and its benefits.

**Table 9.2.30.**

*Crosstabulation: Specialization in special education * Multisensory teaching helps students with dyslexia to achieve learning goals in subjects related to science*

| | | **Multisensory teaching helps students with dyslexia achieve learning goals in subjects related to science** | | | | | |
|---|---|---|---|---|---|---|---|
| **Crosstab** | | Strongly disagree | Disagree | Neither agree nor disagree | Agree | Strongly agree | Total |
| **Specialization in special education** | No | 11 | 26 | 29 | 60 | 14 | 140 |
| | Yes | 15 | 23 | 22 | 52 | 33 | 145 |
| **Total** | | 26 | 49 | 51 | 112 | 47 | 285 |

**Table 9.2.31.**

*Chi-Square Tests for variables: Specialization in special education * Multisensory teaching helps students with dyslexia to achieve learning goals in subjects related to science*

| Chi-Square Tests | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| **Pearson Chi-Square** | 9,927a | 4 | .042 |
| **Likelihood Ratio** | 10,155 | 4 | .038 |
| **Linear-by-Linear Association** | 1,290 | 1 | .256 |
| **N of Valid Cases** | 285 | | |

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 12,77.

A chi-square test of independence was performed to examine the relation between "The school I work has the necessary resources to be able to teach my students multisensorily" and "I use multisensory activities/teaching methods in subjects related to language" (table 9.2.33.). The relation between these variables was significant, $x^2(16)=42.084$, $p<0.001<0.05$.

From reading the content of the table 9.2.32., it generally appears that most teachers and kindergarten teachers of typical and special education in Heraklion prefecture, who express complete disagreement with the statement that "The school I work in has the necessary resources to be able to teach my students multisensorily", tend to decrease the frequency of employing multisensory teaching in language-related courses. This phenomenon may be attributed to their perception that implementing multisensory teaching is more challenging without the appropriate logistical infrastructure in place.

**Table 9.2.32.**

*Crosstabulation: The school I work has the necessary resources to be able to teach my students multisensorily * I use multisensory activities/teaching methods in subjects related to language*

| | | I use multisensory activities/teaching methods in subjects related to language | | | | | |
|---|---|---|---|---|---|---|---|
| **Crosstab** | | Never | Rarely | Occasionally | Often | Daily | Total |
| **The school I work has the necessary** | Strongly disagree | 8 | 16 | 15 | 14 | 5 | 58 |
| | Disagree | 3 | 23 | 26 | 22 | 10 | 84 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **resources to be able to teach my students multisensorily** | Neither agree nor disagree | 9 | 7 | 18 | 22 | 6 | 62 |
| | Agree | 9 | 8 | 7 | 20 | 9 | 53 |
| | Strongly agree | 7 | 4 | 5 | 2 | 10 | 28 |
| **Total** | | 36 | 58 | 71 | 80 | 40 | 285 |

**Table 9.2.33.**

*Chi-Square Tests for variables: The school I work has the necessary resources to be able to teach my students multisensorily * I use multisensory activities/teaching methods in subjects related to language*

| Chi-Square Tests | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| **Pearson Chi-Square** | 42.084[a] | 16 | <.001 |
| **Likelihood Ratio** | 43.326 | 16 | <.001 |
| **Linear-by-Linear Association** | 1.520 | 1 | .218 |
| **N of Valid Cases** | 285 | | |

a. 2 cells (8,0%) have expected count less than 5. The minimum expected count is 3,54.

A chi-square test of independence was performed to examine the relation between "Multisensory teaching helps students with dyslexia better understand the teaching objective" and "I use multisensory activities/teaching methods in subjects related to science" (table 9.2.35.). The relation between these variables was significant, $x^2(16)=62.850$, $p=0.001<0.05$.

From reading the content of the table 9.2.34., it generally appears that most teachers and kindergarten teachers of typical and special education in Heraklion prefecture, particularly those who express disagreement and/or strong disagreement with the statement that "The school I work in has the necessary resources to be able to teach my students multisensorily", tend to decrease the frequency of incorporating multisensory teaching into science-related courses. This could be attributed to their perception that implementing multisensory teaching is more challenging without the appropriate logistical infrastructure in place.

**Table 9.2.34.**

*Crosstabulation: Multisensory teaching helps students with dyslexia better understand the teaching objective * I use multisensory activities/teaching methods in subjects related to science*

| Crosstab | | I use multisensory activities/teaching methods in subjects related to science | | | | | Total |
|---|---|---|---|---|---|---|---|
| | | Never | Rarely | Occasionally | Often | Daily | |
| **Multisensory teaching helps students with dyslexia better understand the teaching objective** | Strongly disagree | 9 | 1 | 4 | 2 | 3 | 19 |
| | Disagree | 7 | 2 | 1 | 3 | 3 | 16 |
| | Neither agree nor disagree | 4 | 7 | 7 | 5 | 4 | 27 |
| | Agree | 8 | 38 | 23 | 23 | 15 | 107 |
| | Strongly agree | 9 | 19 | 37 | 33 | 18 | 116 |
| **Total** | | 37 | 67 | 72 | 66 | 43 | 285 |

**Table 9.2.35.**

*Chi-Square Tests for variables: Multisensory teaching helps students with dyslexia better understand the teaching objective * I use multisensory activities/teaching methods in subjects related to science*

| Chi-Square Tests | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| **Pearson Chi-Square** | 62.850[a] | 16 | <.001 |
| **Likelihood Ratio** | 58.841 | 16 | <.001 |
| **Linear-by-Linear Association** | 6.143 | 1 | .013 |
| **N of Valid Cases** | 285 | | |

a. 2 cells (8,0%) have expected count less than 5. The minimum expected count is 3,64.

A chi-square test of independence was performed to examine the relation between "The school I work has the necessary resources to be able to teach my students multisensorily" and "Choosing or not to use multisensory teaching depends on the technological equipment I have" (table 9.2.37). The relation between these variables was significant, $x^2(12)=23.107$, $p=0.027<0.05$.

From reading the content of the table 9.2.36., it generally appears that most teachers and kindergarten teachers of typical and special education in Heraklion prefecture, especially those who express disagreement or strong disagreement with the statement

that “The school I work in has the necessary resources to be able to teach my students multisensorily”, place great importance on the existence of a logistical infrastructure to support their decision to use multisensory teaching. This may be due to their perception that implementing multisensory teaching is more challenging in the absence of the appropriate logistical resources.

**Table 9.2.36.**

*Crosstabulation: The school I work has the necessary resources to be able to teach my students multisensorily * Choosing to use multisensory teaching depends on the technological equipment I have*

| | | **Choosing to use multisensory teaching depends on the technological equipment I have** | | | | Total |
|---|---|---|---|---|---|---|
| **Crosstab** | | Not important at all | Of little importance | Very important | Absolutely essential | |
| **The school I work has the necessary resources to be able to teach my students multisensorily** | Strongly disagree | 7 | 22 | 13 | 16 | 58 |
| | Disagree | 9 | 15 | 34 | 26 | 84 |
| | Neither agree nor disagree | 8 | 9 | 29 | 16 | 62 |
| | Agree | 1 | 16 | 18 | 18 | 53 |
| | Strongly agree | 5 | 7 | 6 | 10 | 28 |
| **Total** | | 30 | 69 | 100 | 86 | 285 |

**Table 9.2.37.**

*Chi-Square Tests for variables: The school I work has the necessary resources to be able to teach my students multisensorily * Choosing to use multisensory teaching depends on the technological equipment I have*

| **Chi-Square Tests** | **Value** | **df** | **Asymptotic Significance (2-sided)** |
|---|---|---|---|
| **Pearson Chi-Square** | 23.107[a] | 12 | .027 |
| **Likelihood Ratio** | 24.983 | 12 | ,015 |
| **Linear-by-Linear Association** | .869 | 1 | .351 |
| **N of Valid Cases** | 285 | | |

a. 1 cells (5,0%) have expected count less than 5. The minimum expected count is 2,95.

A chi-square test of independence was performed to examine the relation between “Multisensory teaching helps students with dyslexia to achieve learning goals in

subjects related to language" and "Highest level of studies" (table 9.2.39.). The relation between these variables was significant, $x^2(4)=10.336$, p=0.035<0.05.

From reading the content of the table 9.2.38., it generally appears that most teachers and kindergarten teachers of typical and special education in Heraklion prefecture, agree or strongly agree with the statement that "Multisensory teaching helps students with dyslexia to achieve learning goals in subjects related to language". However, it is worth noting that those with a master's degree tend to express a highest degree of agreement compared to those with only a bachelor's degree. This difference in perspective may be attributed to the enhanced knowledge and expertise typically associated with individuals holding master's degrees.

**Table 9.2.38.**

*Crosstabulation: Multisensory teaching helps students with dyslexia to achieve learning goals in subjects related to language * Highest level of studies*

| Crosstab | | Highest level of studies | | Total |
|---|---|---|---|---|
| | | Bachelor degree | Master degree | |
| **Multisensory teaching helps students with dyslexia to achieve learning goals in subjects related to language** | Strongly disagree | 18 | 13 | 31 |
| | Disagree | 14 | 24 | 38 |
| | Neither agree nor disagree | 23 | 21 | 44 |
| | Agree | 47 | 57 | 104 |
| | Strongly agree | 20 | 48 | 68 |
| **Total** | | 122 | 163 | 285 |

**Table 9.2.39.**

*Chi-Square Tests for variables: Multisensory teaching helps students with dyslexia to achieve learning goals in subjects related to language * Highest level of studies*

| Chi-Square Tests | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| **Pearson Chi-Square** | 10.336[a] | 4 | .035 |
| **Likelihood Ratio** | 10.488 | 4 | .033 |
| **Linear-by-Linear Association** | 4.561 | 1 | .033 |
| **N of Valid Cases** | 285 | | |

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 13,27.

A chi-square test of independence was performed to examine the relation between "Multisensory teaching helps students with dyslexia to achieve learning goals in subjects related to language" and "Multisensory teaching helps students with dyslexia achieve learning goals in subjects related to science" (table 9.2.41.). The relation between these variables was significant, $x^2(16)=41.486$, $p=.001<0.05$.

From reading the content of the table 9.2.40., it generally appears that most teachers and kindergarten teachers of typical and special education in Heraklion prefecture who express agreement with the statement "Multisensory teaching helps students with dyslexia achieve learning goals in subjects related to language" also tend to agree with the statement "Multisensory teaching helps students with dyslexia achieve learning goals in subjects related to science". Moreover, a significant number of those who report complete agreement with the first statement also express complete agreement with the second statement. This correlation may suggests that individuals who opt for multisensory instruction recognize its educational benefits across various subjects, irrespective of the specific subject matter.

**Table 9.2.40.**

*Crosstabulation: Multisensory teaching helps students with dyslexia to achieve learning goals in subjects related to language * Multisensory teaching helps students with dyslexia achieve learning goals in subjects related to science*

| | | **Multisensory teaching helps students with dyslexia achieve learning goals in subjects related to science** | | | | | |
|---|---|---|---|---|---|---|---|
| **Crosstab** | | Strongly disagree | Disagree | Neither agree nor disagree | Agree | Strongly agree | Total |
| **Multisensory teaching helps students with dyslexia to achieve learning goals in subjects related to language** | Strongly disagree | 3 | 8 | 9 | 8 | 3 | 31 |
| | Disagree | 4 | 11 | 9 | 13 | 1 | 38 |
| | Neither agree nor disagree | 6 | 9 | 15 | 12 | 2 | 44 |
| | Agree | 7 | 17 | 13 | 58 | 9 | 104 |
| | Strongly agree | 6 | 4 | 5 | 21 | 32 | 68 |
| **Total** | | 26 | 49 | 51 | 112 | 47 | 285 |

**Table 9.2.41.**

*Chi-Square Tests for variables: Multisensory teaching helps students with dyslexia to achieve learning goals in subjects related to language * Multisensory teaching helps students with dyslexia achieve learning goals in subjects related to science*

| Chi-Square Tests | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| **Pearson Chi-Square** | 41.486[a] | 16 | <.001 |
| **Likelihood Ratio** | 41.635 | 16 | <.001 |
| **Linear-by-Linear Association** | 13.047 | 1 | <.001 |
| **N of Valid Cases** | 285 | | |

a. 3 cells (12,0%) have expected count less than 5. The minimum expected count is 3,92.

A chi-square test of independence was performed to examine the relation between "Multisensory teaching helps students with dyslexia to achieve learning goals in subjects related to language" and "Through multisensory activities, I give students with dyslexia equal educational opportunities with their typical classmates" (9.2.43.). The relation between these variables was significant, $x^2(16)=73.063$, $p<0.001<0.05$.

From reading the content of the table 9.2.42., it generally appears that most teachers and kindergarten teachers in Heraklion prefecture, both in typical and special education, who express agreement and/or complete agreement with the statement that "Multisensory teaching helps students with dyslexia achieve learning goals in subjects related to language" also tend to agree with the statement "Through multisensory activities, I provide students with dyslexia equal educational opportunities with their typical classmates". Furthermore, there is a noticeable positive correlation between these two statements. This may suggests a prevailing belief that multisensory teaching is conducive to inclusive education and helps ensure equal opportunities for students with dyslexia compared to their typical peers.

**Table 9.2.42.**

*Crosstabulation: Multisensory teaching helps students with dyslexia to achieve learning goals * Through multisensory activities, I give students with dyslexia equal educational opportunities with their typical classmates*

| Crosstab | | Through multisensory activities, I give students with dyslexia equal educational opportunities with their typical classmates | | | | | |
|---|---|---|---|---|---|---|---|
| | | Strongly disagree | Disagree | Neither agree nor disagree | Agree | Strongly agree | Total |
| **Multisensory teaching helps students with dyslexia to achieve learning goals in subjects related to language** | Strongly disagree | 9 | 7 | 5 | 5 | 5 | 31 |
| | Disagree | 5 | 9 | 6 | 10 | 8 | 38 |
| | Neither agree nor disagree | 4 | 8 | 13 | 10 | 9 | 44 |
| | Agree | 7 | 9 | 23 | 45 | 20 | 104 |
| | Strongly agree | 0 | 2 | 7 | 22 | 37 | 68 |
| **Total** | | 25 | 35 | 54 | 92 | 79 | 285 |

**Table 9.2.43.**

*Chi-Square Tests for variables: Multisensory teaching helps students with dyslexia to achieve learning goals * Through multisensory activities, I give students with dyslexia equal educational opportunities with their typical classmates*

| Chi-Square Tests | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| **Pearson Chi-Square** | 73.063[a] | 16 | <.001 |
| **Likelihood Ratio** | 71.529 | 16 | <.001 |
| **Linear-by-Linear Association** | 44.777 | 1 | <.001 |
| **N of Valid Cases** | 285 | | |

a. 5 cells (20,0%) have expected count less than 5. The minimum expected count is 2,72.

A chi-square test of independence was performed to examine the relation between "Multisensory teaching helps students with dyslexia to achieve learning goals in subjects related to science" and "I use multisensory activities/teaching methods in subjects related to science" (table 9.2.45.). The relation between these variables was significant, $x^2(16)=40.058$, $p<0.001<0.05$.

From reading the content of the table 9.2.44., it appears that, in general, teachers and kindergarten teachers in the prefecture of Heraklion, both in special and typical education, are more inclined to use multisensory activities and teaching methods in subjects related to science when they believe that multisensory teaching helps students with dyslexia achieve learning goals in these subjects. This observation aligns with teachers' perceptions and suggests that they tend to implement teaching practices that align with their beliefs and convictions.

**Table 9.2.44.**

*Crosstabulation: Multisensory teaching helps students with dyslexia achieve learning goals in subjects related to science * I use multisensory activities/teaching methods in subjects related to science*

| | | I use multisensory activities/teaching methods in subjects related to science | | | | | |
|---|---|---|---|---|---|---|---|
| **Crosstab** | | Never | Rarely | Occasionally | Often | Daily | Total |
| **Multisensory teaching helps students with dyslexia achieve learning goals in subjects related to science** | Strongly disagree | 7 | 3 | 8 | 6 | 2 | 26 |
| | Disagree | 9 | 14 | 13 | 7 | 6 | 49 |
| | Neither agree nor disagree | 9 | 16 | 8 | 8 | 10 | 51 |
| | Agree | 9 | 26 | 34 | 34 | 9 | 112 |
| | Strongly agree | 3 | 8 | 9 | 11 | 16 | 47 |
| **Total** | | 37 | 67 | 72 | 66 | 43 | 285 |

**Table 9.2.45.**

*Chi-Square Tests for variables: Multisensory teaching helps students with dyslexia achieve learning goals in subjects related to science * I use multisensory activities/teaching methods in subjects related to science*

| **Chi-Square Tests** | **Value** | **df** | **Asymptotic Significance (2-sided)** |
|---|---|---|---|
| **Pearson Chi-Square** | 40.058[a] | 16 | <.001 |
| **Likelihood Ratio** | 38.339 | 16 | .001 |
| **Linear-by-Linear Association** | 11.983 | 1 | <.001 |
| **N of Valid Cases** | 285 | | |

a. 2 cells (8,0%) have expected count less than 5. The minimum expected count is 3,38.

A chi-square test of independence was performed to examine the relation between "I use multisensory activities/teaching methods in subjects related to language" and "Specialization n special education" (table 9.2.47.). The relation between these variables was significant, $x^2(4)=14.883$, $p=0.005<0.05$.

From reading the content of the table 9.2.46., it appears that, in general, teachers and kindergarten teachers in the prefecture of Heraklion, both in special and typical education they use multisensory activities/teaching methods in subjects related to language. However, it is noteworthy that the number of individuals specializing in special education who incorporate multisensory teaching daily is more than double that of those who integrate it into their daily teaching but lack special education expertise. This observation can be attributed to the fact that those specializing in special education are likely more aware of the advantages of multisensory teaching and make a conscious effort to implement it in their daily teaching practices.

**Table 9.2.46.**

*Crosstabulation: I use multisensory activities/teaching methods in subjects related to language * Specialization in special education*

| | | **Specialization in special education** | | |
|---|---|---|---|---|
| **Crosstab** | | No | Yes | Total |
| **I use multisensory activities/teaching methods in subjects related to language** | Never | 18 | 18 | 36 |
| | Rarely | 37 | 21 | 58 |
| | Occasionally | 33 | 38 | 71 |
| | Often | 42 | 38 | 80 |
| | Daily | 10 | 30 | 40 |
| **Total** | | 140 | 145 | 285 |

**Table 9.2.47.**

*Chi-Square Tests for variables: I use multisensory activities/teaching methods in subjects related to language * Specialization in special education*

| **Chi-Square Tests** | **Value** | **df** | **Asymptotic Significance (2-sided)** |
|---|---|---|---|
| **Pearson Chi-Square** | 14.883[a] | 4 | .005 |
| **Likelihood Ratio** | 15.401 | 4 | .004 |
| **Linear-by-Linear Association** | 6.018 | 1 | .014 |

| | |
|---|---|
| **N of Valid Cases** | 285 |

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 17,68.

A chi-square test of independence was performed to examine the relation between "I use multisensory activities/teaching methods in subjects related to language" and "Multisensory teaching helps students with dyslexia to achieve learning goals in subjects related to language" (table 9.2.49.). The relation between these variables was significant, $x^2(16)=41.486$, $p<0.001<0.05$.

From reading the content of the table 9.2.48., it appears that, in general, teachers and kindergarten teachers in the prefecture of Heraklion, both in typical and special education, exhibit a positive correlation between their belief in the effectiveness of multisensory teaching in helping students with dyslexia achieve learning goals in language-related subjects and their frequency of using multisensory activities or teaching methods in those subjects. However, it is noteworthy that there are generally more individuals who agree or strongly agree with the statement "Multisensory teaching helps students with dyslexia achieve learning goals in subjects related to language" and use multisensory teaching often or daily. This difference in numbers could potentially be attributed to the time-consuming nature of language teaching, which may limit the availability of teaching time for daily use of multisensory methods.

**Table 9.2.48.**

*Crosstabulation: I use multisensory activities/teaching methods in subjects related to language * Multisensory teaching helps students with dyslexia to achieve learning goals in subjects related to language*

| | | **Multisensory teaching helps students with dyslexia to achieve learning goals in subjects related to language** | | | | | Total |
|---|---|---|---|---|---|---|---|
| **Crosstab** | | Strongly disagree | Disagree | Neither agree nor disagree | Agree | Strongly agree | |
| **I use multisensory activities/teaching methods in subjects related to language** | Never | 7 | 9 | 7 | 5 | 8 | 36 |
| | Rarely | 7 | 7 | 12 | 23 | 9 | 58 |
| | Occasionally | 9 | 8 | 12 | 25 | 17 | 71 |
| | Often | 7 | 9 | 6 | 43 | 15 | 80 |
| | Daily | 1 | 5 | 7 | 8 | 19 | 40 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Total** | 31 | 38 | 44 | 104 | 68 | 285 |

**Table 9.2.49.**

*Chi-Square Tests for variables: I use multisensory activities/teaching methods in subjects related to language * Multisensory teaching helps students with dyslexia to achieve learning goals in subjects related to language*

| Chi-Square Tests | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| **Pearson Chi-Square** | 41.486[a] | 16 | <.001 |
| **Likelihood Ratio** | 41.635 | 16 | <.001 |
| **Linear-by-Linear Association** | 13.047 | 1 | <.001 |
| **N of Valid Cases** | 285 | | |

a. 3 cells (12,0%) have expected count less than 5. The minimum expected count is 3,92.

A chi-square test of independence was performed to examine the relation between "I use multisensory activities/teaching methods in subjects related to science" and "Specialty" (table 9.2.51.). The relation between these variables was significant, $x^2(4)=16.238$, $p=0.003<0.05$.

From reading the content of the table 9.2.50., it appears that, generally teachers and kindergarten teachers in the prefecture of Heraklion, both in typical and special education are divided regardingthe use of multisensory activities and teaching methods in subjects related to science are divided. Notably, there is a significant majority of teachers who either never or rarely use multisensory teaching in science subjects, especially when compared to kindergarten teachers who stated that they never or rarely use it. This divergence in approach may be attributed to the historical association of multisensory instruction with language subjects. Additionally, as elementary science involves more complex concepts compared to the foundational math concepts taught in kindergarten, some teachers might be hesitant to implement multisensory methods in science education.

**Table 9.2.50.**

*Crosstabulation: I use multisensory activities/teaching methods in subjects related to science * Specialty*

| | | Specialty | | |
|---|---|---|---|---|
| **Crosstab** | | Kindergarten teacher | Teacher | Total |

| | | | | |
|---|---|---|---|---|
| **I use multisensory activities/teaching methods in subjects related to science** | Never | 9 | 28 | 37 |
| | Rarely | 6 | 61 | 67 |
| | Occasionally | 16 | 56 | 72 |
| | Often | 21 | 45 | 66 |
| | Daily | 17 | 26 | 43 |
| **Total** | | 69 | 216 | 285 |

**Table 9.2.51.**

*Chi-Square Tests for variables: I use multisensory activities/teaching methods in subjects related to science * Specialty*

| **Chi-Square Tests** | **Value** | **df** | **Asymptotic Significance (2-sided)** |
|---|---|---|---|
| **Pearson Chi-Square** | 16.238[a] | 4 | .003 |
| **Likelihood Ratio** | 17.481 | 4 | .002 |
| **Linear-by-Linear Association** | 9.635 | 1 | .002 |
| **N of Valid Cases** | 285 | | |

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 8,96.

A chi-square test of independence was performed to examine the relation between "I use multisensory activities/teaching methods in subjects related to language" and "Specialization in special education" (table 9.2.53). The relation between these variables was significant, $x^2(4)=11.987$, $p=0.017<0.05$.

Based on the information presented in the table 9.2.52., it appears that teachers and kindergarten teachers in the Heraklion prefecture, whether in typical or special education, tend to use multisensory activities and teaching methods to a similar extent across various teaching subjects. However, it is observed that those with specialization in special education tend to use multisensory teaching methods more often than those who do not have specialization, regardless of the teaching subject. This observation could be attributed to the idea that educators who recognize the benefits of multisensory teaching may strive to implement it in their teaching practices, irrespective of the specific subject they are teaching.

**Table 9.2.52.**

*Crosstabulation: I use multisensory activities/teaching methods regardless of the teaching subject * Specialization in special education*

| Crosstab | | Specialization in special education | | Total |
|---|---|---|---|---|
| | | No | Yes | |
| **I use multisensory activities/teaching methods regardless of the teaching subject** | Never | 15 | 15 | 30 |
| | Rarely | 44 | 25 | 69 |
| | Occasionally | 38 | 39 | 77 |
| | Often | 30 | 37 | 67 |
| | Daily | 13 | 29 | 42 |
| **Total** | | 140 | 145 | 285 |

**Table 9.2.53.**

*Chi-Square Tests for variables: I use multisensory activities/teaching methods regardless of the teaching subject * Specialization in special education*

| Chi-Square Tests | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| **Pearson Chi-Square** | 11.987[a] | 4 | .017 |
| **Likelihood Ratio** | 12.210 | 4 | .016 |
| **Linear-by-Linear Association** | 7.835 | 1 | .005 |
| **N of Valid Cases** | 285 | | |

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 14,74.

A chi-square test of independence was performed to examine the relation between “I use multisensory teaching and “Highest level of studies” (table 9.2.55.). The relation between these variables was significant, $x^2(4)=11.022$, $p=0.026<0.05$.

Based on the information provided in the table 9.2.54., it is evident that the views of both teachers and kindergarten teachers in the Heraklion prefecture, whether in typical or special education, with either a bachelor's or master's degree, vary when it comes to the statement “I use multisensory teaching”. However, there is a noticeable trend indicating that individuals with a master's degree tend to use multisensory teaching more frequently, whereas those without a master's degree tend to use it less often. This probably happens either because they came into contact with multisensory teaching methods during their postgraduate specialization, or because regardless of their

postgraduate specialization, they tend to be educated more generally in relation to their profession.

**Table 9.2.54.**

*Crosstabulation: I use multisensory teaching * Highest level of studies*

| Crosstab | | Highest level of studies | | Total |
|---|---|---|---|---|
| | | Bachelor degree | Master degree | |
| **I use multisensory teaching** | Never | 13 | 8 | 21 |
| | Rarely | 38 | 34 | 72 |
| | Occasionaly | 30 | 59 | 89 |
| | Often | 22 | 41 | 63 |
| | Daily | 19 | 21 | 40 |
| **Total** | | 122 | 163 | 285 |

**Table 9.2.55.**

*Chi-Square Tests for variables: I use multisensory teaching * Highest level of studies*

| Chi-Square Tests | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| **Pearson Chi-Square** | 11.022[a] | 4 | .026 |
| **Likelihood Ratio** | 11.050 | 4 | .026 |
| **Linear-by-Linear Association** | 2.916 | 1 | .088 |
| **N of Valid Cases** | 285 | | |

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 8,99.

A chi-square test of independence was performed to examine the relation between "I use multisensory activities/teaching methods in subjects related to language" and "Specialization in special education" (table 9.2.57.). The relation between these variables was significant, $x^2(4)=10.461$, $p=0.033<0.05$.

Based on the information presented in table 9.2.56, it is apparent that there is a division in the opinions of teachers and kindergarten educators in the Heraklion prefecture, including those in both typical and special education. Those who specialize in special education tend to use it more frequently.

**Table 9.2.56.**

*Crosstabulation: I use multisensory teaching * Specialization in special education*

| Crosstab | | Specialization in special education | | Total |
|---|---|---|---|---|
| | | No | Yes | |
| **I use multisensory teaching** | Never | 13 | 8 | 21 |
| | Rarely | 41 | 31 | 72 |
| | Occasionally | 47 | 42 | 89 |
| | Often | 27 | 36 | 63 |
| | Daily | 12 | 28 | 40 |
| **Total** | | 140 | 145 | 285 |

**Table 9.2.57.**

*Chi-Square Tests for variables: I use multisensory teaching * Specialization in special education*

| Chi-Square Tests | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| **Pearson Chi-Square** | 10.461[a] | 4 | .033 |
| **Likelihood Ratio** | 10.661 | 4 | .031 |
| **Linear-by-Linear Association** | 9.699 | 1 | .002 |
| **N of Valid Cases** | 285 | | |

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 10,32.

A chi-square test of independence was performed to examine the relation between "Multisensory teaching requires more teaching time than I can spare" and "Number of students taught per hour the current school year" (table 9.2.59.). The relation between these variables was significant, $x^2(12)=24.944$, $p=0.015<0.05$.

From reading the content of the table 9.2.58, it generally appears that most teachers and kindergarten teachers of typical and special education in the prefecture of Heraklion who believe that multisensory teaching requires more time than they can spare, tend to have 8 or more students in their class. Additionally, a positive correlation is observed between those who strongly agree with the first statement and the number of students in their class. This correlation may be explained by their perception that a larger number of students increases the time demands of the educational process, making it challenging to implement multisensory teaching effectively.

**Table 9.2.58.**

*Crosstabulation: Multisensory teaching requires more teaching time than I can spare * Number of students taught per hour the current school year*

| Crosstab | | Number of students taught per hour the current school year | | | | Total |
|---|---|---|---|---|---|---|
| | | 1 | 2-4 | 5-7 | 8+ | |
| **Multisensory teaching requires more teaching time than I can spare** | Strongly disagree | 5 | 5 | 3 | 9 | 22 |
| | Disagree | 3 | 14 | 8 | 30 | 55 |
| | Neither agree nor disagree | 13 | 8 | 12 | 46 | 79 |
| | Agree | 5 | 9 | 13 | 67 | 94 |
| | Strongly agree | 1 | 5 | 7 | 22 | 35 |
| **Total** | | 27 | 41 | 43 | 174 | 285 |

**Table 9.2.59.**

*Chi-Square Tests for variables: Multisensory teaching requires more teaching time than I can spare * Number of students taught per hour the current school year*

| Chi-Square Tests | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| **Pearson Chi-Square** | 24.944[a] | 12 | .015 |
| **Likelihood Ratio** | 23.513 | 12 | .024 |
| **Linear-by-Linear Association** | 10.005 | 1 | .002 |
| **N of Valid Cases** | 285 | | |

a. 4 cells (20,0%) have expected count less than 5. The minimum expected count is 2,08.

A chi-square test of independence was performed to examine the relation between "Multisensory teaching requires more teaching time than I can spare" and "The syllabus is very stressful and I don't have time to implement multisensory activities with my students" (table 9.2.61.). The relation between these variables was significant, $x^2(16)=112.338$, $p=0.001<0.05$.

From reading the content of the table 9.2.60., it appears that, in general, most typical and special education teachers, as well as kindergarten teachers in Heraklion prefecture, who completely agree with the statement that "Multisensory teaching requires more teaching time than I can spare", tend to perceive the syllabus as extremely stressful. Similarly, those who agree with the first statement also tend to consider the syllabus as

very stressful. This correlation may indeed be due to the pressure teachers feel to cover the curriculum outlined in the syllabus within a limited timeframe. They may be concerned that implementing multisensory teaching could potentially lead to delays in covering the required material, which could contribute to their perception of the syllabus as stressful.

**Table 9.2.60.**

*Crosstabulation: Multisensory teaching requires more teaching time than I can spare * The syllabus is very stressful and I don't have time to implement multisensory activities with my students*

| | | **The syllabus is very stressful and I don't have time to implement multisensory activities with my students** | | | | | |
|---|---|---|---|---|---|---|---|
| **Crosstab** | | Not at all | Slightly | Probably | Very much | Extremely | Total |
| **Multisensory teaching requires more teaching time than I can spare** | Strongly disagree | 9 | 5 | 2 | 5 | 1 | 22 |
| | Disagree | 10 | 21 | 11 | 11 | 2 | 55 |
| | Neither agree nor disagree | 6 | 16 | 38 | 16 | 3 | 79 |
| | Agree | 4 | 13 | 22 | 43 | 12 | 94 |
| | Strongly agree | 3 | 4 | 4 | 8 | 16 | 35 |
| **Total** | | 32 | 59 | 77 | 83 | 34 | 285 |

**Table 9.2.61.**

*Chi-Square Tests for variables: Multisensory teaching requires more teaching time than I can spare * The syllabus is very stressful and I don't have time to implement multisensory activities with my students*

| **Chi-Square Tests** | **Value** | **df** | **Asymptotic Significance (2-sided)** |
|---|---|---|---|
| **Pearson Chi-Square** | 112.338[a] | 16 | <.001 |
| **Likelihood Ratio** | 92.857 | 16 | <.001 |
| **Linear-by-Linear Association** | 48.308 | 1 | <.001 |
| **N of Valid Cases** | 285 | | |

a. 5 cells (20,0%) have expected count less than 5. The minimum expected count is 2,47.

A chi-square test of independence was performed to examine the relation between "Multisensory teaching requires more teaching time than I can spare" and "Choosing to use multisensory teaching depends on the time I can spare" (table 9.2.63.). The relation between these variables was significant, $x^2(12)=23.023$, $p=0.028<0.05$.

From reading the content of the table 9.2.62., it generally appears that most teachers and kindergarten teachers in the prefecture of Heraklion, both in typical and special education, who strongly agree with the statement "Multisensory teaching requires more teaching time than I can spare", place an absolutely essential importance on the time they can spare in order to choose to teach using multisensory methods.

Similarly, the perceptions of those who agree with the first statement also exhibit a considerable degree of importance on the time they can spare, with a large portion considering it absolutely essential and the majority characterizing it as very important. These findings can be justified by the understanding that teaching in the school context is constrained by a specific timeframe, and teachers are meticulous about how they allocate their teaching time to cover the required curriculum effectively.

**Table 9.2.62.**

*Crosstabulation: Multisensory teaching requires more teaching time than I can spare * Choosing to use multisensory teaching depends on the time I can spare*

| | | **Choosing to use multisensory teaching depends on the time I can spare** | | | | |
|---|---|---|---|---|---|---|
| **Crosstab** | | Not important at all | Of little importance | Very important | Absolutely essential | Total |
| **Multisensory teaching requires more teaching time than I can spare** | Strongly disagree | 4 | 7 | 10 | 1 | 22 |
| | Disagree | 7 | 12 | 25 | 11 | 55 |
| | Neither agree nor disagree | 9 | 16 | 32 | 22 | 79 |
| | Agree | 4 | 12 | 40 | 38 | 94 |
| | Strongly agree | 3 | 10 | 10 | 12 | 35 |
| **Total** | | 27 | 57 | 117 | 84 | 285 |

**Table 9.2.63.**

*Chi-Square Tests for variables: Multisensory teaching requires more teaching time than I can spare * Choosing to use multisensory teaching depends on the time I can spare*

| **Chi-Square Tests** | **Value** | **df** | **Asymptotic Significance (2-sided)** |
|---|---|---|---|

| | | | |
|---|---|---|---|
| **Pearson Chi-Square** | 23.023[a] | 12 | .028 |
| **Likelihood Ratio** | 25.787 | 12 | .012 |
| **Linear-by-Linear Association** | 11.136 | 1 | <.001 |
| **N of Valid Cases** | 285 | | |

a. 3 cells (15,0%) have expected count less than 5. The minimum expected count is 2,08.

A chi-square test of independence was performed to examine the relation between "Multisensory teaching requires more teaching time than I can spare" and "Barrier to using multisensory teaching is the limited teaching time" (table 9.2.65.). The relation between these variables was significant, $x^2(12)=32.964$, $p<0.001<0.05$.

From reading the content of the table 9.2.64., it generally appears that most teachers and kindergarten teachers in Heraklion prefecture, both in typical and special education, perceive limited teaching time as an obstacle to implementing multisensory teaching. Moreover, a positive correlation is observed between those who agree and/or strongly agree with the statement "Multisensory teaching requires more teaching time than I can spare" and those who agree and strongly agree with the statement "Barriers to using multisensory teaching include limited teaching time". This correlation is not surprising, as it reflects that teachers tend to provide consistent responses to questions that address the same topic. It underscores the common perception that time constraints pose a significant challenge to the effective use of multisensory teaching methods in the classroom.

**Table 9.2.64.**

*Crosstabulation: Multisensory teaching requires more teaching time than I can spare * Barrier to using multisensory teaching is the limited teaching time*

| | | **Barrier to using multisensory teaching is the limited teaching time** | | | | |
|---|---|---|---|---|---|---|
| **Crosstab** | | Strongly disagree | Disagree | Agree | Strongly agree | Total |
| **Multisensory teaching requires more teaching time than I can spare** | Strongly disagree | 7 | 8 | 4 | 3 | 22 |
| | Disagree | 10 | 14 | 21 | 10 | 55 |
| | Neither agree nor disagree | 9 | 17 | 32 | 21 | 79 |
| | Agree | 4 | 14 | 34 | 42 | 94 |
| | Strongly agree | 4 | 8 | 10 | 13 | 35 |

| | | | | | |
|---|---|---|---|---|---|
| **Total** | 34 | 61 | 101 | 89 | 285 |

**Table 9.2.65.**

*Chi-Square Tests for variables: Multisensory teaching requires more teaching time than I can spare * Barrier to using multisensory teaching is the limited teaching time*

| Chi-Square Tests | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| **Pearson Chi-Square** | 32.964[a] | 12 | <.001 |
| **Likelihood Ratio** | 32.631 | 12 | .001 |
| **Linear-by-Linear Association** | 20.264 | 1 | <.001 |
| **N of Valid Cases** | 285 | | |

a. 3 cells (15,0%) have expected count less than 5. The minimum expected count is 2,62.

A chi-square test of independence was performed to examine the relation between "The syllabus is very stressful and I don't have time to implement multisensory activities with my students" and "Specialty" (table 9.2.67.). The relation between these variables was significant, $x^2(4)=11.388$, $p=.023<.05$.

Based on the information presented in the table 9.2.66., it is evident that a higher proportion of teachers in Heraklion prefecture, whether in typical or special education, express the view that the syllabus is very stressful and that they lack the time to implement multisensory activities with their students, in comparison to kindergarten teachers. This difference could likely be attributed to the increased curriculum demands in primary school settings, which may create more stress and time constraints for teachers as they strive to cover the curriculum within the given time frame.

**Table 9.2.66.**

*Crosstabulation: The syllabus is very stressful and I don't have time to implement multisensory activities with my students * Specialty*

| Crosstab | | Specialty | | Total |
|---|---|---|---|---|
| | | Kindergarten teacher | Teacher | |
| **The syllabus is very stressful and I don't have time to implement multisensory activities with my students** | Not at all | 11 | 21 | 32 |
| | Slightly | 20 | 39 | 59 |
| | Probably | 21 | 56 | 77 |
| | Very much | 13 | 70 | 83 |
| | Extremely | 4 | 30 | 34 |

| | | | |
|---|---|---|---|
| **Total** | 69 | 216 | 285 |

**Table 9.2.67**

*Chi-Square Tests for variables: The syllabus is very stressful and I don't have time to implement multisensory activities with my students * Specialty*

| Chi-Square Tests | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| **Pearson Chi-Square** | 11.388[a] | 4 | .023 |
| **Likelihood Ratio** | 11.830 | 4 | .019 |
| **Linear-by-Linear Association** | 10.392 | 1 | .001 |
| **N of Valid Cases** | 285 | | |

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 7,75.

A chi-square test of independence was performed to examine the relation between "The syllabus is very stressful and I don't have time to implement multisensory activities with my students" and "Barrier to using multisensory teaching is the Syllabus" (table 9.2.69.). The relation between these variables was significant, $x^2(12)=47.891$, $p=0.001<0.05$.

From reading the content of the table 9.2.68., it generally appears that most teachers and kindergarten teachers in Heraklion prefecture, both in typical and special education, view the syllabus as an obstacle to the implementation of multisensory teaching. Furthermore, there is a positive correlation between those who find the syllabus to be very or extremely stressful and those who express a lack of time to implement multisensory activities, as well as those who agree and strongly agree that the syllabus is a barrier to multisensory teaching.

This finding is not surprising, as it reflects the consistent perception among teachers that the demands of the syllabus, particularly when considered stressful, can hinder their ability to allocate time and resources for multisensory teaching methods in the classroom. It underscores the challenge teachers face in balancing the curriculum requirements with innovative teaching approaches.

**Table 9.2.68.**

*Crosstabulation: The syllabus is very stressful and I don't have time to implement multisensory activities with my students * Barrier to using multisensory teaching is the Syllabus*

| | | Barrier to using multisensory teaching is the Syllabus | | | | |
|---|---|---|---|---|---|---|
| **Crosstab** | | Strongly disagree | Disagree | Agree | Strongly agree | Total |
| **The syllabus is very stressful and I don't have time to implement multisensory activities with my students** | Not at all | 8 | 14 | 5 | 5 | 32 |
| | Slightly | 11 | 21 | 14 | 13 | 59 |
| | Probably | 7 | 20 | 35 | 15 | 77 |
| | Very much | 4 | 14 | 34 | 31 | 83 |
| | Extremely | 1 | 5 | 10 | 18 | 34 |
| **Total** | | 31 | 74 | 98 | 82 | 285 |

**Table 9.2.69.**

*Chi-Square Tests for variables: The syllabus is very stressful and I don't have time to implement multisensory activities with my students * Barrier to using multisensory teaching is the Syllabus*

| Chi-Square Tests | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| **Pearson Chi-Square** | 47.891[a] | 12 | <.001 |
| **Likelihood Ratio** | 47.062 | 12 | <.001 |
| **Linear-by-Linear Association** | 35.314 | 1 | <.001 |
| **N of Valid Cases** | 285 | | |

a. 2 cells (10,0%) have expected count less than 5. The minimum expected count is 3,48.

A chi-square test of independence was performed to examine the relation between "I would like to become more familiar with the use of multisensory teaching methods before applying it to my students" and "Specialty" (table 9.2.71.). The relation between these variables was significant, $x^2(4)=13.724$, $p=0.008<0.05$.

From reading the content of the table 9.2.70., it generally appears that most teachers and kindergarten teachers in Heraklion prefecture, both in typical and special education, would like almost equally to become more familiar with the use of multisensory teaching methods before applying it to their students. This may be because even if they have expertise in a multisensory method/program, they want to gain further knowledge in order to choose what to use in their teaching.

**Table 9.2.70.**

*Crosstabulation: I would like to become more familiar with the use of multisensory teaching methods before applying it to my students * Specialty*

| Crosstab | | Specialty | | Total |
|---|---|---|---|---|
| | | Kindergarten teacher | Teacher | |
| **I would like to become more familiar with the use of multisensory teaching methods before applying it to my students** | Strongly disagree | 10 | 18 | 28 |
| | Disagree | 1 | 33 | 34 |
| | Neither agree nor disagree | 15 | 50 | 65 |
| | Agree | 20 | 69 | 89 |
| | Strongly agree | 23 | 46 | 69 |
| **Total** | | 69 | 216 | 285 |

**Table 9.2.71.**

*Chi-Square Tests for variables: I would like to become more familiar with the use of multisensory teaching methods before applying it to my students * Specialty*

| Chi-Square Tests | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| **Pearson Chi-Square** | 13.724[a] | 4 | .008 |
| **Likelihood Ratio** | 17.064 | 4 | .002 |
| **Linear-by-Linear Association** | 1.708 | 1 | .191 |
| **N of Valid Cases** | 285 | | |

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 6,78.

A chi-square test of independence was performed to examine the relation between "I would like to become more familiar with the use of multisensory teaching methods before applying it to my students" and "Type of school you are working in the current school year" (table 9.2.73.). The relation between these variables was significant, $x^2(4)=29.986$, $p<0.001<0.05$.

From reading the content of the table 9.2.72., it appears in general that most teachers and kindergarten teachers in the prefecture of Heraklion, would like to become more familiar with the use of multisensory teaching methods before applying it to their students and especially those who work in a typical education school. This is probably

because in special education schools there are more opportunities for multisensory teaching than in regular schools, with the result that teachers there are more familiar.

**Table 9.2.72.**

*Crosstabulation: I would like to become more familiar with the use of multisensory teaching methods before applying it to my students * Type of school you are working in the current school year*

| Crosstab | | Type of school you are working in the current school year: Typical education school | Type of school you are working in the current school year: Special education school | Total |
|---|---|---|---|---|
| **I would like to become more familiar with the use of multisensory teaching methods before applying it to my students** | Strongly disagree | 18 | 10 | 28 |
| | Disagree | 32 | 2 | 34 |
| | Neither agree nor disagree | 63 | 2 | 65 |
| | Agree | 85 | 4 | 89 |
| | Strongly agree | 61 | 8 | 69 |
| **Total** | | 259 | 26 | 285 |

**Table 9.2.73.**

*Chi-Square Tests for variables: I would like to become more familiar with the use of multisensory teaching methods before applying it to my students * Type of school you are working in the current school year*

| Chi-Square Tests | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| **Pearson Chi-Square** | 29.986[a] | 4 | <.001 |
| **Likelihood Ratio** | 22.342 | 4 | <.001 |
| **Linear-by-Linear Association** | 5.676 | 1 | .017 |
| **N of Valid Cases** | 285 | | |

a. 2 cells (20,0%) have expected count less than 5. The minimum expected count is 2,55.

A chi-square test of independence was performed to examine the relation between "I would like to become more familiar with the use of multisensory teaching methods before applying it to my students" and "I have the necessary knowledge to teach my

students multisensorily" (table 9.2.75.). The relation between these variables was significant, $x^2(16)=50.444$, $p<0.001<0.05$.

From reading the content of the table 9.2.74., it appears in general that most teachers and kindergarten teachers of typical and special education in the prefecture of Heraklion, would like to become more familiar with the use of multisensory teaching methods before applying it to their students. Also, it seems that in general there is a positive correlation between the statement "I have the necessary knowledge to teach my students multisensorily" and the teachers' desire for more familiarity with multisensory methods. This could probably be explained by the fact that there are many multisensory methods and programs, so for the implementation of each one, teachers may think that they need specialized knowledge.

**Table 9.2.74.**

*Crosstabulation: I would like to become more familiar with the use of multisensory teaching methods before applying it to my students * I have the necessary knowledge to teach my students multisensorily*

| | | **I have the necessary knowledge to teach my students multisensorily** | | | | | |
|---|---|---|---|---|---|---|---|
| **Crosstab** | | Strongly disagree | Disagree | Neither agree nor disagree | Agree | Strongly agree | **Total** |
| **I would like to become more familiar with the use of multisensory teaching methods before applying it to my students** | Strongly disagree | 6 | 6 | 8 | 5 | 3 | 28 |
| | Disagree | 10 | 2 | 5 | 12 | 5 | 34 |
| | Neither agree nor disagree | 6 | 19 | 9 | 24 | 7 | 65 |
| | Agree | 10 | 18 | 35 | 15 | 11 | 89 |
| | Strongly agree | 3 | 13 | 30 | 9 | 14 | 69 |
| **Total** | | 35 | 58 | 87 | 65 | 40 | 285 |

**Table 9.2.75.**

*Chi-Square Tests for variables: I would like to become more familiar with the use of multisensory teaching methods before applying it to my students * I have the necessary knowledge to teach my students multisensorily*

| **Chi-Square Tests** | **Value** | **df** | **Asymptotic Significance (2-sided)** |
|---|---|---|---|

| | | | |
|---|---|---|---|
| **Pearson Chi-Square** | 50.444[a] | 16 | <.001 |
| **Likelihood Ratio** | 50.944 | 16 | <.001 |
| **Linear-by-Linear Association** | 2.520 | 1 | .112 |
| **N of Valid Cases** | 285 | | |

a. 4 cells (16,0%) have expected count less than 5. The minimum expected count is 3,44.

A chi-square test of independence was performed to examine the relation between "Multisensory teaching can only be implemented by a special educator" and "Highest level of studies" (table 9.2.77.). The relation between these variables was significant, $x^2(4)=9.939$, $p=0.041<0.05$.

From reading the content of the table 9.2.76., it appears in general that teachers and kindergarten teachers of typical and special education in the prefecture of Heraklion, disagree or strongly disagree with the statement "Multisensory teaching can only be implemented by a special educator". In fact, it is worth mentioning that there is a positive correlation between having a master's degree and disagreeing or strongly disagreeing with the statement in question. This is probably due to the fact that due to their specialization they perceived that multisensory teaching is not something specific to special education teachers but to the educational process itself, therefore also to general education teachers.

**Table 9.2.76.**

*Crosstabulation: Multisensory teaching can only be implemented by a special educator * Highest level of studies*

| **Crosstab** | | **Highest level of studies** | | Total |
|---|---|---|---|---|
| | | Bachelor degree | Master degree | |
| **Multisensory teaching can only be implemented by a special educator** | Strongly disagree | 17 | 41 | 58 |
| | Disagree | 38 | 59 | 97 |
| | Neither agree nor disagree | 27 | 27 | 54 |
| | Agree | 20 | 22 | 42 |
| | Strongly agree | 20 | 14 | 34 |
| **Total** | | 122 | 163 | 285 |

**Table 9.2.77.**

*Chi-Square Tests for variables: Multisensory teaching can only be implemented by a special educator * Highest level of studies*

| Chi-Square Tests | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| **Pearson Chi-Square** | 9.939[a] | 4 | .041 |
| **Likelihood Ratio** | 10.059 | 4 | .039 |
| **Linear-by-Linear Association** | 8.923 | 1 | .003 |
| **N of Valid Cases** | 285 | | |

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 14,55.

A chi-square test of independence was performed to examine the relation between "Multisensory teaching is effectively implemented one-on-one" and "Multisensory teaching is easily implemented one-on-one" (table 9.2.79). The relation between these variables was significant, $x^2(16)=89.801$, $p=0.001<0.05$.

From reading the content of the table 9.2.78., it generally appears that most teachers and kindergarten teachers of typical and special education in the prefecture of Heraklion agree with the above variables and in fact most of them agree strongly. That is, that the multisensory teaching is both effectively and easily implemented one-on-one. Still, a positive correlation is generally observed between the two variables. This can probably be explained by the belief that the fewer the students, the more efficient and procedurally the lesson is made.

**Table 9.2.78.**

*Crosstabulation: Multisensory teaching is effectively implemented one-on-one * Multisensory teaching is easily implemented one-on-one*

| Crosstab | | Multisensory teaching is easily implemented one-on-one | | | | | Total |
|---|---|---|---|---|---|---|---|
| | | Strongly disagree | Disagree | Neither agree nor disagree | Agree | Strongly agree | |
| **Multisensory teaching is effectively implemented one-on-one** | Strongly disagree | 8 | 4 | 7 | 6 | 11 | 36 |
| | Disagree | 5 | 14 | 16 | 9 | 7 | 51 |
| | Neither agree nor disagree | 3 | 8 | 15 | 19 | 5 | 50 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Agree | 6 | 7 | 6 | 29 | 22 | 70 |
| | Strongly agree | 7 | 5 | 2 | 15 | 49 | 78 |
| **Total** | | 29 | 38 | 46 | 78 | 94 | 285 |

**Table 9.2.79.**

*Chi-Square Tests for variables: Multisensory teaching is effectively implemented one-on-one * Multisensory teaching is easily implemented one-on-one*

| **Chi-Square Tests** | **Value** | **df** | **Asymptotic Significance (2-sided)** |
|---|---|---|---|
| **Pearson Chi-Square** | 89.801[a] | 16 | <.001 |
| **Likelihood Ratio** | 90.194 | 16 | <.001 |
| **Linear-by-Linear Association** | 28.468 | 1 | <.001 |
| **N of Valid Cases** | 285 | | |

a. 2 cells (8,0%) have expected count less than 5. The minimum expected count is 3,66.

A chi-square test of independence was performed to examine the relation between "Multisensory teaching is implemented effectively in a small group of students" and "Multisensory teaching is easily implemented in a small group of students" (table 9.2.81.). The relation between these variables was significant, $x^2(16)=162.400$, $p<0.001<0.05$.

From reading the content of the table 9.2.80., it generally appears that most teachers and kindergarten teachers of typical and special education in the prefecture of Heraklion agree with the above variables. That is, most consider that multisensory teaching is implemented both effectively and easily in a small group of students. Furthermore, it seems that most of those who strongly agree with the statement "Multisensory teaching is implemented effectively in a small group of students" also strongly agree with the statement "Multisensory teaching is easily implemented in a small group of students". This can probably be explained by the belief that the fewer the students, the more efficient and procedurally the lesson is made.

**Table 9.2.80.**

*Crosstabulation: Multisensory teaching is implemented effectively in a small group of students * Multisensory teaching is easily implemented in a small group of students*

| **Crosstab** | **Multisensory teaching is easily implemented in a small group of students** | Total |
|---|---|---|

| | | Strongly disagree | Disagree | Neither agree nor disagree | Agree | Strongly agree | |
|---|---|---|---|---|---|---|---|
| **Multisensory teaching is implemented effectively in a small group of students** | Strongly disagree | 7 | 8 | 5 | 3 | 8 | 31 |
| | Disagree | 8 | 13 | 9 | 7 | 2 | 39 |
| | Neither agree nor disagree | 1 | 5 | 19 | 15 | 4 | 44 |
| | Agree | 1 | 7 | 9 | 60 | 14 | 91 |
| | Strongly agree | 2 | 1 | 5 | 26 | 46 | 80 |
| **Total** | | 19 | 34 | 47 | 111 | 74 | 285 |

**Table 9.2.81.**

*Chi-Square Tests for variables: Multisensory teaching is implemented effectively in a small group of students * Multisensory teaching is easily implemented in a small group of students*

| Chi-Square Tests | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| **Pearson Chi-Square** | 162.400[a] | 16 | <.001 |
| **Likelihood Ratio** | 150.874 | 16 | <.001 |
| **Linear-by-Linear Association** | 77.353 | 1 | <.001 |
| **N of Valid Cases** | 285 | | |

a. 5 cells (20,0%) have expected count less than 5. The minimum expected count is 2,07.

A chi-square test of independence was performed to examine the relation between "Multisensory teaching is implemented effectively in the whole class" and "Multisensory teaching is easily implemented in the whole class" (table 9.2.83.). The relation between these variables was significant, $x^2(16)=155.549$, $p<0.001<0.05$.

From reading the content of the table 9.2.82., it generally appears that most teachers and kindergarten teachers in Heraklion prefecture, both in typical and special education, hold a negative view of both of the statements in question. Additionally, it seems that a majority of those who disagree with the statement "Multisensory teaching is implemented effectively in the whole class" also disagree with the statement "Multisensory teaching is easily implemented in the whole class". This finding can likely be explained by the belief that as the number of students in the class increases, the effectiveness and ease of implementing multisensory teaching may decrease.

Teachers may perceive multisensory teaching as more challenging to carry out in larger class settings, which could lead to their negative responses regarding both statements.

**Table 9.2.82.**

*Crosstabulation: Multisensory teaching is implemented effectively in the whole class * Multisensory teaching is easily implemented in the whole class*

| | | **Multisensory teaching is easily implemented in the whole class** | | | | | |
|---|---|---|---|---|---|---|---|
| **Crosstab** | | Strongly disagree | Disagree | Neither agree nor disagree | Agree | Strongly agree | Total |
| **Multisensory teaching is implemented effectively in the whole class** | Strongly disagree | 19 | 7 | 3 | 3 | 2 | 34 |
| | Disagree | 21 | 32 | 7 | 4 | 0 | 64 |
| | Neither agree nor disagree | 5 | 23 | 44 | 10 | 2 | 84 |
| | Agree | 5 | 16 | 11 | 25 | 5 | 62 |
| | Strongly agree | 7 | 9 | 2 | 11 | 12 | 41 |
| **Total** | | 57 | 87 | 67 | 53 | 21 | 285 |

**Table 9.2.83.**

*Chi-Square Tests for variables: Multisensory teaching is implemented effectively in the whole class * Multisensory teaching is easily implemented in the whole class*

| **Chi-Square Tests** | **Value** | **df** | **Asymptotic Significance (2-sided)** |
|---|---|---|---|
| **Pearson Chi-Square** | 155.549[a] | 16 | <.001 |
| **Likelihood Ratio** | 140.832 | 16 | <.001 |
| **Linear-by-Linear Association** | 54.453 | 1 | <.001 |
| **N of Valid Cases** | 285 | | |

a. 4 cells (16,0%) have expected count less than 5. The minimum expected count is 2,51.

A chi-square test of independence was performed to examine the relation between "Multisensory teaching is implemented effectively in the whole class" and "The more students I teach per hour, the less I use multisensory teaching methods" (table 9.2.85.) The relation between these variables was significant, $x^2(16)=29.095$, $p=0.023<0.05$.

From reading the content of the table 9.2.84., it generally appears that most teachers and kindergarten teachers of general and special education in Heraklion prefecture neither agree nor disagree with the above statements. Also, it seems that most of those who disagree or strongly disagree with the statement "Multisensory teaching is implemented effectively in the whole class" agree with the statement "The more students I teach per hour, the less I use multisensory teaching methods". This can probably be explained by the belief that the fewer students in the class, the more effective the lesson.

**Table 9.2.84.**

*Crosstabulation: Multisensory teaching is implemented effectively in the whole class * The more students I teach per hour, the less I use multisensory teaching methods*

| | | **The more students I teach per hour, the less I use multisensory teaching methods** | | | | | |
|---|---|---|---|---|---|---|---|
| **Crosstab** | | Strongly disagree | Disagree | Neither agree nor disagree | Agree | Strongly agree | Total |
| **Multisensory teaching is implemented effectively in the whole class** | Strongly disagree | 3 | 7 | 7 | 9 | 8 | 34 |
| | Disagree | 5 | 6 | 13 | 25 | 15 | 64 |
| | Neither agree nor disagree | 6 | 16 | 32 | 21 | 9 | 84 |
| | Agree | 8 | 12 | 15 | 15 | 12 | 62 |
| | Strongly agree | 10 | 4 | 11 | 6 | 10 | 41 |
| **Total** | | 32 | 45 | 78 | 76 | 54 | 285 |

**Table 9.2.85.**

*Chi-Square Tests for variables: Multisensory teaching is implemented effectively in the whole class * The more students I teach per hour, the less I use multisensory teaching methods*

| **Chi-Square Tests** | **Value** | **df** | **Asymptotic Significance (2-sided)** |
|---|---|---|---|
| **Pearson Chi-Square** | 29.095[a] | 16 | .023 |
| **Likelihood Ratio** | 28.296 | 16 | .029 |
| **Linear-by-Linear Association** | 3.923 | 1 | .048 |
| **N of Valid Cases** | 285 | | |

a. 2 cells (8,0%) have expected count less than 5. The minimum expected count is 3,82.

A chi-square test of independence was performed to examine the relation between "Multisensory teaching is implemented effectively in the whole class" and "The fewer students I teach per hour, the more I use multisensory teaching methods" (table 9.2.87.). The relation between these variables was significant, $x^2(16)=60.790$, $p<0.001<0.05$.

From reading the content of the table 9.2.86, it generally appears that most teachers and kindergarten teachers in Heraklion prefecture, both in typical and special education, agree with the statement "The fewer students I teach per hour, the more I use multisensory teaching methods".

It also seems that a majority of those who completely disagree with the statement "Multisensory teaching is implemented effectively in the whole class" disagree with the statement "The fewer students I teach per hour, the more I use multisensory teaching methods". This may be because they have a general lack of belief in the effectiveness of multisensory methods in a whole-class setting, which often includes several students. Alternatively, they may not consider multisensory teaching to be effective, regardless of the number of students involved, leading to their disagreement with both statements.

**Table 9.2.86.**

*Crosstabulation: Multisensory teaching is implemented effectively in the whole class * The fewer students I teach per hour, the more I use multisensory teaching methods*

| | | **The fewer students I teach per hour, the more I use multisensory teaching methods** | | | | | |
|---|---|---|---|---|---|---|---|
| **Crosstab** | | Strongly disagree | Disagree | Neither agree nor disagree | Agree | Strongly agree | Total |
| **Multisensory teaching is implemented effectively in the whole class** | Strongly disagree | 2 | 15 | 7 | 5 | 5 | 34 |
| | Disagree | 6 | 16 | 13 | 24 | 5 | 64 |
| | Neither agree nor disagree | 6 | 7 | 28 | 31 | 12 | 84 |
| | Agree | 5 | 9 | 15 | 21 | 12 | 62 |
| | Strongly agree | 12 | 5 | 8 | 3 | 13 | 41 |
| **Total** | | 31 | 52 | 71 | 84 | 47 | 285 |

**Table 9.2.87.**

*Chi-Square Tests for variables: Multisensory teaching is implemented effectively in the whole class * The fewer students I teach per hour, the more I use multisensory teaching methods*

| Chi-Square Tests | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| **Pearson Chi-Square** | 60.790[a] | 16 | <.001 |
| **Likelihood Ratio** | 57.275 | 16 | <.001 |
| **Linear-by-Linear Association** | .986 | 1 | .321 |
| **N of Valid Cases** | 285 | | |

a. 2 cells (8,0%) have expected count less than 5. The minimum expected count is 3,70.

A chi-square test of independence was performed to examine the relation between "Multisensory teaching is implemented effectively in the whole class" and "Barrier to using multisensory teaching is the number of students" (table 9.2.89.). The relation between these variables was significant, $x^2(12)=29.969$, $p=0.003<0.05$.

From reading the content of the table 9.2.88., it generally appears that most teachers and kindergarten teachers in the prefecture of Heraklion, both in typical and special education, agree with the statement that "Barrier to using multisensory teaching is the number of students".

Furthermore, it is observed that most of those who disagree regarding the effectiveness of multisensory teaching in the whole class also strongly agree that the number of students acts as an obstacle to its implementation. This correlation can likely be explained by the belief that having fewer students in the class leads to a more effective lesson, and a larger number of students may hinder the successful implementation of multisensory teaching methods.

**Table 9.2.88.**

*Crosstabulation: Multisensory teaching is implemented effectively in the whole class * Barrier to using multisensory teaching is the number of students*

| | | Barrier to using multisensory teaching is the number of students | | | | |
|---|---|---|---|---|---|---|
| **Crosstab** | | Strongly disagree | Disagree | Agree | Strongly agree | Total |
| | Strongly disagree | 8 | 4 | 10 | 12 | 34 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Multisensory teaching is implemented effectively in the whole class** | Disagree | 4 | 12 | 21 | 27 | 64 |
| | Neither agree nor disagree | 8 | 24 | 39 | 13 | 84 |
| | Agree | 7 | 18 | 20 | 17 | 62 |
| | Strongly agree | 5 | 17 | 11 | 8 | 41 |
| **Total** | | 32 | 75 | 101 | 77 | 285 |

**Table 9.2.89.**

*Chi-Square Tests for variables: Multisensory teaching is implemented effectively in the whole class * Barrier to using multisensory teaching is the number of students*

| **Chi-Square Tests** | **Value** | **df** | **Asymptotic Significance (2-sided)** |
|---|---|---|---|
| **Pearson Chi-Square** | 29.969[a] | 12 | .003 |
| **Likelihood Ratio** | 29.295 | 12 | .004 |
| **Linear-by-Linear Association** | 4.290 | 1 | .038 |
| **N of Valid Cases** | 285 | | |

a. 2 cells (10,0%) have expected count less than 5. The minimum expected count is 3,82.

A chi-square test of independence was performed to examine the relation between "Multisensory teaching is easily implemented one-on-one" and "The fewer students I teach per hour, the more I use multisensory teaching methods" (table 9.2.91.). The relation between these variables was significant, $x^2(16)=42.254$, $p<0.001<0.05$.

From reading the content of the table 9.2.90., it generally appears that most teachers and kindergarten teachers in Heraklion prefecture, both in typical and special education, agree with both of the above statements.

Additionally, it seems that most of those who disagree and strongly disagree with the statement "multisensory teaching is easily implemented one-on-one" also strongly disagree with the statement that "the fewer students I teach per hour, the more I use multisensory teaching methods". This could be explained by the belief that they may not generally see the one-on-one multisensory method as effective, or they may not consider the number of students as a significant factor contributing to the increased use of multisensory teaching.

**Table 9.2.90.**

*Crosstabulation: Multisensory teaching is easily implemented one-on-one * The fewer students I teach per hour, the more I use multisensory teaching methods*

| Crosstab | | The fewer students I teach per hour, the more I use multisensory teaching methods | | | | | |
|---|---|---|---|---|---|---|---|
| | | Strongly disagree | Disagree | Neither agree nor disagree | Agree | Strongly agree | Total |
| **Multisensory teaching is easily implemented one-on-one** | Strongly disagree | 8 | 6 | 7 | 4 | 4 | 29 |
| | Disagree | 10 | 9 | 9 | 7 | 3 | 38 |
| | Neither agree nor disagree | 6 | 2 | 14 | 15 | 9 | 46 |
| | Agree | 5 | 17 | 20 | 27 | 9 | 78 |
| | Strongly agree | 2 | 18 | 21 | 31 | 22 | 94 |
| **Total** | | 31 | 52 | 71 | 84 | 47 | 285 |

**Table 9.2.91.**

| *Chi-Square Tests for variables: Multisensory teaching is easily implemented one-on-one * The fewer students I teach per hour, the more I use multisensory teaching methods* **Chi-Square Tests** | **Value** | **df** | **Asymptotic Significance (2-sided)** |
|---|---|---|---|
| **Pearson Chi-Square** | 42.254[a] | 16 | <.001 |
| **Likelihood Ratio** | 44.238 | 16 | <.001 |
| **Linear-by-Linear Association** | 19.187 | 1 | <.001 |
| **N of Valid Cases** | 285 | | |

a. 3 cells (12,0%) have expected count less than 5. The minimum expected count is 3,15.

A chi-square test of independence was performed to examine the relation between "Multisensory teaching is easily implemented in a small group of students" and "Specialty" (table 9.2.93.). The relation between these variables was significant, $x^2(4)=10.751$, $p=0.030<0.05$.

From reading the content of the table 9.2.92., it generally appears that teachers and kindergarten teachers in Heraklion prefecture, both in typical and special education, mainly agree or strongly agree with the statement "Multisensory teaching is easily

implemented in a small group of students". This is likely because both teachers and kindergarten teachers recognize the ease of implementing multisensory teaching methods/programs to a small group of students. However, it should be mentioned that there are slightly more teachers who gave positive answers than kindergarten teachers.

**Table 9.2.92.**

*Crosstabulation: Multisensory teaching is easily implemented in a small group of students * Specialty*

| Crosstab | | Specialty | | |
|---|---|---|---|---|
| | | Kindergarten teacher | Teacher | Total |
| **Multisensory teaching is easily implemented in a small group of students** | Strongly disagree | 7 | 12 | 19 |
| | Disagree | 5 | 29 | 34 |
| | Neither agree nor disagree | 15 | 32 | 47 |
| | Agree | 32 | 79 | 111 |
| | Strongly agree | 10 | 64 | 74 |
| **Total** | | 69 | 216 | 285 |

**Table 9.2.93.**

*Chi-Square Tests for variables: Multisensory teaching is easily implemented in a small group of students * Specialty*

| Chi-Square Tests | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| **Pearson Chi-Square** | 10.751[a] | 4 | .030 |
| **Likelihood Ratio** | 11.275 | 4 | .024 |
| **Linear-by-Linear Association** | 2.075 | 1 | .150 |
| **N of Valid Cases** | 285 | | |

a. 1 cells (10,0%) have expected count less than 5. The minimum expected count is 4,60.

A chi-square test of independence was performed to examine the relation between "Multisensory teaching is easily implemented in the whole class" and "Specialty" (table 9.2.95). The relation between these variables was significant, $x^2(4)=10.528$, $p=0.032<0.05$.

From reading the content of the table 9.2.94, it generally appears that teachers and kindergarten teachers in Heraklion prefecture, both in typical and special education, mainly disagree or strongly disagree with the statement "Multisensory teaching is easily

implemented in the whole class". This is likely because both teachers and kindergarten teachers have tried to implement it in the whole class and found the difficulty of implementation, either because they think that teaching multisensory is complex in itself, so the difficulty increases when you have to teach in this way to the whole class. However, it should be mentioned that teachers express more opposition than kindergartners.

**Table 9.2.94.**

*Crosstabulation: Multisensory teaching is easily implemented in the whole class * Specialty*

| | | Specialty | | |
|---|---|---|---|---|
| **Crosstab** | | Kindergarten teacher | Teacher | Total |
| **Multisensory teaching is easily implemented in the whole class** | Strongly disagree | 7 | 50 | 57 |
| | Disagree | 19 | 68 | 87 |
| | Neither agree nor disagree | 21 | 46 | 67 |
| | Agree | 13 | 40 | 53 |
| | Strongly agree | 9 | 12 | 21 |
| **Total** | | 69 | 216 | 285 |

**Table 9.2.95.**

*Chi-Square Tests for variables: Multisensory teaching is easily implemented in the whole class * Specialty*

| **Chi-Square Tests** | **Value** | **df** | **Asymptotic Significance (2-sided)** |
|---|---|---|---|
| **Pearson Chi-Square** | 10.528[a] | 4 | .032 |
| **Likelihood Ratio** | 10.645 | 4 | .031 |
| **Linear-by-Linear Association** | 7.371 | 1 | .007 |
| **N of Valid Cases** | 285 | | |

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 5,08.

A chi-square test of independence was performed to examine the relation between "Multisensory teaching is easily implemented in the whole class" and "Barrier to using multisensory teaching is the number of students" (table 9.2.97.). The relation between these variables was significant, $x^2(12)=24.774$, $p=0.016<0.05$.

From reading the content of the table 9.2.96., it generally appears that most teachers and kindergarten teachers in Heraklion prefecture, both in typical and special education, hold a negative view of the ease with which multisensory teaching methods are applied to the whole class, with many disagreeing and strongly disagreeing with this statement.

Moreover, it is observed that most of those who strongly disagree with the idea that multisensory teaching is easily implemented in the whole class also strongly agree that the number of students is an obstacle to the implementation of multisensory teaching methods. Conversely, it's noted that many of those who do not consider the number of students as an obstacle tend to agree with the effectiveness of multisensory teaching in the whole class.

These findings likely reflect varying beliefs and perceptions among teachers regarding the feasibility and effectiveness of multisensory teaching in different classroom settings and with varying numbers of students.

**Table 9.2.96.**

*Crosstabulation: Multisensory teaching is easily implemented in the whole class * Barrier to using multisensory teaching is the number of students*

| | | **Barrier to using multisensory teaching is the number of students** | | | | |
|---|---|---|---|---|---|---|
| **Crosstab** | | Strongly disagree | Disagree | Agree | Strongly agree | Total |
| **Multisensory teaching is easily implemented in the whole class** | Strongly disagree | 2 | 12 | 19 | 24 | 57 |
| | Disagree | 9 | 19 | 34 | 25 | 87 |
| | Neither agree nor disagree | 8 | 18 | 28 | 13 | 67 |
| | Agree | 10 | 17 | 18 | 8 | 53 |
| | Strongly agree | 3 | 9 | 2 | 7 | 21 |
| **Total** | | 32 | 75 | 101 | 77 | 285 |

**Table 9.2.97.**

*Chi-Square Tests for variables: Multisensory teaching is easily implemented in the whole class * Barrier to using multisensory teaching is the number of students*

| Chi-Square Tests | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| **Pearson Chi-Square** | 24.774[a] | 12 | **.016** |
| **Likelihood Ratio** | 26.662 | 12 | .009 |
| **Linear-by-Linear Association** | 13.412 | 1 | <.001 |
| **N of Valid Cases** | 285 | | |

a. 1 cells (5,0%) have expected count less than 5. The minimum expected count is 2,36.

A chi-square test of independence was performed to examine the relation between "I use a specific method/program of multisensory teaching" and "I have the necessary knowledge to teach my students multisensorily" (table 9.2.99.). The relation between these variables was significant, $x^2(4)=23.841$, $p<0.001<0.05$.

From reading the content of the table 9.2.98., it generally appears that most teachers and kindergarten teachers in Heraklion prefecture, both in typical and special education, do not use a specific method/program of multisensory teaching. It's notable that this happens despite the fact that most teachers state that they have the necessary knowledge to teach multisensory. Also, it is observed that most who declare that they use a specific multisensory method program, agree that they have the necessary knowledge to teach multisensory. This is probably because their knowledge leads them to move from theory to practical application of multisensory methods/programs.

**Table 9.2.98.**

*Crosstabulation: I use a specific method/program of multisensory teaching * I have the necessary knowledge to teach my students multisensorily*

| | | I have the necessary knowledge to teach my students multisensorily | | | | | |
|---|---|---|---|---|---|---|---|
| **Crosstab** | | Strongly disagree | Disagree | Neither agree nor disagree | Agree | Strongly agree | Total |
| | No | 34 | 53 | 70 | 41 | 29 | 227 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **I use a specific method/program of multisensory teaching** | Yes | 1 | 5 | 17 | 24 | 11 | 58 |
| **Total** | | 35 | 58 | 87 | 65 | 40 | 285 |

**Table 9.2.99.**

*Chi-Square Tests for variables: I use a specific method/program of multisensory teaching * I have the necessary knowledge to teach my students multisensorily*

| **Chi-Square Tests** | **Value** | **df** | **Asymptotic Significance (2-sided)** |
|---|---|---|---|
| **Pearson Chi-Square** | 23.841a | 4 | <.001 |
| **Likelihood Ratio** | 26.218 | 4 | <.001 |
| **Linear-by-Linear Association** | 18,402 | 1 | <.001 |
| **N of Valid Cases** | 285 | | |

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 7,12.

A chi-square test of independence was performed to examine the relation between "Choosing to use multisensory teaching depends on the lesson" and "I use multisensory activities/teaching methods in subjects related to language" (table 9.2.1011). The relation between these variables was significant, $x^2(12)=30.078$, $p=0.003<0.05$.

From reading the content of the table 9.2.100., it generally appears that most teachers and kindergarten teachers in Heraklion prefecture, both in typical and special education, consider the lesson itself to be a very important factor in their decision to choose multisensory teaching for that particular lesson. Additionally, it's observed that most of those who do not consider the subject to be an important factor in the choice of multisensory teaching methods never use it in subjects related to language. This may be because they do not recognize or acknowledge its benefits in general or believe that it's less applicable or effective in language-related subjects.

**Table 9.2.100.**

*Crosstabulation: Choosing to use multisensory teaching depends on the lesson * I use multisensory activities/teaching methods in subjects related to language*

| **Crosstab** | | **I use multisensory activities/teaching methods in subjects related to language** | Total |
|---|---|---|---|

| | | Never | Occasionally | Sometimes | Usually | Daily | |
|---|---|---|---|---|---|---|---|
| **Choosing to use multisensory teaching depends on the lesson** | Not important at all | 13 | 9 | 7 | 8 | 1 | 38 |
| | Of little importance | 7 | 16 | 14 | 14 | 8 | 59 |
| | Very important | 10 | 21 | 41 | 41 | 21 | 134 |
| | Absolutely essential | 6 | 12 | 9 | 17 | 10 | 54 |
| **Total** | | 36 | 58 | 71 | 80 | 40 | 285 |

**Table 9.2.101.**

*Chi-Square Tests for variables: Choosing to use multisensory teaching depends on the lesson * I use multisensory activities/teaching methods in subjects related to language*

| Chi-Square Tests | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| **Pearson Chi-Square** | 30.078[a] | 12 | .003 |
| **Likelihood Ratio** | 27.985 | 12 | .006 |
| **Linear-by-Linear Association** | 13.682 | 1 | <.001 |
| **N of Valid Cases** | 285 | | |

a. 1 cells (5,0%) have expected count less than 5. The minimum expected count is 4,80.

A chi-square test of independence was performed to examine the relation between "Choosing to use multisensory teaching depends on the lesson" and "I use multisensory activities/teaching methods in subjects related to science" (table 9.2.103.). The relation between these variables was significant, $x^2(12)=21.354$, $p=0.045<0.05$.

From reading the content of the table 9.2.102., it generally appears that most teachers and kindergarten teachers in the prefecture of Heraklion, both in typical and special education, sometimes use multisensory activities or teaching methods in subjects related to science.

Furthermore, it seems that those who consider the subject to be a very important factor in the choice of multisensory teaching often include multisensory methods in their teaching when they are instructing a subject related to science.

It's worth noting that generally, teachers' opinions regarding these two variables appear to be quite divided. This division in opinions could be explained by the fact that teachers

who consider multisensory teaching important may particularly emphasize its relevance in teaching subjects related to science. Additionally, because multisensory teaching has historically been associated more with language courses, the general opinions of teachers seem to vary, reflecting a range of perspectives on its applicability and effectiveness across different subjects.

**Table 9.2.102.**

*Crosstabulation: Choosing to use multisensory teaching depends on the lesson * I use multisensory activities/teaching methods in subjects related to science*

| | | I use multisensory activities/teaching methods in subjects related to science | | | | | |
|---|---|---|---|---|---|---|---|
| **Crosstab** | | Never | Occasionally | Sometimes | Usually | Daily | Total |
| **Choosing to use multisensory teaching depends on the lesson** | Not important at all | 9 | 9 | 12 | 4 | 4 | 38 |
| | Of little importance | 10 | 16 | 9 | 13 | 11 | 59 |
| | Very important | 9 | 30 | 38 | 40 | 17 | 134 |
| | Absolutely essential | 9 | 12 | 13 | 9 | 11 | 54 |
| **Total** | | 37 | 67 | 72 | 66 | 43 | 285 |

**Table 9.2.103.**

*Chi-Square Tests for variables: Choosing to use multisensory teaching depends on the lesson * I use multisensory activities/teaching methods in subjects related to science*

| Chi-Square Tests | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| **Pearson Chi-Square** | 21.354[a] | 12 | .045 |
| **Likelihood Ratio** | 22.291 | 12 | .034 |
| **Linear-by-Linear Association** | 3.200 | 1 | .074 |
| **N of Valid Cases** | 285 | | |

a. 1 cells (5,0%) have expected count less than 5. The minimum expected count is 4,93.

A chi-square test of independence was performed to examine the relation between "Choosing to use multisensory teaching depends on the teaching objective" and "I use multisensory activities/teaching methods in subjects related to language" (table

9.2.105). The relation between these variables was significant, $x^2(12)=50.141$, $p<0.001<0.05$.

From reading the content of the table 9.2.104., it generally appears that most teachers and kindergarten teachers in the prefecture of Heraklion, both in typical and special education, who consider the teaching objective to be a very important or absolutely essential factor in their decision to choose multisensory teaching tend to use multisensory teaching methods in subjects related to language usually or even daily.

This observation aligns with the historical association of multisensory teaching with language instruction, as multisensory methods were originally developed to enhance language learning. Teachers who view the course as crucial in their choice of multisensory teaching likely recognize the efficacy of these methods in language-related subjects and, therefore, apply them frequently in such courses.

**Table 9.2.104.**

*Crosstabulation: Choosing to use multisensory teaching depends on the teaching objective * I use multisensory activities/teaching methods in subjects related to language*

| | | **I use multisensory activities/teaching methods in subjects related to language** | | | | | |
|---|---|---|---|---|---|---|---|
| **Crosstab** | | Never | Occasionally | Sometimes | Usually | Daily | Total |
| **Choosing to use multisensory teaching depends on the teaching objective** | Not important at all | 10 | 9 | 2 | 8 | 1 | 30 |
| | Of little importance | 7 | 20 | 10 | 4 | 7 | 48 |
| | Very important | 14 | 18 | 34 | 34 | 14 | 114 |
| | Absolutely essential | 5 | 11 | 25 | 34 | 18 | 93 |
| **Total** | | 36 | 58 | 71 | 80 | 40 | 285 |

**Table 9.2.105.**

*Chi-Square Tests for variables: Choosing to use multisensory teaching depends on the teaching objective * I use multisensory activities/teaching methods in subjects related to language*

| **Chi-Square Tests** | **Value** | **df** | **Asymptotic Significance (2-sided)** |
|---|---|---|---|

| | | | |
|---|---|---|---|
| **Pearson Chi-Square** | 50.141[a] | 12 | <.001 |
| **Likelihood Ratio** | 50.901 | 12 | <.001 |
| **Linear-by-Linear Association** | 27.200 | 1 | <.001 |
| **N of Valid Cases** | 285 | | |

a. 2 cells (10,0%) have expected count less than 5. The minimum expected count is 3,79.

A chi-square test of independence was performed to examine the relation between "Choosing to use multisensory teaching depends on the time I can spare" and "specialty" (table 9.2.107.). The relation between these variables was significant, $x^2(3)=8.040$, $p=0.045<0.05$.

From reading the content of the table 9.2.106., it generally appears that most teachers and kindergarten teachers in the prefecture of Heraklion, both in typical and special education, consider very important or absolutely essential the time they can spare regarding choosing to use multisensory teaching. In fact, it appears that teachers, in particular, largely agree with the statement provided. This could be due to the time constraints they experience, as there is a specific curriculum they need to cover within a limited timeframe.

**Table 9.2.106.**

*Crosstabulation: Choosing to use multisensory teaching depends on the time I can spare * Specialty*

| | | **Specialty** | | |
|---|---|---|---|---|
| **Crosstab** | | Kindergarten teacher | Teacher | Total |
| **Choosing to use multisensory teaching depends on the time I can spare** | Not important at all | 10 | 17 | 27 |
| | Of little importance | 17 | 40 | 57 |
| | Very important | 30 | 87 | 117 |
| | Absolutely essential | 12 | 72 | 84 |
| **Total** | | 69 | 216 | 285 |

**Table 9.2.107.**

*Chi-Square Tests for variables: Choosing to use multisensory teaching depends on the time I can spare * Specialty*

| **Chi-Square Tests** | **Value** | **df** | **Asymptotic Significance (2-sided)** |
|---|---|---|---|

| | | | |
|---|---|---|---|
| **Pearson Chi-Square** | 8.040[a] | 3 | .045 |
| **Likelihood Ratio** | 8.321 | 3 | .040 |
| **Linear-by-Linear Association** | 7.512 | 1 | .006 |
| **N of Valid Cases** | 285 | | |

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 6,54.

A chi-square test of independence was performed to examine the relation between "Choosing to use multisensory teaching depends on the time I can spare" and "Barrier to using multisensory teaching is the limited teaching time" (table 9.2.109.). The relation between these variables was significant, $x^2(9)=46.778$, $p<0.001<0.05$.

From reading the content of the table 9.2.108., it generally appears that most teachers and kindergarten teachers in the prefecture of Heraklion, both in typical and special education, who consider the time they can spare as a very important or even absolutely essential factor in their choice of sensory teaching methods, tend to agree or even agree strongly with the statement that "Barrier to using multisensory teaching is the limited teaching time".

This finding likely reflects the belief that implementing multisensory teaching does indeed require additional time, and those who prioritize the allocation of time as an important factor in their teaching choices recognize the potential time constraints associated with multisensory methods.

**Table 9.2.108.**

*Crosstabulation: Choosing to use multisensory teaching depends on the time I can spare * Barrier to using multisensory teaching is the limited teaching time*

| | | **Barrier to using multisensory teaching is the limited teaching time** | | | | |
|---|---|---|---|---|---|---|
| **Crosstab** | | Strongly disagree | Disagree | Agree | Strongly agree | **Total** |
| **Choosing to use multisensory teaching depends on the time I can spare** | Not important at all | 4 | 9 | 9 | 5 | 27 |
| | Of little importance | 10 | 16 | 28 | 3 | 57 |
| | Very important | 13 | 23 | 47 | 34 | 117 |
| | Absolutely essential | 7 | 13 | 17 | 47 | 84 |
| **Total** | | 34 | 61 | 101 | 89 | **285** |

**Table 9.2.109.**

*Chi-Square Tests for variables: Choosing to use multisensory teaching depends on the time I can spare * Barrier to using multisensory teaching is the limited teaching time*

| Chi-Square Tests | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| **Pearson Chi-Square** | 46.778[a] | 9 | **<.001** |
| **Likelihood Ratio** | 50.816 | 9 | <.001 |
| **Linear-by-Linear Association** | 22.029 | 1 | <.001 |
| **N of Valid Cases** | 285 | | |

a. 1 cells (6,3%) have expected count less than 5. The minimum expected count is 3,22.

A chi-square test of independence was performed to examine the relation between "Choosing to use multisensory teaching depends on my background knowledge" and "Multisensory teaching helps all students to better understand the teaching objective" (table 9.2.111). The relation between these variables was significant, $x^2(12)=34.215$, $p=0.001<0.05$.

From reading the content of the table 9.2.110, it generally appears that most teachers and kindergarten teachers in Heraklion prefecture, both in typical and special education, who consider their background knowledge to be a very important or absolutely essential factor, tend to agree or strongly agree with the statement "Multisensory teaching helps all students to better understand the teaching objective".

This finding can likely be attributed to their deeper understanding of multisensory teaching methods. Teachers who value their own background knowledge may recognize that multisensory teaching is beneficial not only for students with learning difficulties but also for the broader student population, as it can enhance comprehension and engagement for all students.

**Table 9.2.110.**

*Crosstabulation: Choosing to use multisensory teaching depends on my background knowledge * Multisensory teaching helps all students to better understand the teaching objective*

| Crosstab | Multisensory teaching helps all students to better understand the teaching objective | Total |
|---|---|---|

| | | Strongly disagree | Disagree | Neither agree nor disagree | Agree | Strongly agree | |
|---|---|---|---|---|---|---|---|
| **Choosing to use multisensory teaching depends on my background knowledge** | Not important at all | 5 | 9 | 2 | 15 | 11 | 42 |
| | Of little importance | 8 | 10 | 17 | 15 | 17 | 67 |
| | Very important | 4 | 8 | 7 | 41 | 43 | 103 |
| | Absolutely essential | 4 | 5 | 10 | 24 | 30 | 73 |
| **Total** | | 21 | 32 | 36 | 95 | 101 | 285 |

**Table 9.2.111.**

*Chi-Square Tests for variables: Choosing to use multisensory teaching depends on my background knowledge * Multisensory teaching helps all students to better understand the teaching objective*

| Chi-Square Tests | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| **Pearson Chi-Square** | 34.215[a] | 12 | <.001 |
| **Likelihood Ratio** | 33.253 | 12 | <.001 |
| **Linear-by-Linear Association** | 11.996 | 1 | <.001 |
| **N of Valid Cases** | 285 | | |

a. 3 cells (15,0%) have expected count less than 5. The minimum expected count is 3,09.

A chi-square test of independence was performed to examine the relation between "Choosing to use multisensory teaching depends on inclusion of all students" and "Specialty" (table 9.2.113.). The relation between these variables was significant, $x^2(3)=11.400$, $p=0.010<0.05$.

From reading the content of the table 9.2.112., it generally appears that most teachers and kindergarten teachers in Heraklion prefecture, both in typical and special education, consider that the choice of multisensory teaching is very important or absolutely essential for the inclusion of all students. It is worth noting that the teachers who consider it to be of little importance are ten times more than the kindergarten teachers. This could not be attributed to teachers' indifference, as the majority of them consider the inclusion of students with dyslexia important. This is probably because as there is curriculum, syllabus and time pressure, the teacher is constantly called upon to make

decisions that concern the good of all students and does not have time to constantly deal with the inclusion of dyslexic students.

**Table 9.2.112.**

*Crosstabulation: Choosing to use multisensory teaching depends on inclusion of all students * Specialty*

| Crosstab | | Specialty | | Total |
|---|---|---|---|---|
| | | Kindergarten teacher | Teacher | |
| **Choosing to use multisensory teaching depends on inclusion of all students** | Not important at all | 11 | 21 | 32 |
| | Of little importance | 5 | 50 | 55 |
| | Very important | 30 | 66 | 96 |
| | Absolutely essential | 23 | 79 | 102 |
| **Total** | | 69 | 216 | 285 |

**Table 9.2.113.**

*Chi-Square Tests for variables: Choosing to use multisensory teaching depends on inclusion of all students * Specialty*

| Chi-Square Tests | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| **Pearson Chi-Square** | 11.400[a] | 3 | .010 |
| **Likelihood Ratio** | 12.661 | 3 | .005 |
| **Linear-by-Linear Association** | .000 | 1 | .987 |
| **N of Valid Cases** | 285 | | |

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 7,75.

A chi-square test of independence was performed to examine the relation between "Choosing to use multisensory teaching depends on inclusion of all students" and "Highest level of studies" (table 9.2.115.). The relation between these variables was significant, $x^2(3)=9.767$, $p=0.021<0.05$.

From reading the content of the table 9.2.114., it generally appears that most teachers and kindergarten teachers in Heraklion prefecture, both in typical and special education, irrespective of their educational level, place significant importance on the inclusion of all students when choosing to implement multisensory teaching. However, there is a tendency for those with a master's degree to consider the selection of a multisensory

method/program as very important or absolutely essential for the inclusion of students with dyslexia, compared to those without.

**Table 9.2.114.**

*Crosstabulation: Choosing to use multisensory teaching depends on inclusion of all students * Highest level of studies*

| Crosstab | | Highest level of studies | | Total |
|---|---|---|---|---|
| | | Bachelor degree | Master degree | |
| **Choosing to use multisensory teaching depends on inclusion of all students** | Not important at all | 17 | 15 | 32 |
| | Of little importance | 32 | 23 | 55 |
| | Very important | 37 | 59 | 96 |
| | Absolutely essential | 36 | 66 | 102 |
| **Total** | | 122 | 163 | 285 |

**Table 9.2.115.**

*Chi-Square Tests for variables: Choosing to use multisensory teaching depends on inclusion of all students * Highest level of studies*

| Chi-Square Tests | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| **Pearson Chi-Square** | 9.767[a] | 3 | .021 |
| **Likelihood Ratio** | 9.728 | 3 | .021 |
| **Linear-by-Linear Association** | 7.400 | 1 | .007 |
| **N of Valid Cases** | 285 | | |

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 13,70.

A chi-square test of independence was performed to examine the relation between "Choosing to use multisensory teaching depends on inclusion of all students" and "Multisensory teaching helps all students to better understand the teaching objective" (table 9.2.117). The relation between these variables was significant, $x^2(12)=64.211$, $p=0.001<0.05$.

From reading the content of the table 9.2.116., it generally appears that most teachers and kindergarten teachers in the prefecture of Heraklion, both in typical and special education, who consider the inclusion of students as a very important or absolutely essential factor in their choice of multisensory teaching, agree or completely agree with

the statement that “Multisensory teaching helps all students to better understand the teaching objective”.

This observation likely stems from their recognition that multisensory teaching, when employed with the goal of inclusion, benefits all students, not just those with learning difficulties. Their informed perspective leads them to appreciate the positive impact of multisensory methods on the entire student population, supporting their agreement with the statement.

**Table 9.2.116.**

*Crosstabulation: Choosing to use multisensory teaching depends on inclusion of all students * Multisensory teaching helps all students to better understand the teaching objective*

| | | **Multisensory teaching helps all students to better understand the teaching objective** | | | | | |
|---|---|---|---|---|---|---|---|
| **Crosstab** | | Strongly disagree | Disagree | Neither agree nor disagree | Agree | Strongly agree | Total |
| **Choosing to use multisensory teaching depends on inclusion of all students** | Not important at all | 8 | 3 | 5 | 9 | 7 | 32 |
| | Of little importance | 4 | 16 | 13 | 15 | 7 | 55 |
| | Very important | 5 | 3 | 12 | 39 | 37 | 96 |
| | Absolutely essential | 4 | 10 | 6 | 32 | 50 | 102 |
| **Total** | | 21 | 32 | 36 | 95 | 101 | 285 |

**Table 9.2.117.**

*Chi-Square Tests for variables: Choosing to use multisensory teaching depends on inclusion of all students * Multisensory teaching helps all students to better understand the teaching objective*

| **Chi-Square Tests** | **Value** | **df** | **Asymptotic Significance (2-sided)** |
|---|---|---|---|
| **Pearson Chi-Square** | 64.211[a] | 12 | <.001 |
| **Likelihood Ratio** | 58.953 | 12 | <.001 |
| **Linear-by-Linear Association** | 29.660 | 1 | <.001 |
| **N of Valid Cases** | 285 | | |

a. 4 cells (20,0%) have expected count less than 5. The minimum expected count is 2,36.

A chi-square test of independence was performed to examine the relation between "Choosing to use multisensory teaching depends on the technological equipment I have" and "Barrier to using multisensory teaching is the lack of logistical infrastructure" (table 9.2.119). The relation between these variables was significant, $x^2(9)=28.002$, $p<0.001<0.05$.

From reading the content of the table 9.2.118., it generally appears that most teachers and kindergarten teachers in the prefecture of Heraklion, both in typical and special education, tend to perceive technological equipment as an important factor in their choice of multisensory teaching methods. Additionally, there is a correlation suggesting that the more important they consider technological equipment, the more they view the absence of appropriate equipment as an obstacle to the use of logistical infrastructure.

This correlation likely arises from their belief that having the necessary technological equipment can make the teaching process easier and more efficient when implementing multisensory methods. They see technology as a valuable tool that enhances the effectiveness of multisensory teaching, and the absence of such equipment may be viewed as a hindrance to its successful implementation.

**Table 9.2.118.**

*Crosstabulation: Choosing to use multisensory teaching depends on the technological equipment I have * Barrier to using multisensory teaching is the lack of logistical infrastructure*

| Crosstab | | Barrier to using multisensory teaching is the lack of logistical infrastructure | | | | Total |
|---|---|---|---|---|---|---|
| | | Strongly disagree | Disagree | Agree | Strongly agree | |
| **Choosing to use multisensory teaching depends on the technological equipment I have** | Not important at all | 5 | 9 | 6 | 10 | 30 |
| | Of little importance | 6 | 16 | 21 | 26 | 69 |
| | Very important | 7 | 12 | 49 | 32 | 100 |
| | Absolutely essential | 6 | 11 | 21 | 48 | 86 |
| **Total** | | 24 | 48 | 97 | 116 | 285 |

**Table 9.2.119.**

*Chi-Square Tests for variables: Choosing to use multisensory teaching depends on the technological equipment I have * Barrier to using multisensory teaching is the lack of logistical infrastructure*

| Chi-Square Tests | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| **Pearson Chi-Square** | 28.002[a] | 9 | <.001 |
| **Likelihood Ratio** | 26.408 | 9 | .002 |
| **Linear-by-Linear Association** | 9.430 | 1 | .002 |
| **N of Valid Cases** | 285 | | |

a. 1 cells (6,3%) have expected count less than 5. The minimum expected count is 2,53.

A chi-square test of independence was performed to examine the relation between "The more students I teach per hour, the less I use multisensory teaching methods" and "Specialty" (table 9.2.121.). The relation between these variables was significant, $x^2(4)=10.482$, $p=0.033<0.05$.

From reading the content of the table 9.2.120., it generally appears that most teachers and kindergarten teachers in the prefecture of Heraklion, both in typical and special education, tend to agree or strongly agree with the statement "The more students I teach per hour, the less I use multisensory teaching methods". However, it appears that there are many more teachers than kindergarten teachers who agree or strongly agree with the above statement. This may be because they consider the many students in the classroom as an obstacle to the implementation of multisensory teaching.

**Table 9.2.120.**

*Crosstabulation: The more students I teach per hour, the less I use multisensory teaching methods * Specialty*

| Crosstab | | Specialty | | Total |
|---|---|---|---|---|
| | | Kindergarten teacher | Teacher | |
| **The more students I teach per hour, the less I use multisensory teaching methods** | Strongly disagree | 5 | 27 | 32 |
| | Disagree | 16 | 29 | 45 |
| | Neither agree nor disagree | 25 | 53 | 78 |
| | Agree | 15 | 61 | 76 |
| | Strongly agree | 8 | 46 | 54 |

| | | | |
|---|---|---|---|
| **Total** | 69 | 216 | 285 |

**Table 9.2.121.**

*Chi-Square Tests for variables: The more students I teach per hour, the less I use multisensory teaching methods * Specialty*

| Chi-Square Tests | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| **Pearson Chi-Square** | 10.482[a] | 4 | .033 |
| **Likelihood Ratio** | 10.521 | 4 | .033 |
| **Linear-by-Linear Association** | 2.112 | 1 | .146 |
| **N of Valid Cases** | 285 | | |

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 7,75.

A chi-square test of independence was performed to examine the relation between "The more students I teach per hour, the less I use multisensory teaching methods" and "The fewer students I teach per hour, the more I use multisensory teaching methods" (table 9.2.123.). The relation between these variables was significant, $x^2(16)=69.496$, $p<0.001<0.05$.

From reading the content of the table 9.2.122., it generally appears that most teachers and kindergarten teachers in the prefecture of Heraklion, both in typical and special education, who agree or strongly agree with the first statement also agree or strongly agree with the second.

This correlation may be attributed to their belief that in smaller classes, there are more opportunities and flexibility to apply various teaching techniques, including multisensory methods. Smaller class sizes can create a more conducive environment for trying out different instructional approaches, leading to their agreement with both statements.

**Table 9.2.122.**

*Crosstabulation: The more students I teach per hour, the less I use multisensory teaching methods * The fewer students I teach per hour, the more I use multisensory teaching methods*

| Crosstab | The fewer students I teach per hour, the more I use multisensory teaching methods | Total |
|---|---|---|

| | | Strongly disagree | Disagree | Neither agree nor disagree | Agree | Strongly agree | |
|---|---|---|---|---|---|---|---|
| **The more students I teach per hour, the less I use multisensory teaching methods** | Strongly disagree | 8 | 8 | 8 | 1 | 7 | 32 |
| | Disagree | 4 | 15 | 11 | 8 | 7 | 45 |
| | Neither agree nor disagree | 10 | 8 | 31 | 25 | 4 | 78 |
| | Agree | 2 | 12 | 13 | 38 | 11 | 76 |
| | Strongly agree | 7 | 9 | 8 | 12 | 18 | 54 |
| **Total** | | 31 | 52 | 71 | 84 | 47 | 285 |

**Table 9.2.123.**

*Chi-Square Tests for variables: The more students I teach per hour, the less I use multisensory teaching methods * The fewer students I teach per hour, the more I use multisensory teaching methods*

| **Chi-Square Tests** | **Value** | **df** | **Asymptotic Significance (2-sided)** |
|---|---|---|---|
| **Pearson Chi-Square** | 69.496[a] | 16 | <.001 |
| **Likelihood Ratio** | 72.339 | 16 | <.001 |
| **Linear-by-Linear Association** | 13.600 | 1 | <.001 |
| **N of Valid Cases** | 285 | | |

a. 2 cells (8,0%) have expected count less than 5. The minimum expected count is 3,48.

A chi-square test of independence was performed to examine the relation between "The more students I teach per hour, the less I use multisensory teaching methods" and "Barrier to using multisensory teaching is the limited teaching time" (table 9.2.125.). The relation between these variables was significant, $x^2(12)=22.245$, $p=0.035<0.05$.

From reading the content of the table 9.2.124., it generally appears that most typical and special education teachers and kindergarten teachers in the prefecture of Heraklion who agree or completely agree with the statement "The more students I teach per hour, the less I use multisensory teaching methods" also tend to agree or completely agree that barriers to using multisensory teaching include limited teaching time".

This correlation likely reflects the belief that in smaller classes, there is more time available to utilize various teaching techniques, including multisensory methods. Conversely, in larger classes, time constraints become more significant, which leads to

the perception that limited teaching time can be a barrier to implementing multisensory teaching effectively.

**Table 9.2.124.**

*Crosstabulation: The more students I teach per hour, the less I use multisensory teaching methods * Barrier to using multisensory teaching is the limited teaching time*

| Crosstab | | Barrier to using multisensory teaching is the limited teaching time | | | | Total |
|---|---|---|---|---|---|---|
| | | Strongly disagree | Disagree | Agree | Strongly agree | |
| **The more students I teach per hour, the less I use multisensory teaching methods** | Strongly disagree | 8 | 6 | 10 | 8 | 32 |
| | Disagree | 5 | 16 | 16 | 8 | 45 |
| | Neither agree nor disagree | 5 | 19 | 30 | 24 | 78 |
| | Agree | 6 | 12 | 29 | 29 | 76 |
| | Strongly agree | 10 | 8 | 16 | 20 | 54 |
| **Total** | | 34 | 61 | 101 | 89 | 285 |

**Table 9.2.125.**

*Chi-Square Tests for variables: The more students I teach per hour, the less I use multisensory teaching methods * Barrier to using multisensory teaching is the limited teaching time*

| Chi-Square Tests | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| **Pearson Chi-Square** | 22.245[a] | 12 | .035 |
| **Likelihood Ratio** | 21.361 | 12 | .045 |
| **Linear-by-Linear Association** | 4.715 | 1 | .030 |
| **N of Valid Cases** | 285 | | |

a. 1 cells (5,0%) have expected count less than 5. The minimum expected count is 3,82.

A chi-square test of independence was performed to examine the relation between "The fewer students I teach per hour, the more I use multisensory teaching methods" and "Barrier to using multisensory teaching is the limited teaching time" (table 9.2.127.). The relation between these variables was significant, $x^2(12)=23.922$, $p=0.021<0.05$.

From reading the content of the table 9.2.126., it generally appears that most typical and special education teachers and kindergarten teachers in the prefecture of Heraklion who agree with the statement that "The fewer students I teach per hour, the more I use

multisensory teaching methods" also completely agree with the statement that "Barrier to using multisensory teaching is the limited teaching time".

This finding is likely due to their shared belief that having more teaching time allows for the effective implementation of multisensory teaching methods. They recognize that teaching multisensory lessons may require additional time, and when teaching fewer students per hour, they may have the necessary time to incorporate these methods effectively. Conversely, when time is limited, it can act as a barrier to implementing multisensory teaching as desired.

**Table 9.2.126.**

*Crosstabulation: The fewer students I teach per hour, the more I use multisensory teaching methods * Barrier to using multisensory teaching is the limited teaching time*

| | | **Barrier to using multisensory teaching is the limited teaching time** | | | | |
|---|---|---|---|---|---|---|
| **Crosstab** | | Strongly disagree | Disagree | Agree | Strongly agree | Total |
| **The fewer students I teach per hour, the more I use multisensory teaching methods** | Strongly disagree | 9 | 5 | 12 | 5 | 31 |
| | Disagree | 6 | 13 | 23 | 10 | 52 |
| | Neither agree nor disagree | 8 | 17 | 21 | 25 | 71 |
| | Agree | 4 | 15 | 29 | 36 | 84 |
| | Strongly agree | 7 | 11 | 16 | 13 | 47 |
| **Total** | | 34 | 61 | 101 | 89 | 285 |

**Table 9.2.127.**

*Chi-Square Tests for variables: The fewer students I teach per hour, the more I use multisensory teaching methods * Barrier to using multisensory teaching is the limited teaching time*

| **Chi-Square Tests** | **Value** | **df** | **Asymptotic Significance (2-sided)** |
|---|---|---|---|
| **Pearson Chi-Square** | 23.922[a] | 12 | .021 |
| **Likelihood Ratio** | 23.261 | 12 | .026 |
| **Linear-by-Linear Association** | 5.604 | 1 | .018 |
| **N of Valid Cases** | 285 | | |

a. 1 cells (5,0%) have expected count less than 5. The minimum expected count is 3,70.

A chi-square test of independence was performed to examine the relation between "Through multisensory activities, I give students with dyslexia equal educational opportunities with their typical classmates" and "Highest level of studies" (table 9.2.129.). The relation between these variables was significant, $x^2(4)=10.685$, $p=0.030<0.05$.

From an analysis of the table's 9.2.128. content, it becomes evident that the majority of typical and special education teachers, as well as kindergarten teachers in the Heraklion prefecture, tend to either agree or strongly agree with the statement "Through multisensory activities, I provide students with dyslexia equal educational opportunities compared to their typical peers". This alignment in perspective appears consistent across educators, irrespective of their highest level of education. However, those who have a master's degree and completely agree with it are clearly far more than those who have a bachelor's degree.

This consensus might be attributed to their understanding that students with dyslexia often require unconventional teaching methods for effective learning. Therefore, they perceive multisensory teaching as a means of providing these students with the diverse approaches necessary to thrive academically alongside their typically developing peers.

**Table 9.2.128.**

*Crosstabulation: Through multisensory activities, I give students with dyslexia equal educational opportunities with their typical classmates * Highest level of studies*

| Crosstab | | Highest level of studies | | Total |
|---|---|---|---|---|
| | | Bachelor degree | Master degree | |
| **Through multisensory activities, I give students with dyslexia equal educational opportunities with their typical classmates** | Strongly disagree | 12 | 13 | 25 |
| | Disagree | 22 | 13 | 35 |
| | Neither agree nor disagree | 21 | 33 | 54 |
| | Agree | 42 | 50 | 92 |
| | Strongly agree | 25 | 54 | 79 |
| **Total** | | 122 | 163 | 285 |

**Table 9.2.129.**

*Chi-Square Tests for variables: Through multisensory activities, I give students with dyslexia equal educational opportunities with their typical classmates * Highest level of studies*

| Chi-Square Tests | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| **Pearson Chi-Square** | 10.685[a] | 4 | .030 |
| **Likelihood Ratio** | 10.746 | 4 | .030 |
| **Linear-by-Linear Association** | 5.519 | 1 | .019 |
| **N of Valid Cases** | 285 | | |

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 10,70.

A chi-square test of independence was performed to examine the relation between "Through multisensory activities, I give students with dyslexia equal educational opportunities with their typical classmates" and "The participation of students with dyslexia in the lesson increases when I involve multisensory activities" (table 9.2.131.). The relation between these variables was significant, $x^2(16)=41.416$, $p=0.001<0.05$.

From reading the content of the table 9.2.130., it generally appears that the more typical and special education teachers and kindergarten teachers in the prefecture of Heraklion completely agree with the statement "Through multisensory activities, I give students with dyslexia equal educational opportunities with their typical classmates", the more they also strongly agree with the statement "The participation of students with dyslexia in the lesson increases when I involve multisensory activities".

This correlation suggests that these educators recognize the benefits of multisensory activities in promoting equal educational opportunities for students with dyslexia and increasing their participation in lessons. It's likely that they are well-informed about the positive impact of multisensory teaching, which motivates them to use such methods to engage students and enhance their learning experiences, especially for those with dyslexia.

**Table 9.2.130.**

*Crosstabulation: Through multisensory activities, I give students with dyslexia equal educational opportunities with their typical classmates * The participation of students with dyslexia in the lesson increases when I involve multisensory activities*

| | | The participation of students with dyslexia in the lesson increases when I involve multisensory activities | | | | | |
|---|---|---|---|---|---|---|---|
| **Crosstab** | | Strongly disagree | Disagree | Neither agree nor disagree | Agree | Strongly agree | Total |
| **Through multisensory activities, I give students with dyslexia equal educational opportunities with their typical classmates** | Strongly disagree | 0 | 6 | 7 | 6 | 6 | 25 |
| | Disagree | 5 | 6 | 6 | 8 | 10 | 35 |
| | Neither agree nor disagree | 6 | 6 | 18 | 15 | 9 | 54 |
| | Agree | 5 | 6 | 28 | 38 | 15 | 92 |
| | Strongly agree | 3 | 7 | 9 | 27 | 33 | 79 |
| **Total** | | 19 | 31 | 68 | 94 | 73 | 285 |

**Table 9.2.131.**

*Chi-Square Tests for variables: Through multisensory activities, I give students with dyslexia equal educational opportunities with their typical classmates * The participation of students with dyslexia in the lesson increases when I involve multisensory activities*

| **Chi-Square Tests** | **Value** | **df** | **Asymptotic Significance (2-sided)** |
|---|---|---|---|
| **Pearson Chi-Square** | 41.416[a] | 16 | <.001 |
| **Likelihood Ratio** | 41.752 | 16 | <.001 |
| **Linear-by-Linear Association** | 9.639 | 1 | .002 |
| **N of Valid Cases** | 285 | | |

a. 5 cells (20,0%) have expected count less than 5. The minimum expected count is 1,67.

A chi-square test of independence was performed to examine the relation between "The participation of students with dyslexia in the lesson increases when I involve multisensory activities" and "Highest level of studies" (table 9.2.133.). The relation between these variables was significant, $x^2(4)=10.108$, $p=0.039<0.05$.

Based on the information presented in the table 9.2.132., it seems that both teachers and kindergarten teachers in typical and special education in the Heraklion prefecture tend to agree or strongly agree with the statement "The participation of students with dyslexia in the lesson increases when I involve multisensory activities". However, it clearly appears that many more people with a master's degree agree or strongly agree with the above than those with a bachelor's degree.

**Table 9.2.132.**

*Crosstabulation: The participation of students with dyslexia in the lesson increases when I involve multisensory activities * Highest level of studies*

| Crosstab | | Highest level of studies | | Total |
|---|---|---|---|---|
| | | Bachelor degree | Master degree | |
| **The participation of students with dyslexia in the lesson increases when I involve multisensory activities** | Strongly disagree | 14 | 5 | 19 |
| | Disagree | 12 | 19 | 31 |
| | Neither agree nor disagree | 30 | 38 | 68 |
| | Agree | 33 | 61 | 94 |
| | Strongly agree | 33 | 40 | 73 |
| **Total** | | 122 | 163 | 285 |

**Table 9.2.133.**

*Chi-Square Tests for variables: The participation of students with dyslexia in the lesson increases when I involve multisensory activities * Highest level of studies*

| Chi-Square Tests | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| **Pearson Chi-Square** | 10.108a | 4 | .039 |
| **Likelihood Ratio** | 10.198 | 4 | .037 |
| **Linear-by-Linear Association** | 2.102 | 1 | .147 |
| **N of Valid Cases** | 285 | | |

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 8,13.

A chi-square test of independence was performed to examine the relation between "Barrier to using multisensory teaching is the Syllabus" and "Specialty" (table

9.2.135.). The relation between these variables was significant, $x^2(3)=13.454$, $p=0.004<0.05$.

Based on the information presented in the table 9.2.134., it seems that a higher proportion of teachers in both typical and special education in the Heraklion prefecture tend to agree or strongly agree with the statement "Barriers to using multisensory teaching include the Syllabus" compared to kindergarten teachers. This discrepancy could be attributed to the pressure that teachers often experience to cover the curriculum within a specified timeframe, which may lead them to perceive the curriculum as a hindrance to the implementation of multisensory teaching.

**Table 9.2.134.**

*Crosstabulation: Barrier to using multisensory teaching is the Syllabus * Specialty*

| | | Specialty | | |
|---|---|---|---|---|
| **Crosstab** | | Kindergarten teacher | Teacher | Total |
| **Barrier to using multisensory teaching is the Syllabus** | Strongly disagree | 8 | 23 | 31 |
| | Disagree | 29 | 45 | 74 |
| | Agree | 19 | 79 | 98 |
| | Strongly agree | 13 | 69 | 82 |
| **Total** | | 69 | 216 | 285 |

**Table 9.2.135.**

*Chi-Square Tests for variables: Barrier to using multisensory teaching is the Syllabus * Specialty*

| **Chi-Square Tests** | **Value** | **df** | **Asymptotic Significance (2-sided)** |
|---|---|---|---|
| **Pearson Chi-Square** | 13.454[a] | 3 | .004 |
| **Likelihood Ratio** | 12.891 | 3 | .005 |
| **Linear-by-Linear Association** | 7.211 | 1 | .007 |
| **N of Valid Cases** | 285 | | |

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 7,51.

A chi-square test of independence was performed to examine the relation between "Barriers to using multisensory teaching is the Syllabus" and "Barrier to using multisensory teaching is the limited teaching time" (table 9.2.137.). The relation between these variables was significant, $x^2(9)=135.208$, $p=0.001<0.05$.

From reading the content of the table 9.2.136., it generally appears that most typical and special education teachers and kindergarten teachers in the prefecture of Heraklion who disagree with the first statement also disagree with the second statement, while most of those who agree with the first statement also agree with the second.

This correlation may indeed reflect how teachers perceive the syllabus. For some, it may be seen as a source of stress and hindrance to their teaching methods, leading to their disagreement with both statements. Conversely, for those who view the syllabus as helpful or manageable, they are more likely to agree with both statements regarding the use of multisensory teaching methods. It highlights the diverse opinions among educators about the role and impact of the syllabus on their teaching practices.

**Table 9.2.136.**

*Crosstabulation: Barrier to using multisensory teaching is the Syllabus * Barrier to using multisensory teaching is the limited teaching time*

| | | **Barrier to using multisensory teaching is the limited teaching time** | | | | |
|---|---|---|---|---|---|---|
| **Crosstab** | | Strongly disagree | Disagree | Agree | Strongly agree | Total |
| **Barrier to using multisensory teaching is the Syllabus** | Strongly disagree | 13 | 10 | 6 | 2 | 31 |
| | Disagree | 8 | 30 | 29 | 7 | 74 |
| | Agree | 3 | 11 | 58 | 26 | 98 |
| | Strongly agree | 10 | 10 | 8 | 54 | 82 |
| **Total** | | 34 | 61 | 101 | 89 | 285 |

**Table 9.2.137.**

*Chi-Square Tests for variables: Barrier to using multisensory teaching is the Syllabus * Barrier to using multisensory teaching is the limited teaching time*

| **Chi-Square Tests** | **Value** | **df** | **Asymptotic Significance (2-sided)** |
|---|---|---|---|
| **Pearson Chi-Square** | 135.208[a] | 9 | <.001 |
| **Likelihood Ratio** | 130.969 | 9 | <.001 |
| **Linear-by-Linear Association** | 57.194 | 1 | <.001 |
| **N of Valid Cases** | 285 | | |

a. 1 cells (6,3%) have expected count less than 5. The minimum expected count is 3,70.

A chi-square test of independence was performed to examine the relation between "Barrier to using multisensory teaching is the limited teaching time" and "Specialty" (table 9.2.139.). The relation between these variables was significant, $x^2(3)=11.814$, $p=0.008<0.05$.

After reviewing the table's 9.2.138. contents, it becomes apparent that both typical and special education teachers, as well as kindergarten teachers in the Heraklion prefecture, generally agree or strongly agree with the statement" Barriers to using multisensory teaching include limited teaching time". Nevertheless, it's noteworthy that teachers, when compared to kindergarten teachers, tend to express a higher degree of agreement or strong agreement with this statement. This distinction may be attributed to the greater pressure teachers often experience to manage time constraints while implementing multisensory teaching methods. Indeed, the increased agreement among teachers, as opposed to kindergarten teachers, with the statement about limited teaching time as a barrier to using multisensory teaching may be linked to the substantial pressure teachers face concerning curriculum coverage and time management.

**Table 9.2.138.**

*Crosstabulation: Barrier to using multisensory teaching is the limited teaching time * Specialty*

| Crosstab | | Specialty | | Total |
|---|---|---|---|---|
| | | Kindergarten teacher | Teacher | |
| **Barrier to using multisensory teaching is the limited teaching time** | Strongly disagree | 7 | 27 | 34 |
| | Disagree | 20 | 41 | 61 |
| | Agree | 31 | 70 | 101 |
| | Strongly agree | 11 | 78 | 89 |
| **Total** | | 69 | 216 | 285 |

**Table 9.2.139.**

*Chi-Square Tests for variables: Barrier to using multisensory teaching is the limited teaching time * Specialty*

| Chi-Square Tests | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| **Pearson Chi-Square** | 11.814[a] | 3 | .008 |
| **Likelihood Ratio** | 12.598 | 3 | .006 |

| | | | |
|---|---|---|---|
| **Linear-by-Linear Association** | 3.434 | 1 | .064 |
| **N of Valid Cases** | 285 | | |

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 8,23.

A chi-square test of independence was performed to examine the relation between "Barrier to using multisensory teaching is the limited teaching time" and "Number of students taught per hour the current school year" (table 9.2.141.). The relation between these variables was significant, $x^2(9)=32.970$, $p=0.001<0.05$.

From reading the content of the table 9.2.140., it generally appears that most typical and special education teachers and kindergarten teachers in Heraklion prefecture who agree and strongly agree with the statement "Barrier to using multisensory teaching is the limited teaching time" also tend to have 8 or more students.

This correlation could be explained by the belief among these educators that it's more challenging to implement multisensory teaching or other innovative practices in larger classes. They may feel compelled to follow more traditional teaching methods due to the logistical challenges posed by larger class sizes. As a result, they perceive the limited teaching time as a barrier to implementing multisensory teaching effectively.

**Table 9.2.140.**

*Crosstabulation: Barrier to using multisensory teaching is the limited teaching time * Number of students taught per hour the current school year*

| | | **Number of students taught per hour the current school year** | | | | |
|---|---|---|---|---|---|---|
| **Crosstab** | | 1 | 2-4 | 5-7 | 8+ | Total |
| **Barrier to using multisensory teaching is the limited teaching time** | Strongly disagree | 10 | 3 | 7 | 14 | 34 |
| | Disagree | 4 | 6 | 15 | 36 | 61 |
| | Agree | 11 | 18 | 12 | 60 | 101 |
| | Strongly agree | 2 | 14 | 9 | 64 | 89 |
| **Total** | | 27 | 41 | 43 | 174 | 285 |

**Table 9.2.141.**

*Chi-Square Tests for variables: Barrier to using multisensory teaching is the limited teaching time * Number of students taught per hour the current school year*

| Chi-Square Tests | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| **Pearson Chi-Square** | 32.970[a] | 9 | <.001 |
| **Likelihood Ratio** | 30.011 | 9 | <.001 |
| **Linear-by-Linear Association** | 9.481 | 1 | .002 |
| **N of Valid Cases** | 285 | | |

a. 2 cells (12,5%) have expected count less than 5. The minimum expected count is 3,22.

A chi-square test of independence was performed to examine the relation between "Barrier to using multisensory teaching is my background knowledge" and "Barrier to using multisensory teaching is the lack of interest on my part" (table 9.2.143.). The relation between these variables was significant, $x^2(9)=21.257$, $p=0.012<0.05$.

From reading the content of the table 9.2.142., it generally appears that the vast majority of teachers and kindergarten teachers in the prefecture of Heraklion, both in typical and special education, disagree or strongly disagree with the statement "Barrier to using multisensory teaching is the lack of interest on my part".

Interestingly, most of those who disagreed with the lack of interest as a barrier to multisensory teaching agreed that their background knowledge could be a barrier. This suggests that they may not view their own lack of interest as a significant obstacle to implementing multisensory teaching, even though they acknowledge that they may not have the necessary theoretical background. Their prioritization of background knowledge over personal interest in this context could indicate their commitment to effective teaching practices despite potential knowledge gaps.

**Table 9.2.142.**

*Crosstabulation: Barrier to using multisensory teaching is my background knowledge * Barrier to using multisensory teaching is the lack of interest on my part*

| | | **Barrier to using multisensory teaching is the lack of interest on my part** | | | |
|---|---|---|---|---|---|
| **Crosstab** | | Strongly disagree | Disagree | Agree | Strongly agree | Total |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Barrier to using multisensory teaching is my background knowledge** | Strongly disagree | 27 | 11 | 5 | 2 | 45 |
| | Disagree | 39 | 31 | 10 | 6 | 86 |
| | Agree | 28 | 44 | 20 | 13 | 105 |
| | Strongly agree | 15 | 16 | 11 | 7 | 49 |
| **Total** | | 109 | 102 | 46 | 28 | 285 |

**Table 9.2.143.**

*Chi-Square Tests for variables: Barrier to using multisensory teaching is my background knowledge * Barrier to using multisensory teaching is the lack of interest on my part*

| **Chi-Square Tests** | **Value** | **df** | **Asymptotic Significance (2-sided)** |
|---|---|---|---|
| **Pearson Chi-Square** | 21.257[a] | 9 | .012 |
| **Likelihood Ratio** | 21.299 | 9 | .011 |
| **Linear-by-Linear Association** | 14.769 | 1 | <.001 |
| **N of Valid Cases** | 285 | | |

a. 2 cells (12,5%) have expected count less than 5. The minimum expected count is 4,42.

A chi-square test of independence was performed to examine the relation between "Barrier to using multisensory teaching is the number of students" and "Number of students taught per hour the current school year" (table 9.2.145.). The relation between these variables was significant, $x^2(9)=44.505$, $p=0.001<0.05$.

From reading the content of the table 9.2.144., it generally appears that most teachers and kindergarten teachers in Heraklion prefecture, both in general and special education, consider that there is a correlation between the number of students and the opinion that "Barrier to using multisensory teaching is the number of students".

This observation likely stems from their perception that it becomes more challenging to implement multisensory teaching or other innovative practices in larger classes. In larger class settings, they may find it difficult to apply multisensory methods and tend to rely on more traditional teaching approaches. The number of students in a class can influence their view on the feasibility of using multisensory teaching effectively.

**Table 9.2.144.**

*Crosstabulation: Barrier to using multisensory teaching is the number of students * Number of students taught per hour the current school year*

| Crosstab | | Number of students taught per hour the current school year | | | | Total |
|---|---|---|---|---|---|---|
| | | 1 | 2-4 | 5-7 | 8+ | |
| **Barrier to using multisensory teaching is the number of students** | Strongly disagree | 7 | 5 | 4 | 16 | 32 |
| | Disagree | 9 | 12 | 24 | 30 | 75 |
| | Agree | 9 | 16 | 12 | 64 | 101 |
| | Strongly agree | 2 | 8 | 3 | 64 | 77 |
| **Total** | | 27 | 41 | 43 | 174 | 285 |

**Table 9.2.145.**

*Chi-Square Tests for variables: Barrier to using multisensory teaching is the number of students * Number of students taught per hour the current school year*

| Chi-Square Tests | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| **Pearson Chi-Square** | 44,505[a] | 9 | <.001 |
| **Likelihood Ratio** | 44,162 | 9 | <.001 |
| **Linear-by-Linear Association** | 20,006 | 1 | <.001 |
| **N of Valid Cases** | 285 | | |

a. 3 cells (18,8%) have expected count less than 5. The minimum expected count is 3,03.

A chi-square test of independence was performed to examine the relation between "Barrier to using multisensory teaching is the class size" and "Barrier to using multisensory teaching is the number of students" (table 9.2.147.). The relation between these variables was significant, $x^2(9)=86.503$, $p=0.001<0.05$.

From reading the content of the table 9.2.146., it generally appears that most teachers and kindergarten teachers in Heraklion prefecture, both in typical and special education, agree that class size can be a barrier to using multisensory teaching methods. Specifically, most of them that agree that the class size is a barrier to using multisensory techniques also agree that the number of students in the class is a barrier to teaching multisensory instruction.

This finding is likely attributed to the belief among educators that a small class size combined with a significant number of students can create challenging teaching conditions. In such scenarios, they may find it more difficult to effectively apply multisensory teaching methods, leading to their agreement that class size can be a hindrance in this regard.

**Table 9.2.146.**

*Crosstabulation: Barrier to using multisensory teaching is the class size * Barrier to using multisensory teaching is the number of students*

| | | **Barrier to using multisensory teaching is the number of students** | | | | |
|---|---|---|---|---|---|---|
| **Crosstab** | | Strongly disagree | Disagree | Agree | Strongly agree | Total |
| **Barrier to using multisensory teaching is the class size** | Strongly disagree | 10 | 12 | 14 | 14 | 50 |
| | Disagree | 11 | 31 | 17 | 18 | 77 |
| | Agree | 9 | 19 | 62 | 9 | 99 |
| | Strongly agree | 2 | 13 | 8 | 36 | 59 |
| **Total** | | 32 | 75 | 101 | 77 | 285 |

**Table 9.2.147.**

*Chi-Square Tests for variables: Barrier to using multisensory teaching is the class size * Barrier to using multisensory teaching is the number of students*

| **Chi-Square Tests** | **Value** | **df** | **Asymptotic Significance (2-sided)** |
|---|---|---|---|
| **Pearson Chi-Square** | 86.503[a] | 9 | <.001 |
| **Likelihood Ratio** | 83.176 | 9 | <.001 |
| **Linear-by-Linear Association** | 15.358 | 1 | <.001 |
| **N of Valid Cases** | 285 | | |

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 5,61.

A chi-square test of independence was performed to examine the relation between "Barrier to using multisensory teaching is the lack of logistical infrastructure" and "Specialization in special education" (table 9.2.149.). The relation between these variables was significant, $x^2(3)=8.608$, $p=0.035<0.05$.

Upon reviewing the table's 9.2.148. data, it becomes evident that the majority of teachers and kindergarten teachers in Heraklion prefecture, encompassing both typical and special education, tend to agree or strongly agree with the statement that “Barrier to using multisensory teaching include the lack of logistical infrastructure”. Also, it is observed that those who do not have expertise in special education tend to consider slightly more that the lack of logistical infrastructure is a barrier to using multisensory teaching.

**Table 9.2.148.**

*Crosstabulation: Barrier to using multisensory teaching is the lack of logistical infrastructure * Specialization in special education*

| Crosstab | | Specialization in special education | | Total |
|---|---|---|---|---|
| | | No | Yes | |
| **Barrier to using multisensory teaching is the lack of logistical infrastructure** | Strongly disagree | 11 | 13 | 24 |
| | Disagree | 15 | 33 | 48 |
| | Agree | 55 | 42 | 97 |
| | Strongly agree | 59 | 57 | 116 |
| **Total** | | 140 | 145 | 285 |

**Table 9.2.149.**

*Chi-Square Tests for variables: Barrier to using multisensory teaching is the lack of logistical infrastructure * Specialization in special education*

| Chi-Square Tests | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| **Pearson Chi-Square** | 8.608[a] | 3 | .035 |
| **Likelihood Ratio** | 8.779 | 3 | .032 |
| **Linear-by-Linear Association** | 2.286 | 1 | .131 |
| **N of Valid Cases** | 285 | | |

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 11,79.

A chi-square test of independence was performed to examine the relation between “Barrier to using multisensory teaching is the lack of interest on my part” and “Years of prior service” (table 9.2.151.). The relation between these variables was significant, $x^2(12)=28.674$, $p=0.004<0.05$.

From reading the content of the table 9.2.150., it generally appears that most teachers and kindergarten teachers in Heraklion prefecture, both in typical and special education, disagree or strongly disagree with the statement "Barrier to using multisensory teaching is the lack of interest on my part".

Furthermore, there seems to be a correlation between the years of experience of teachers and their agreement with this statement. Those with fewer years of experience tend to disagree with the notion that lack of interest is a barrier to using multisensory teaching, while those with 21 or more years of service are more likely to agree with it.

These findings could be attributed to the idea that educators with fewer years of experience may be more enthusiastic about their profession and more open to trying new teaching methods, including multisensory approaches. On the other hand, those with many years of service may either be more set in their ways or feel they have sufficient experience and qualifications to carry out their work effectively without needing to explore new teaching methods.

**Table 9.2.150.**

*Crosstabulation: Barrier to using multisensory teaching is the lack of interest on my part * Years of prior service*

| Crosstab | | Years of prior service | | | | | Total |
|---|---|---|---|---|---|---|---|
| | | 1-5 | 6-10 | 11-15 | 16-20 | 21+ | |
| **Barrier to using multisensory teaching is the lack of interest on my part** | Strongly disagree | 21 | 13 | 36 | 24 | 15 | 109 |
| | Disagree | 19 | 21 | 22 | 28 | 12 | 102 |
| | Agree | 4 | 8 | 9 | 8 | 17 | 46 |
| | Strongly agree | 4 | 1 | 12 | 7 | 4 | 28 |
| **Total** | | 48 | 43 | 79 | 67 | 48 | 285 |

**Table 9.2.151.**

*Chi-Square Tests for variables: Barrier to using multisensory teaching is the lack of interest on my part * Years of prior service*

| Chi-Square Tests | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| **Pearson Chi-Square** | 28.674[a] | 12 | .004 |
| **Likelihood Ratio** | 27.275 | 12 | .007 |

| | | | |
|---|---|---|---|
| **Linear-by-Linear Association** | 3.391 | 1 | .066 |
| **N of Valid Cases** | 285 | | |

a. 3 cells (15,0%) have expected count less than 5. The minimum expected count is 4,22.

A chi-square test of independence was performed to examine the relation between "Barrier to using multisensory teaching is the lack of interest on my part" and "Choosing to use multisensory teaching depends on inclusion of all students" (table 9.2.153.). The relation between these variables was significant, $x^2(9)=56.063$, $p<0.001<0.05$.

From reading the content of the table 9.2.152., it generally appears that most teachers and kindergarten teachers in Heraklion Prefecture, both in typical and special education, disagree or strongly disagree with the statement that "Barrier to using multisensory teaching is the lack of interest on my part".

Furthermore, there appears to be a correlation between those who completely disagree with the above statement and the importance they place on the inclusion of students through multisensory teaching methods. The more important the factor of including students through multisensory teaching methods is considered, the more likely teachers are to completely disagree with considering their lack of interest as a barrier to using multisensory teaching.

This correlation suggests that teachers who are highly motivated and value the inclusion of students through innovative teaching practices, such as multisensory methods, are less likely to perceive a lack of interest as a barrier. They are more inclined to continuously seek ways to improve and educate themselves in new methods and practices to better serve their students.

**Table 9.2.152.**

*Crosstabulation: Barrier to using multisensory teaching is the lack of interest on my part * Choosing to use multisensory teaching depends on inclusion of all students*

| | | **Choosing to use multisensory teaching depends on inclusion of all students** | | | |
|---|---|---|---|---|---|
| **Crosstab** | | Not important at all | Of little importance | Very important | Absolutely essential | Total |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Barrier to using multisensory teaching is the lack of interest on my part** | Strongly disagree | 8 | 9 | 35 | 57 | 109 |
| | Disagree | 6 | 22 | 45 | 29 | 102 |
| | Agree | 11 | 11 | 13 | 11 | 46 |
| | Strongly agree | 7 | 13 | 3 | 5 | 28 |
| **Total** | | 32 | 55 | 96 | 102 | 285 |

**Table 9.2.153.**

*Chi-Square Tests for variables: Barrier to using multisensory teaching is the lack of interest on my part * Choosing to use multisensory teaching depends on inclusion of all students*

| Chi-Square Tests | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| **Pearson Chi-Square** | 56.063[a] | 9 | <.001 |
| **Likelihood Ratio** | 53.989 | 9 | <.001 |
| **Linear-by-Linear Association** | 36.302 | 1 | <.001 |
| **N of Valid Cases** | 285 | | |

a. 1 cells (6,3%) have expected count less than 5. The minimum expected count is 3,14.

A chi-square test of independence was performed to examine the relation between "Barrier to using multisensory teaching is the lack of interest on my part" and "I would be interested in learning some multisensory method" (table 9.2.155.). The relation between these variables was significant, $x^2(12)=60.160$, $p<0.001<0.05$.

From reading the content of the table 9.2.154., it generally appears that most teachers and kindergarten teachers in Heraklion prefecture, both in typical and special education, disagree or strongly disagree with the statement that "Barrier to using multisensory teaching is the lack of interest on my part".

Interestingly, there seems to be an inversely proportional relationship between their desire for training in some multisensory method and their agreement with the statement about a lack of interest as a barrier. The more they desire relevant training, the more they disagree with considering their lack of interest as a barrier to using multisensory teaching.

This correlation suggests that teachers who express a desire for training in multisensory methods are less likely to attribute their non-use of multisensory teaching to a lack of interest. They may either actively seek opportunities to implement multisensory

methods or, if they are not currently using them, have reasons unrelated to their own lack of interest.

**Table 9.2.154.**

*Crosstabulation: Barrier to using multisensory teaching is the lack of interest on my part * I would be interested in learning some multisensory method*

| Crosstab | | I would be interested in learning some multisensory method | | | | | Total |
|---|---|---|---|---|---|---|---|
| | | Not at all | Slightly | Indifferent | Very | Extremely | |
| **Barrier to using multisensory teaching is the lack of interest on my part** | Strongly disagree | 4 | 7 | 12 | 36 | 50 | 109 |
| | Disagree | 6 | 14 | 23 | 38 | 21 | 102 |
| | Agree | 10 | 12 | 3 | 8 | 13 | 46 |
| | Strongly agree | 8 | 6 | 5 | 4 | 5 | 28 |
| **Total** | | 28 | 39 | 43 | 86 | 89 | 285 |

**Table 9.2.155.**

*Chi-Square Tests for variables: Barrier to using multisensory teaching is the lack of interest on my part * I would be interested in learning some multisensory method*

| Chi-Square Tests | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| **Pearson Chi-Square** | 60.160[a] | 12 | <.001 |
| **Likelihood Ratio** | 57.355 | 12 | <.001 |
| **Linear-by-Linear Association** | 36.980 | 1 | <.001 |
| **N of Valid Cases** | 285 | | |

a. 4 cells (20,0%) have expected count less than 5. The minimum expected count is 2,75.

The chi-square tests of independence were performed to "Barrier to using multisensory teaching is students' lack of interest" and "I adapt my teaching multisensorily without following any specific method" crossing with the other variables, did not give statistically significant results or results concerning the objective of the present study.

A chi-square test of independence was performed to examine the relation between "I reeducate myself regularly trying to follow new educational trends" and "I use multisensory activities/teaching methods in subjects related to language" (table 9.2.157.). The relation between these variables was significant, $x^2(16)=36.191$, $p=0.003<0.05$.

From reading the content of the table 9.2.156., it generally appears that most teachers and kindergarten teachers in Heraklion prefecture, both in typical and special education, agree or strongly agree with the statement that "I reeducate myself regularly trying to follow new educational trends", as well as, that the majority of them try to use multisensory activities/teaching in subjects related to science usually.

It is also observed that there is a correlation between the statement "I reeducate myself regularly trying to follow new educational trends" and the statement "I use multisensory activities/teaching methods in subjects related to language" and specifically, that those who disagree or disagree completely with the first statement, it is observed that they use multisensory teaching methods less often than those who gave a more positive answer regarding being retrained.

**Table 9.2.156.**

*Crosstabulation: I reeducate myself regularly trying to follow new educational trends * I use multisensory activities/teaching methods in subjects related to language*

| Crosstab | | I use multisensory activities/teaching methods in subjects related to language | | | | | Total |
|---|---|---|---|---|---|---|---|
| | | Never | Occasionally | Sometimes | Usually | Daily | |
| **I reeducate myself regularly trying to follow new educational trends** | Strongly disagree | 2 | 4 | 2 | 2 | 1 | 11 |
| | Disagree | 9 | 14 | 11 | 7 | 3 | 44 |
| | Neither agree nor disagree | 9 | 19 | 26 | 20 | 6 | 80 |
| | Agree | 13 | 15 | 22 | 31 | 13 | 94 |
| | Strongly agree | 3 | 6 | 10 | 20 | 17 | 56 |
| **Total** | | 36 | 58 | 71 | 80 | 40 | 285 |

**Table 9.2.157.**

*Chi-Square Tests for variables: I reeducate myself regularly trying to follow new educational trends * I use multisensory activities/teaching methods in subjects related to language*

| Chi-Square Tests | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| **Pearson Chi-Square** | 36,191a | 16 | .003 |
| **Likelihood Ratio** | 34,958 | 16 | .004 |

| | | | |
|---|---|---|---|
| **Linear-by-Linear Association** | 24,186 | 1 | <.001 |
| **N of Valid Cases** | 285 | | |

a. 5 cells (20,0%) have expected count less than 5. The minimum expected count is 1,39.

A chi-square test of independence was performed to examine the relation between "I reeducate myself regularly trying to follow new educational trends" and "Specialization in special education" (table 9.2.159.). The relation between these variables was significant, $x^2(4)=12.796$, $p=0.012<0.05$.

Based on the information presented in the table 9.2.158., it appears that the majority of teachers and kindergarten teachers in Heraklion prefecture, specialized or not in special education, try to reeducate themselves. However, there is a tendency for those trained in special education to pursue their training more. Moreover, it is observed that a large portion of the participants gave medium values. This may be because they do not have a strong opinion or did not expend the cognitive effort required to decide on a clear answer and therefore chose towards the center of the scale (Saris & Gallhofer, 2007).

**Table 9.2.158.**

*Crosstabulation: I reeducate myself regularly trying to follow new educational trends * Specialization in special education*

| **Crosstab** | | **Specialization in special education** | | |
|---|---|---|---|---|
| | | No | Yes | Total |
| **I reeducate myself regularly trying to follow new educational trends** | Strongly disagree | 8 | 3 | 11 |
| | Disagree | 21 | 23 | 44 |
| | Neither agree nor disagree | 49 | 31 | 80 |
| | Agree | 43 | 51 | 94 |
| | Strongly agree | 19 | 37 | 56 |
| **Total** | | 140 | 145 | 285 |

**Table 9.2.159.**

*Chi-Square Tests for variables: I reeducate myself regularly trying to follow new educational trends * Specialization in special education*

| Chi-Square Tests | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| **Pearson Chi-Square** | 12.796a | 4 | .012 |
| **Likelihood Ratio** | 13.018 | 4 | .011 |
| **Linear-by-Linear Association** | 7.255 | 1 | .007 |
| **N of Valid Cases** | 285 | | |

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 5,40.

A chi-square test of independence was performed to examine the relation between "The use of multisensory teaching works adequately for kindergarten students (3-5 years old)" and "Specialty" (table 9.2.161.). The relation between these variables was significant, $x^2(4)=9.876$, $p=0.043<0.05$.

Based on the information presented in the table 9.2.160., it appears that a significant majority of both teachers and kindergarten teachers in Heraklion prefecture, including those in typical and special education, tend to agree or strongly agree with the statement that "The use of multisensory teaching is effective for kindergarten students (3-5 years old)". This alignment in perspective may be attributed to the nature of teaching at a young age, where kinesthetic and tactile methods are traditionally employed to engage children, and these methods are often enjoyed by young learners. Additionally, there may be a belief that multisensory teaching is particularly effective for younger students due to their developmental stage and learning preferences. However, it should be mentioned that there seems to be a tendency for teachers to agree more than kindergarten teachers about the benefits of multisensory teaching for students aged 3 to 5.

**Table 9.2.160.**

*Crosstabulation: The use of multisensory teaching works adequately for kindergarten students (3-5 years old) * Specialty*

| | | Specialty | | |
|---|---|---|---|---|
| **Crosstab** | | Kindergarten teacher | Teacher | Total |

| | | | | |
|---|---|---|---|---|
| **The use of multisensory teaching works adequately for kindergarten students (3-5 years old)** | Strongly disagree | 3 | 5 | 8 |
| | Disagree | 4 | 34 | 38 |
| | Neither agree nor disagree | 12 | 57 | 69 |
| | Agree | 23 | 46 | 69 |
| | Strongly agree | 27 | 74 | 101 |
| **Total** | | 69 | 216 | 285 |

**Table 9.2.161.**

*Chi-Square Tests for variables: The use of multisensory teaching works adequately for kindergarten students (3-5 years old) * Specialty*

| Chi-Square Tests | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| **Pearson Chi-Square** | 9.876[a] | 4 | .043 |
| **Likelihood Ratio** | 10.456 | 4 | .033 |
| **Linear-by-Linear Association** | 3.007 | 1 | .083 |
| **N of Valid Cases** | 285 | | |

a. 1 cells (10,0%) have expected count less than 5. The minimum expected count is 1,94.

The chi-square tests of independence were performed to "The use of multisensory teaching works adequately for students in the first grades of primary school (6-8 years old)", crossing with other variables, and the Kruskal-Wallis non-parametric test did not give statistically significant results or results concerning the objective of the present study.

A chi-square test of independence was performed to examine the relation between "The use of multisensory teaching works adequately for students in the last grades of primary school (9-11 years old)" (table 9.2.163.). The relation between these variables was significant, $x^2(4)=9.540$, $p=0.049<0.05$.

Based on the information presented in the table 9.2.162., it appears that the majority of teachers and kindergarten teachers in Heraklion prefecture, agrees that multisensory teaching works adequately for students 9 to 11 years old. However, the following peculiarities are observed: although there seems to be a tendency for slightly more teachers than kindergarten teachers to believe this, there is nevertheless a tendency for teachers who disagree with the above position to seem to be much more than

kindergarten teachers. That is, the teachers are divided into two categories: those who agree and those who disagree with the above statement.

**Table 9.2.162.**

*Crosstabulation: The use of multisensory teaching works adequately for students in the last grades of primary school (9-11 years old) * Specialty*

| Crosstab | | Specialty | | Total |
|---|---|---|---|---|
| | | Kindergarten teacher | Teacher | |
| **The use of multisensory teaching works adequately for students in the last grades of primary school (9-11 years old)** | Strongly disagree | 3 | 9 | 12 |
| | Disagree | 9 | 50 | 59 |
| | Neither agree nor disagree | 23 | 65 | 88 |
| | Agree | 17 | 67 | 84 |
| | Strongly agree | 17 | 25 | 42 |
| **Total** | | 69 | 216 | 285 |

**Table 9.2.163.**

*Chi-Square Tests for variables: The use of multisensory teaching works adequately for students in the last grades of primary school (9-11 years old) * Specialty*

| Chi-Square Tests | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| **Pearson Chi-Square** | 9.540a | 4 | .049 |
| **Likelihood Ratio** | 9.180 | 4 | .057 |
| **Linear-by-Linear Association** | 3.871 | 1 | .049 |
| **N of Valid Cases** | 285 | | |

a. 1 cells (10,0%) have expected count less than 5. The minimum expected count is 2,91.

A Wallis test showed that there was a statistically significant difference in the statement "the use of multisensory teaching works adequately for students in the last grades of primary school (9-11 years old)" between years of prior service (table 9.2.164.), Kruskal Wallis H (4) = 13,297, p =,010, with a mean rank of the dependent variable 138,52 for 1-5 years, 132.42 for 6-10 years, 142,82 for 11-15 years, 170,48 for 16-20 years and 118,90 for 21 or more years. According to this, teachers with service from 1-5 years (M=138.52) consider the use of multisensory teaching works adequately for

students in the last grades of primary school (9-11 years old) to be comparatively more effective than those who have a seniority equal to or more than 21 years.

**Table 9.2.164.**

*Overviews of the sample teachers regarding the statement "The use of multisensory teaching works adequately for students in the last grades of primary school (9-11 years old)" over the years of prior service*

| Years of prior service | N | Mean Rank | Kruskal-Wallis Test | p-value |
|---|---|---|---|---|
| 1-5 | 48 | 138,52 | 13,297 | 0,010 |
| 6-10 | 43 | 132,42 | | |
| 11-15 | 79 | 142,82 | | |
| 16-20 | 67 | 170,48 | | |
| 21+ | 48 | 118,90 | | |
| **Total** | 285 | | | |

A Kruskal-Wallis test showed that there was a statistically significant difference in the statement "Students with dyslexia can adequately master the reading skill through multisensory activities" between the respondents' work structure whether it is formal or special education (table 9.2.165.), Kruskal Wallis (1)=4,414, p=,036, with a mean rank of the dependent variable 137,03 for typical education, and 158,58 for special education. According to this, teachers working in a typical education structure (M=137,03) consider less that students with dyslexia can adequately master the reading skill through multisensory activities" than those working in a special education structure.

**Table 9.2.165.**

*Overviews of the sample teachers regarding the statement "Students with dyslexia can adequately master the reading skill through multisensory activities" over number of students taught per hour the current school year*

| Typical Education or Special Education | N | Mean Rank | Kruskal-Wallis Test | p-value |
|---|---|---|---|---|
| Typical Education | 206 | 137,03 | | |

| | | | | |
|---|---|---|---|---|
| Special Education | 79 | 158,58 | 4,414 | 0,036 |
| **Total** | 285 | | | |

A Wallis test showed that there was a statistically significant difference in the statement "Students with dyslexia can adequately master the reading skill through multisensory activities" over the number if students taught per hour the current school year (table 9.2.149.), Kruskal Wallis (3)= 8,461, p =,037, with a mean rank of the dependent variable 145,13 for 1 student, 175,37 for 2-4 students, 136,64 for 5-7 students, 136,61 for 8 or more students. According to this, teachers who teach to 1 student per hour (M=145,13) consider more that Students with dyslexia can adequately master the reading skill through multisensory activities compared to those who have 8 students and above.

**Table 9.2.166.**

*Overviews of the sample teachers regarding the statement "Students with dyslexia can adequately master the reading skill through multisensory activities" over number of students taught per hour the current school year*

| **Number of students taught per hour the current school year** | **N** | **Mean Rank** | **Kruskal-Wallis Test** | **p-value** |
|---|---|---|---|---|
| 1 | 27 | 145,13 | 8,461 | 0,037 |
| 2-4 | 41 | 175,37 | | |
| 5-7 | 43 | 136,64 | | |
| 8+ | 174 | 136,61 | | |
| **Total** | 285 | | | |

A chi-square test of independence was performed to examine the relation between "I would be interested in learning some multisensory method" and "Years of prior service" (table 9.2.168.). The relation between these variables was significant, $x^2(16)=29.765$, $p=0.019<0.05$.

From reading the content of the table 9.2.167., it generally appears that most teachers and kindergarten teachers in Heraklion prefecture, both in typical and special education, express a strong desire to learn some multisensory teaching method, with many of them indicating they wish to do so very much or extremely.

Additionally, it appears that most of these educators have up to 15 years of experience. This trend could be explained by the belief that teachers with fewer years of experience are more inclined to seek opportunities for improvement and professional development through training, including in multisensory teaching methods. They may view training as a means to enhance their teaching skills and better meet the diverse needs of their students.

**Table 9.2.167.**

*Crosstabulation: I would be interested in learning some multisensory method/program * Years of prior service*

| **Crosstab** | | **Years of prior service** | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1-5 | 6-10 | 11-15 | 16-20 | 21+ | Total |
| **I would be interested in learning some multisensory method/program** | Not at all | 2 | 1 | 8 | 7 | 10 | 28 |
| | Slightly | 4 | 7 | 7 | 14 | 7 | 39 |
| | Indifferent | 5 | 6 | 14 | 11 | 7 | 43 |
| | Very | 13 | 17 | 20 | 21 | 15 | 86 |
| | Extremely | 24 | 12 | 30 | 14 | 9 | 89 |
| **Total** | | 48 | 43 | 79 | 67 | 48 | 285 |

**Table 9.2.168.**

*Chi-Square Tests for variables: I would be interested in learning some multisensory method/program * Years of prior service*

| **Chi-Square Tests** | **Value** | **df** | **Asymptotic Significance (2-sided)** |
|---|---|---|---|
| **Pearson Chi-Square** | 29.765[a] | 16 | .019 |
| **Likelihood Ratio** | 29.628 | 16 | .020 |
| **Linear-by-Linear Association** | 16.653 | 1 | <.001 |
| **N of Valid Cases** | 285 | | |

a. 3 cells (12,0%) have expected count less than 5. The minimum expected count is 4,22.

A chi-square test of independence was performed to examine the relation between "I would be interested in learning some multisensory method/program" and "Years of prior service" (table 9.2.170.). The relation between these variables was significant, $x^2(4)=12.711$, $p=0.013<0.05$.

From reading the content of the table 9.2.169., it generally appears that most teachers and kindergarten teachers in Heraklion prefecture, both in typical and special education, are interested in training on some multisensory method or program. Furthermore, it is observed that there is a positive correlation regarding the highest level of studies and the desire for training. That is, there are more people who have a master's degree and wish to further their education compared to those who hold a bachelor's degree.

**Table 9.2.169.**

*Crosstabulation: I would be interested in learning some multisensory method/program * Highest level of studies*

| Crosstab | | Highest level of studies | | Total |
|---|---|---|---|---|
| | | Bachelor degree | Master degree | |
| **I would be interested in learning some multisensory method/program** | Not at all | 13 | 15 | 28 |
| | Slightly | 25 | 14 | 39 |
| | Indifferent | 22 | 21 | 43 |
| | Very | 32 | 54 | 86 |
| | Extremely | 30 | 59 | 89 |
| **Total** | | 122 | 163 | 285 |

**Table 9.2.170.**

*Chi-Square Tests for variables: I would be interested in learning some multisensory method/program * Highest level of studies*

| Chi-Square Tests | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| **Pearson Chi-Square** | 12.711[a] | 4 | .013 |
| **Likelihood Ratio** | 12.708 | 4 | .013 |
| **Linear-by-Linear Association** | 8.115 | 1 | .004 |
| **N of Valid Cases** | 285 | | |

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 11,99.

A chi-square test of independence was performed to examine the relation between "I would be interested in learning some multisensory method/program" and "Multisensory teaching helps students with dyslexia achieve learning goals in subjects related to science" (table 9.2.172). The relation between these variables was significant, $x^2(16)=91.907$, $p<0.001<0.05$.

From reading the content of the table 9.2.171., it generally appears that most teachers and kindergarten teachers in Heraklion prefecture, both in typical and special education, who are very or extremely interested in learning some multisensory method tend to agree or strongly agree with the statement that "Multisensory teaching helps students with dyslexia achieve learning goals in subjects related to science". This is probably due either because they have already applied a multisensory method and want to learn it even better, or because they have been informed that the multisensory method is effective in learning goals related to science.

**Table 9.2.171.**

*Crosstabulation: I would be interested in learning some multisensory method/program * Multisensory teaching helps students with dyslexia achieve learning goals in subjects related to science*

| | | **Multisensory teaching helps students with dyslexia achieve learning goals in subjects related to science** | | | | | |
|---|---|---|---|---|---|---|---|
| **Crosstab** | | Strongly disagree | Disagree | Neither agree nor disagree | Agree | Strongly agree | Total |
| **I would be interested in learning some multisensory method/program** | Not at all | 3 | 13 | 7 | 5 | 0 | 28 |
| | Slightly | 4 | 15 | 11 | 8 | 1 | 39 |
| | Indifferent | 3 | 8 | 14 | 15 | 3 | 43 |
| | Very | 9 | 11 | 12 | 42 | 12 | 86 |
| | Extremely | 7 | 2 | 7 | 42 | 31 | 89 |
| **Total** | | 26 | 49 | 51 | 112 | 47 | 285 |

**Table 9.2.172.**

*Chi-Square Tests for variables: I would be interested in learning some multisensory method/program * Multisensory teaching helps students with dyslexia achieve learning goals in subjects related to science*

| **Chi-Square Tests** | **Value** | **df** | **Asymptotic Significance (2-sided)** |
|---|---|---|---|
| **Pearson Chi-Square** | 91,907a | 16 | <.001 |
| **Likelihood Ratio** | 96,483 | 16 | <.001 |
| **Linear-by-Linear Association** | 51,138 | 1 | <.001 |
| **N of Valid Cases** | 285 | | |

a. 5 cells (20,0%) have expected count less than 5. The minimum expected count is 2,55.

A chi-square test of independence was performed to examine the relation between "I would be interested in learning some multisensory method/program" and "I use multisensory activities/teaching methods in subjects related to language" (table 9.2.174). The relation between these variables was significant, $x^2(16)=46.853$, $p<0.001<0.05$.

From reading the content of the table 9.2.173., it generally appears that most teachers and kindergarten teachers in Heraklion prefecture, both in typical and special education, who are very or extremely interested in learning some multisensory method tend to use daily multisensory activities/teaching methods in subjects related to language. This is probably due either because they have already applied a multisensory method and want to learn it even better, or because they have been informed that the multisensory method is effective in learning goals related to language.

**Table 9.2.173.**

*Crosstabulation: I would be interested in learning some multisensory method/program * I use multisensory activities/teaching methods in subjects related to language*

| | | **I use multisensory activities/teaching methods in subjects related to language** | | | | | |
|---|---|---|---|---|---|---|---|
| **Crosstab** | | Never | Occasionally | Sometimes | Usually | Daily | Total |
| **I would be interested in learning some multisensory method** | Not at all | 8 | 11 | 4 | 3 | 2 | 28 |
| | Slightly | 7 | 15 | 8 | 6 | 3 | 39 |
| | Indifferent | 6 | 6 | 16 | 14 | 1 | 43 |
| | Very | 9 | 11 | 23 | 29 | 14 | 86 |
| | Extremely | 6 | 15 | 20 | 28 | 20 | 89 |
| **Total** | | 36 | 58 | 71 | 80 | 40 | 285 |

**Table 9.2.174.**

*Chi-Square Tests for variables: I would be interested in learning some multisensory method/program * I use multisensory activities/teaching methods in subjects related to language*

| **Chi-Square Tests** | **Value** | **df** | **Asymptotic Significance (2-sided)** |
|---|---|---|---|
| **Pearson Chi-Square** | 46,853a | 16 | <.001 |

| | | | |
|---|---|---|---|
| **Likelihood Ratio** | 47,093 | 16 | <.001 |
| **Linear-by-Linear Association** | 29,238 | 1 | <.001 |
| **N of Valid Cases** | 285 | | |

a. 3 cells (12,0%) have expected count less than 5. The minimum expected count is 3,54.

A chi-square test of independence was performed to examine the relation between "Learning a multisensory teaching method is provided free of charge by the state" and "Learning a multisensory teaching method will burden me financially" (table 9.2.176). The relation between these variables was significant, $x^2(4)=12.711$, $p=0.013<0.05$.

From reading the content of the table 9.2.175., it generally appears that most typical and special education teachers and kindergarten teachers in the prefecture of Heraklion disagree or strongly disagree with the statement "Learning a multisensory teaching method is provided free of charge by the state". In contrast, they tend to agree or strongly agree with the statement "Learning a multisensory teaching method will burden me financially".

This observation may be due to the perception that if the state does not provide free training in multisensory teaching methods, the financial burden of acquiring such training would fall on the educators themselves. It's possible that they believe there are limited options for obtaining this training at no cost from other sources, which could lead to concerns about the financial implications of pursuing such education.

**Table 9.2.175.**

*Crosstabulation: Learning a multisensory teaching method is provided free of charge by the state * Learning a multisensory teaching method will burden me financially*

| | | **Learning a multisensory teaching method will burden me financially** | | | | | |
|---|---|---|---|---|---|---|---|
| **Crosstab** | | Strongly disagree | Disagree | Neither agree nor disagree | Agree | Strongly agree | Total |
| **Learning a multisensory teaching method is provided free of charge by the state** | Strongly disagree | 7 | 0 | 4 | 14 | 73 | 98 |
| | Disagree | 2 | 5 | 10 | 48 | 11 | 76 |
| | Neither agree nor disagree | 1 | 1 | 36 | 11 | 1 | 50 |
| | Agree | 5 | 19 | 9 | 2 | 0 | 35 |
| | Strongly agree | 9 | 9 | 3 | 1 | 4 | 26 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Total** | 24 | 34 | 62 | 76 | 89 | 285 |

**Table 9.2.176.**

*Chi-Square Tests for variables: Learning a multisensory teaching method is provided free of charge by the state * Learning a multisensory teaching method will burden me financially*

| Chi-Square Tests | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| **Pearson Chi-Square** | 12.711[a] | 4 | .013 |
| **Likelihood Ratio** | 12.708 | 4 | .013 |
| **Linear-by-Linear Association** | 8.115 | 1 | .004 |
| **N of Valid Cases** | 285 | | |

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 11,99.

A chi-square test of independence was performed to examine the relation between "I am familiar with Orton-Gillingham" and "Specialization in special education" (table 9.2.178.). The relation between these variables was significant, $x^2(3)=11.320$, $p=0.010<0.05$.

From reading the content of the table 9.2.177., it generally appears that there is a negative correlation between the two variables according to the opinions of the teachers and kindergarten teachers of standard and special education in the prefecture of Heraklion. More specifically, it is observed that there are more people who are not familiar with the Orton-Gillingham multisensory method and do not have expertise in special education.

**Table 9.2.177.**

*Crosstabulation: I am familiar with Orton-Gillingham * Specialization in special education*

| Crosstab | | Specialization in special education | | Total |
|---|---|---|---|---|
| | | No | Yes | |
| **I am familiar with Orton-Gillingham** | Not at all | 81 | 64 | 145 |
| | Slightly | 38 | 39 | 77 |
| | Very | 15 | 37 | 52 |
| | Extremely | 6 | 5 | 11 |
| **Total** | | 140 | 145 | 285 |

**Table 9.2.178.**

*Chi-Square Tests for variables: I am familiar with Orton-Gillingham * Specialization in special education*

| Chi-Square Tests | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| **Pearson Chi-Square** | 11.320[a] | 3 | .010 |
| **Likelihood Ratio** | 11.621 | 3 | .009 |
| **Linear-by-Linear Association** | 6.529 | 1 | .011 |
| **N of Valid Cases** | 285 | | |

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 5,40.

The chi-square tests of independence were performed to "I am familiar with LiPS", "I am familiar with BDTS", "I am familiar with BRSS", "I am familiar with Jolly Phonics", I am familiar with Alphabetic Phonics", "I am familiar with PRS-VRS", "I am familiar with visualization-verbalization", "I am familiar with Letterland", "I am familiar with SMT", "I am familiar with Wilson Reading System", "I am familiar with BGI", "I am familiar with Hickey", "I am familiar with D.I.S.T.A.R." and "I am familiar with Toe by Toe", crossing with other variables, did not give statistically significant results or results concerning the objective of the present study.

This may be due to the fact that most of these programs, although quite popular in special education, are in English or other European languages and not in the native language of the participants.

A chi-square test of independence was performed to examine the relation between "I am familiar with Dyslexia Box" and "Specialty" (table 9.2.180.). The relation between these variables was significant, $x^2(3)=9.137$, $p=0.028<0.05$.

From reading the content of the table 9.2.179, it generally appears that most typical and special education teachers and kindergarten teachers in the prefecture of Heraklion are not familiar with Dyslexia. However, it is observed that there are more teachers who declare that they are familiar with it than kindergarten teachers. This may be because the specific program is an intervention program for dyslexia, reading and writing and at this age, it is rare for any of the children to be diagnosed with dyslexia. Therefore, kindergarten teachers may turn to other teaching tools.

**Table 9.2.179.**

*Crosstabulation: I am familiar with Dyslexia Box * Specialty*

| Crosstab | | Specialty | | Total |
|---|---|---|---|---|
| | | Kindergarten teacher | Teacher | |
| **I am familiar with Dyslexia Box** | Not at all | 32 | 71 | 103 |
| | Slightly | 23 | 64 | 87 |
| | Very | 11 | 46 | 57 |
| | Extremely | 3 | 35 | 38 |
| **Total** | | 69 | 216 | 285 |

**Table 9.2.180.**

*Chi-Square Tests for variables: I am familiar with Dyslexia Box * Specialty*

| Chi-Square Tests | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| **Pearson Chi-Square** | 9.137[a] | 3 | .028 |
| **Likelihood Ratio** | 10.437 | 3 | .015 |
| **Linear-by-Linear Association** | 8.716 | 1 | .003 |
| **N of Valid Cases** | 285 | | |

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 9,20.

A chi-square test of independence was performed to examine the relation between "I am familiar with Dyslexia Box" and "I use a specific method of multisensory teaching" (table 9.2.182.). The relation between these variables was significant, $x^2(3)=31.470$, $p<0.001<0.05$.

From reading the content of the table 9.2.181., it generally appears that most typical and special education teachers and kindergarten teachers in the prefecture of Heraklion even if they are familiar with the Dyslexia Box, they do not use any specific multisensory teaching method. This probably means that they do not use it in their teaching, which may be due to the way the tool in question is structured and more specifically to the fact that it does not serve the simultaneous teaching of a large number of students.

**Table 9.2.181.**

*Crosstabulation: I am familiar with Dyslexia Box * I use a specific method of multisensory teaching*

| Crosstab | | I use a specific method of multisensory teaching | | Total |
|---|---|---|---|---|
| | | No | Yes | |
| **I am familiar with Dyslexia Box** | Not at all | 93 | 10 | 103 |
| | Slightly | 74 | 13 | 87 |
| | Very | 41 | 16 | 57 |
| | Extremely | 19 | 19 | 38 |
| **Total** | | 227 | 58 | 285 |

**Table 9.2.182.**

*Chi-Square Tests for variables: I am familiar with Dyslexia Box * I use a specific method of multisensory teaching*

| Chi-Square Tests | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| **Pearson Chi-Square** | 31.470[a] | 3 | <.001 |
| **Likelihood Ratio** | 28.612 | 3 | <.001 |
| **Linear-by-Linear Association** | 28.585 | 1 | <.001 |
| **N of Valid Cases** | 285 | | |

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 7,73.

A chi-square test of independence was performed to examine the relation between "I am familiar with the Dyslexia Box" and "I use the Dyslexia Box in my teaching" (table 9.2.184). The relation between these variables was significant, $x^2(9)=176.520$, $p=0.001<0.05$.

From reading the content of the table 9.2.183., it appears that most teachers and kindergarten teachers in Heraklion prefecture, both in typical and special education, who do not use the Dyslexia Box are likely not aware of its existence. Additionally, there seems to be a positive correlation between those who are extremely familiar with Dyslexia Box and the frequency of its use during teaching.

This correlation suggests that teachers who are well-informed and extremely familiar with the Dyslexia Box are more likely to incorporate it into their teaching practices. The fact that some educators do not use it may not necessarily reflect a lack of interest in multisensory methods but rather a lack of awareness about this specific tool. If they

were made aware of the Dyslexia Box, they might be more inclined to use it, especially if they believe it can benefit their students.

**Table 9.2.183.**

*Crosstabulation: I am familiar with Dyslexia Box * I use Dyslexia Box in my teaching*

| Crosstab | | I use Dyslexia Box in my teaching | | | | Total |
|---|---|---|---|---|---|---|
| | | Never | Rarely | Frequently | Always | |
| **I am familiar with Dyslexia Box** | Not at all | 94 | 3 | 5 | 1 | 103 |
| | Slightly | 33 | 39 | 12 | 3 | 87 |
| | Very | 15 | 18 | 20 | 4 | 57 |
| | Extremely | 2 | 8 | 13 | 15 | 38 |
| **Total** | | 144 | 68 | 50 | 23 | 285 |

**Table 9.2.184.**

*Chi-Square Tests for variables: I am familiar with Dyslexia Box * I use Dyslexia Box in my teaching*

| Chi-Square Tests | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| **Pearson Chi-Square** | 176.520[a] | 9 | <.001 |
| **Likelihood Ratio** | 171.909 | 9 | <.001 |
| **Linear-by-Linear Association** | 115.770 | 1 | <.001 |
| **N of Valid Cases** | 285 | | |

a. 2 cells (12,5%) have expected count less than 5. The minimum expected count is 3,07.

The chi-square tests of independence were performed to "I use Orton-Gillingham in my teaching", "I use LiPS in my teaching", "I use BDTS in my teaching", "I use BRSS in my teaching", "I use Jolly Phonics in my teaching", I use Alphabetic Phonics in my teaching", "I use PRS-VRS in my teaching", "I use visualization-verbalization in my teaching", "I use Letterland in my teaching", "I use SMT in my teaching", "I use Wilson Reading System in my teaching", "I use BGI in my teaching", "I use Hickey in my teaching", "I use D.I.S.T.A.R. in my teaching" and "I use Toe by Toe in my teaching", crossing with other variables, did not give statistically significant results or results concerning the objective of the present study. This may be due to the fact that most of these programs, although quite popular in special education, are in English or other European languages and not in the native language of the participants.

It's essential to recognize that educators cannot use a tool or method that they are not aware of. Therefore, we cannot conclude that the lack of use of specific multisensory programs or tools is necessarily connected to a lack of desire to use multisensory teaching methods in general. The availability of resources and information plays a crucial role in educators' decisions regarding which teaching methods to implement. If they are not aware of certain tools or programs, it doesn't necessarily indicate a lack of interest in multisensory teaching but rather a potential gap in information or access to resources.

A chi-square test of independence was performed to examine the relation between “I am familiar with the Dyslexia Box” and “I use the Dyslexia Box in my teaching” (table 9.2.186.). The relation between these variables was significant, $x^2(3)=20.788$, $p<0.001<0.05$.

From reading the content of the table 9.2.185., it appears that most teachers and kindergarten teachers in Heraklion prefecture, both in typical and special education, do not use or rarely use Dyslexia Box. Furthermore, it is observed that the less this tool is used, the more the teachers declare that they do not use any specific multisensory method. This probably happens either because they don't know it as an educational tool, or because they know it and for some reason, they don't think it serves the educational process.

**Table 9.2.185.**

*Crosstabulation: I use Dyslexia Box * I use a specific method of multisensory teaching*

| | | **I use a specific method of multisensory teaching** | | |
|---|---|---|---|---|
| **Crosstab** | | No | Yes | Total |
| **I use Dyslexia Box** | Never | 125 | 19 | 144 |
| | Rarely | 55 | 13 | 68 |
| | Frequently | 36 | 14 | 50 |
| | Always | 11 | 12 | 23 |
| **Total** | | 227 | 58 | 285 |

**Table 9.2.186.**

*Chi-Square Tests for variables: I use Dyslexia Box * I use a specific method of multisensory teaching*

| Chi-Square Tests | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| **Pearson Chi-Square** | 20.788[a] | 3 | <.001 |
| **Likelihood Ratio** | 18.147 | 3 | <.001 |
| **Linear-by-Linear Association** | 18.307 | 1 | <.001 |
| **N of Valid Cases** | 285 | | |

a. 1 cells (12,5%) have expected count less than 5. The minimum expected count is 4,68.

A chi-square test of independence was performed to examine the relation between "I use the following multisensory teaching methods and programs [Dyslexia Box]" and "Specialization in special education" (table 9.2.188.). The relation between these variables was significant, $x^2(3)=24.640$, $p<0.001<0.05$.

From reading the content of the table 9.2.187., it appears that most teachers and kindergarten teachers in Heraklion prefecture, both in typical and special education, do not use or rarely use Dyslexia Box. However, its use is almost twice that of those specializing in special education.

**Table 9.2.187.**

*Crosstabulation: I use the following multisensory teaching methods and programs [Dyslexia Box] * Specialization in special education*

| Crosstab | | Specialization in special education | | Total |
|---|---|---|---|---|
| | | No | Yes | |
| **I use the following multisensory teaching methods and programs [Dyslexia Box]** | Never | 91 | 53 | 144 |
| | Rarely | 27 | 41 | 68 |
| | Frequently | 14 | 36 | 50 |
| | Always | 8 | 15 | 23 |
| **Total** | | 140 | 145 | 285 |

**Table 9.2.188.**

*Chi-Square Tests for variables: I use the following multisensory teaching methods and programs [Dyslexia Box] * Specialization in special education*

| Chi-Square Tests | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| **Pearson Chi-Square** | 24.640a | 3 | <.001 |
| **Likelihood Ratio** | 25.147 | 3 | <.001 |
| **Linear-by-Linear Association** | 20.090 | 1 | <.001 |
| **N of Valid Cases** | 285 | | |

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 11,30.

A Wallis test (table 9.2.189.) showed that there was a statistically significant difference in the statement "I know of a multisensory teaching program designed or translated into Greek language" over the specialty, Kruskal Wallis (4)= 12,098, p =.017, with a mean rank of the dependent variable 123,00 for "never" and 178,38 for "daily". According to this, fewer of those who stated that they never use multisensory teaching (M=123.00) state that they know of a multisensory teaching program designed or translated into Greek language compared to those who stated that use multisensory teaching daily.

**Table 9.2.189.**

*Overviews of the sample teachers regarding the statement "I know of a multisensory teaching program designed or translated into Greek language" over number of students taught per hour the current school year*

| I use multisensory teaching | N | Mean Rank | Kruskal-Wallis Test | p-value |
|---|---|---|---|---|
| Never | 21 | **123,00** | | |
| Rarely | 72 | 133,17 | | |
| Occasionaly | 89 | 139,92 | 12,098 | 0.017 |
| Often | 63 | 142,79 | | Never vs daily |
| Daily | 40 | **178,38** | | |
| **Total** | 285 | | | |

# CHAPTER 10

## CONCLUSIONS

### 10.1. Conclusions and discussion

Teachers at different grade levels vary in their pedagogical beliefs, preferences for technology-embedded activities, rationale for valuing them, and knowledge of these activities (Hughes et al., 2020; Wu et al., 2022). However, few studies have found the separation of teachers' and kindergarten teachers' opinions, which is surprising since although both are at the same level of education, their educational work and the school context are completely different. In 2008, Adler provided an assessment of the state of research in the field of social studies teacher education, highlighting that it predominantly concentrated on "individualized studies of specific practices" and often lacked connections to the broader context of teacher preparation across different settings (van Hover & Hicks, 2018). Despite the passage of 15 years since Adler's observations, the current study appears to align with this perspective. This is particularly evident when examining research that specifically delves into teachers' perspectives on the application of multisensory teaching techniques for both mainstream students and those with dyslexia. Nonetheless, this study aims to comprehensively review the existing literature, seeking to validate the research findings while also shedding light on any gaps that may exist in the current body of research.

Regarding the 1st scientific objective aimed at identifying teachers' knowledge about multisensory teaching methods/programs, as well as the frequency of their use depending on the teaching subject, there are the following findings.

The findings of this research shed light on teachers' awareness of multisensory teaching, its application, and who is best suited to implement it. In response to the question “When I hear the phrase multisensory teaching I think…”, the survey responses were subjected to descriptive qualitative analysis, yielding several noteworthy conclusions.

It appears that a significant portion of educators, when confronted with the term “multisensory teaching”, immediately associate it with the simultaneous engagement of multiple senses. The next most common associations included terms like “attractive”, “rich logistical infrastructure”, and “visual aids”. This suggests that, in the eyes of

teachers, multisensory teaching is closely linked to interactive teaching methods and the availability of diverse materials and technological support.

Interestingly, the phrase “special education students” emerged as a somewhat distant association, indicating that teachers may not readily connect multisensory education with this particular group of students. Lastly, less prevalent responses included “a specific teaching method” and “syllabus”.

The multisensory approach to teaching is an educational method in which students engage all of their sensory faculties, including hearing, smell, touch, sight, taste, and feel, within the learning environment (Suryaratri et al. 2019). This approach encompasses various programs and techniques that can be implemented through software and additional tools. Its primary objective is to enhance children's learning by involving multiple senses simultaneously. By doing so, it addresses potential challenges associated with processing information from a single sense, such as hearing or vision, as it enables the concurrent engagement of multiple senses like touch, movement, hearing, and vision in the learning process (Loizou, 2016).

Research conducted by Alwaqassi (2017) has shown that teachers hold different interpretations of the multisensory approach to teaching and employ diverse methods in its application. However, based on the findings provided, it appears that both typical and special education teachers and kindergarten teachers in the Heraklion prefecture are knowledgeable about multisensory education.

Regarding whether teachers and kindergarten teachers in the Heraklion prefecture know how to teach using a multisensory approach, there is a division of opinions. However, it is evident that individuals with postgraduate degrees and specialization in special education are more likely to agree or strongly agree that they possess the necessary knowledge to teach students using multisensory methods. Similarly, those with a master's degree tend to express a higher degree of agreement or strong agreement when it comes to having professional confidence in employing multisensory teaching, compared to those with only a bachelor's degree.

Furthermore, statistically significant findings have been identified concerning whether teachers have the requisite knowledge and professional confidence to implement multisensory teaching, and the frequency of its use in language and science-related courses. Specifically, in language-related subjects, those who believe they have the

necessary knowledge to teach multisensorily are more inclined to frequently use multisensory teaching methods. Conversely, teachers without relevant training tend to rarely or never utilize this approach. In general, a majority of teachers and kindergarten teachers in the Heraklion prefecture, both in typical and special education, agree that they have the professional confidence to teach students multisensorily. This confidence is reflected in a higher frequency of multisensory teaching in language-related courses. Moreover, there is an increasing trend in the utilization of multisensory teaching in language courses among those who report having complete professional confidence.

In the context of science-related subjects, there is a noticeable pattern among educators who strongly disagree that they possess the requisite knowledge to teach using multisensory methods. These individuals tend not to choose multisensory teaching, and those who do, use it rarely. Conversely, a significant number of educators who feel well-qualified in this area incorporate multisensory teaching into their daily instruction. In general, teachers and kindergarten teachers in the Heraklion prefecture, both in typical and special education, express professional confidence in their ability to teach using multisensory techniques. Notably, a considerable portion of those who feel confident about their skills frequently employ multisensory teaching in science-related courses.

These findings indicate that while most teachers are aware of multisensory education, a smaller percentage actually utilize it in their teaching. This is further supported by their responses to whether they would like to become more acquainted with multisensory methods/programs before implementing them with their students, with the majority expressing a positive inclination. Additionally, teachers in typical education settings tend to have a more favorable response to this question, and there is a positive correlation between the statement “I have the necessary knowledge to teach my students multisensorily” and a desire for greater familiarity with multisensory methods.

Also, it was observed that fewer educators who never use multisensory teaching are aware of multisensory teaching programs available in the Greek language, in comparison to those who employ multisensory teaching on a daily basis.

Since multisensory teaching is commonly recognized as a best practice, training teachers in this approach is expected to lead to greater use of multisensory methods in the classroom. Consequently, the findings of previous research indirectly align with the results of the present study.

It is apparent that teachers and kindergarten teachers in the Heraklion prefecture, whether in typical or special education, do not believe that multisensory teaching can only be effectively implemented by special educators. From an examination of existing literature on the broader subject of implementing multisensory practices in the classroom, it becomes evident that numerous studies have focused on special education teachers (e.g., Alwaqassi, 2017; Nijakowska, 2018), as well as on teachers in typical education. Nevertheless, none of these studies have specifically addressed teachers' opinions about who they believe is better qualified to teach multisensory techniques. This reveals a notable gap in the literature, highlighting the need for further research in this area.

The percentages of typical and special education teachers, as well as kindergarten teachers, who utilize a specific multisensory method or program are relatively low. However, there is a positive correlation between having the necessary knowledge to teach multisensory techniques and the use of a specific multisensory method or program. The utilization of the 16 reported multisensory programs is generally minimal, with only slight variations observed, particularly in the case of the Dyslexia Box program, which appears to be used more frequently. These findings align with the information provided by Gaitanidi et al. (2023), indicating that in Greece, there are limited structured programs for dyslexia in Greek language, apart from the Dyslexia Box, which can be implemented without extensive training for the person administering it to students. It is important to note that there is no prior research identified that would allow for a direct comparison of these results regarding the use of specific multisensory methods or programs.

Regarding the selection of multisensory teaching methods, the research did not provide substantial findings due to certain limitations. Out of the 16 methods and programs listed in the questionnaire concerning the use of multisensory teaching methods, statistically significant data was obtained for only one. The reason for this was that, of the 16 programs, only one was originally designed in the Greek language. The remaining 15 methods and programs predominantly use English as their primary language, making them less accessible and usable within the Greek educational context. Some teachers who indicated using certain English-language programs may have resorted to adapting or modifying them to suit the Greek language and curriculum.

The Greek program that yielded statistically significant data is “Dyslexia Box”. However, despite being available in Greek, it appears that most teachers and kindergarten teachers in Heraklion prefecture, including those in both typical and special education settings, infrequently use or rarely use Dyslexia Box. Nonetheless, the usage of this program is nearly double among those who specialize in special education.

The frequency of using multisensory teaching methods appears to vary based on the subject being taught. According to the responses of typical and special education teachers, as well as kindergarten teachers in Heraklion prefecture, multisensory teaching methods are more frequently employed in subjects related to language compared to subjects related to science. In terms of the frequency of using multisensory teaching methods, the research indicates that teachers and kindergarten teachers in Heraklion, both in typical and special education, tend to agree that the more students they teach per hour, the less they use multisensory teaching methods. More teachers than kindergarten teachers agree with the statement above. Additionally, those who agree that the more students they teach per hour, the less they use multisensory teaching methods also tend to agree that the fewer students they teach per hour, the more they use multisensory teaching methods. This suggests that the number of students taught per hour influences the frequency of multisensory teaching methods used by educators.

The research also reveals additional findings regarding teachers' attitudes and opinions. The fact that those who agree or strongly agree with that the more students they teach per hour, the less they use multisensory teaching methods also tend to agree or strongly agree with that the number of students is an obstacle to the application of multisensory teaching methods. Also, there is a positive correlation between those who agree that the fewer students they teach per hour, the more they use multisensory teaching methods and those who strongly agree that barrier to using multisensory teaching is the limited teaching time. It is worth noting that those who disagree and strongly disagree that multisensory teaching is easily implemented one-on-one also strongly disagree that the fewer students they teach per hour, the more they use multisensory teaching methods. Differentiation is observed regarding the specialty of the teachers and their opinions regarding the ease of implementing multisensory practices in small groups of students and in the whole class, with teachers being more than kindergarten teachers in the first

case. In the second case, the negative answers of the teachers are statistically significantly more than those of the kindergarten teachers.

It is worth noting that no specific researches were found that study the opinions of teachers in relation to the number of students per class regarding multisensory teaching, the researches mentioned below generally approach the subject of teaching in the whole class. Traditionally, whole-class pedagogy has been strongly associated with direct instruction of the same curriculum content for all pupils and characterized by structured, teacher-led approaches (Cox, 2012; Alexander, 2017). More recently, however, recognition of the potential for highly interactive and pupil-centred pedagogies to be successfully embedded within whole-class practice has emerged (Willemsen et al., 2020; Hardman, 2020). What is more, it generally appears that most typical and special education teachers and kindergarten teachers in the prefecture of Heraklion are not familiar with Dyslexia Box. However, it is observed that there are more teachers who declare that they are familiar with it than kindergarten teachers. This is not surprising, as according to the research of Gaitanidi et al. (2023), this tool is mainly aimed at primary school students. The chi-square tests of independence were performed to "Type of school you are working the current school year" crossing with other variables, did not give statistically significant results or results concerning the objective of the present study.

While there is no significant difference in teachers' opinions regarding the use of multisensory teaching methods in subjects related to language and their specialization in special education, it is worth noting that a greater number of individuals with special education expertise incorporate multisensory teaching into their daily practices compared to those who lack such specialization.

The opinions of typical and special education teachers and kindergarten teachers in Heraklion prefecture seem to vary quite a bit depending on the subject and the frequency of using multisensory teaching methods. Specifically, according to the responses of the participants, multisensory teaching is used more often in subjects related to language than in subjects related to science. Although there is no significant differentiation of teachers' opinions regarding the use of multisensory teaching methods in subjects related to language and their specialization in special education, however, it is noteworthy that the number of individuals specializing in special education who

incorporate multisensory teaching daily is more than double that of those who integrate it into their daily teaching but lack special education expertise. In addition, it is observed that those with specialization in special education tend to use multisensory teaching methods more often than those who do not have specialization in general and regardless of the teaching subject. Another differentiation in the opinions of the teachers on the subject in question was identified based on their specialty. More specifically, it appears that, generally teachers and kindergarten teachers in the prefecture of Heraklion, both in typical and special education are divided regarding the use of multisensory activities and teaching methods in subjects related to science are divided. Notably, there is a significant majority of teachers who never or rarely use multisensory teaching in science subjects, especially when compared to kindergarten teachers who stated that they never or rarely use it.

Most teachers and kindergarten teachers of special and formal education in the prefecture of Heraklion use multisensory teaching methods/programs frequently or daily. However, it appears that those with a special education background who use them are twice as likely as those without. Also, there is a difference in terms of the level of study, even though it seems that this type of teaching is used by both bachelor and master holders. The existing noticeable difference indicating that individuals with a master's degree tend to use multisensory teaching more frequently, whereas those without a master's degree tend to use it less often.

There's a dearth of specific studies examining teachers' opinions about the frequency of applying multisensory teaching practices. While there is ample research on the effectiveness of multisensory education in different types of courses, few studies have explored teachers' perspectives in this regard. The frequency of using multisensory teaching methods remains a gap in the existing literature. However, research on the frequency of use of more general teaching tools can indirectly shed light on the findings of the present research.

For instance, Heafner et al. (2014) reported that despite curriculum references to dynamic teaching, it was not associated with more frequent use in teaching. In their study, half of the participants mentioned that they did not consider the frequency of using a teaching method as a significant factor.

In another study by Anderson and Putman (2023), which involved three elementary education special educators, one of them with a bachelor's degree reported feeling unsure about using certain new programs, including multisensory tools, even though she used technology daily. The second special educator, with a master's degree, seamlessly integrated technology into daily instruction. The third special educator, also with a master's degree, felt comfortable using technological tools and incorporated them into daily teaching. While Anderson and Putman's research does not provide data on the frequency of using multisensory teaching methods in kindergarten, it does highlight a correlation between tool use and professional development, with additional formal qualifications such as a master's degree potentially influencing the frequency of use.

Regarding the 2nd scientific objective aimed at identifying the barriers to the use of multisensory practices and the factors that influence the choice of a multisensory method/program the choice of a specific or not a multisensory method/program, the findings of the present research lead to the conclusions below.

Based on the responses provided by teachers regarding factors such as teaching objectives, available teaching time, inclusion of all students, logistical infrastructure, teachers' knowledge of multisensory techniques, number of students per hour and lesson, it is evident that a significant proportion of teachers consider all these factors influential for choosing to teach multisensorily. While the participants were not explicitly asked to rank these factors in comparison to each other to determine the most critical factor, it is clear from their responses that all respondents consider these factors to be at least very important, with a strong consensus among teachers and kindergarten teachers. Upon closer examination, it is apparent that those who do not view the subject as an important factor in the selection of multisensory teaching methods tend to refrain from using such methods in language-related subjects. On the other hand, individuals who regard the subject as a highly important factor in choosing multisensory teaching often incorporate multisensory techniques into their instruction, especially when teaching science-related subjects.

The teaching objective stands out as a significant factor in the selection of multisensory teaching, influencing teachers considerably. Specifically, those who consider the teaching objective to be a very important or even essential factor in their decision to opt

for multisensory teaching tend to frequently use multisensory methods in language courses, often on a daily basis.

The majority of teachers and kindergarten educators in the Heraklion prefecture, spanning both typical and special education, perceive limited teaching time as a significant impediment to the adoption of multisensory teaching methods. There is a clear positive correlation between those who agree or strongly agree that multisensory teaching requires more time than they can allocate and those who express agreement or strong agreement that restricted teaching time acts as a barrier to the incorporation of multisensory teaching methods. Additionally, individuals who regard the time they can allocate as a very important or even absolutely essential factor in their choice of sensory teaching methods are more likely to agree or strongly agree that limited teaching time poses a hindrance to the utilization of multisensory teaching. Those who regard the time they have at their disposal as a very important or even essential factor in their selection of multisensory teaching methods tend to agree or strongly agree that limited teaching time acts as a barrier to the utilization of multisensory teaching. It is noteworthy that most teachers and kindergarten teachers in the Heraklion prefecture, whether in typical or special education, consider the time available to them as very important or even essential when deciding to employ multisensory teaching. Moreover, a greater number of teachers, as opposed to kindergarten teachers, strongly agree with this statement, indicating the significance of time management in their instructional choices. These findings underscore the significant role that time constraints play as a perceived obstacle to the effective implementation of multisensory teaching methods.

Another noteworthy finding is that the majority of teachers and kindergarten teachers in the Heraklion prefecture, including those in typical and special education, perceive the syllabus as a significant impediment to the implementation of multisensory teaching. Additionally, a positive correlation exists between those who find the syllabus to be very or extremely stressful and those who express a lack of time to implement multisensory activities, as well as those who agree or strongly agree that the syllabus acts as a barrier to multisensory teaching. It is worth noting that a higher proportion of teachers, both in typical and special education in the Heraklion prefecture, tend to agree or strongly agree that the syllabus hinders the use of multisensory teaching compared to kindergarten educators. Furthermore, teachers, in comparison to kindergarten educators, tend to demonstrate a higher degree of agreement or strong agreement with

this statement. This research also reveals that, in general, teachers and kindergarten teachers in the Heraklion prefecture, encompassing both typical and special education, consider the syllabus to be an impediment to teaching, with teachers expressing this sentiment particularly strongly. Furthermore, the findings suggest that most teachers who disagree that the syllabus is a barrier to implementing multisensory instruction also disagree that limited teaching time is a barrier. Conversely, those who agree that the syllabus is an obstacle also tend to agree that limited teaching time is an obstacle. The adherence to the syllabus can be linked to teacher evaluation and effectiveness, corroborating previous research findings in this regard.

In addition, it is evident that a significant portion of both typical and special education teachers, as well as kindergarten educators in the Heraklion prefecture, express agreement with the notion that the 'number of students' constitutes a barrier to the adoption of multisensory teaching. Notably, a considerable number of individuals who hold a contrary opinion regarding the effectiveness of multisensory teaching in whole-class settings also strongly agree that the 'number of students' poses an impediment to its implementation. In a similar vein, it is observed that most of those who disagree regarding the effectiveness of multisensory teaching in the whole class also strongly agree that the number of students acts as an obstacle to its implementation. This correlation is reinforced by those who strongly disagree with the idea that multisensory teaching is easily implemented in the whole class and also strongly agree that the number of students is an obstacle to the implementation of multisensory teaching methods. The factor of student numbers also exerts an influence on teachers, as indicated by the findings of the present research. It appears that a high number of students per hour is associated with a tendency to reduce the use of multisensory teaching practices.

Another significant barrier to multisensory teaching appears to be the logistical infrastructure. Most teachers and kindergarten educators in the Heraklion prefecture, spanning both typical and special education, tend to view technological equipment as an important factor in their choice of multisensory teaching methods. Notably, kindergarten educators tend to express stronger agreement with this statement compared to teachers. Additionally, there is a correlation indicating that the more importance educators attribute to technological equipment, the more they perceive the absence of suitable equipment as an obstacle to utilizing logistical infrastructure. It is

observed that individuals without expertise in special education tend to be slightly more inclined to consider the lack of logistical infrastructure as a barrier to using multisensory teaching.

Another intriguing but paradoxical finding is that the majority of those who disagreed that the lack of their interest serves as a barrier to multisensory teaching simultaneously agreed that their background knowledge could be a barrier. Teachers' background knowledge, while considered at least important by the majority of them when choosing multisensory teaching, appears to be the least popular among the factors provided. It is worth noting that those who regard their background knowledge as a very important or absolutely essential factor tend to agree or strongly agree that multisensory teaching enhances the understanding of the teaching objective for all students.

Class size also emerges as a barrier to employing multisensory teaching. Specifically, it is apparent that most teachers and kindergarten teachers in the Heraklion prefecture, encompassing both general and special education, share the consensus that class size can indeed present an impediment when it comes to implementing multisensory teaching techniques. To be more precise, most of them concur that the number of students in a class acts as an obstacle to the utilization of multisensory instructional approaches.

An obstacle identified through this research pertains to the lack of educators' motivation to use multisensory teaching. There appears to be a correlation between the years of experience of teachers and their agreement with this statement. Educators with fewer years of experience tend to disagree with the notion that a lack of interest serves as a barrier to using multisensory teaching, while those with 21 or more years of service are more likely to agree with it. Another interesting finding is that there seems to be an inversely proportional relationship between educators' desire for training in a multisensory method/program and their agreement with the statement about a lack of interest as a barrier. The more they desire relevant training, the more they disagree with considering their lack of interest as a barrier to using multisensory teaching.

Another crucial factor for implementing multisensory teaching, as highlighted by the findings of the current research, is the inclusion of students. It's worth noting that there are ten times more teachers who consider this factor to be of little importance compared to kindergarten teachers. This discrepancy does not necessarily imply indifference on

the part of teachers, as the majority of them still acknowledge the importance of including students with dyslexia. The likely explanation for this difference lies in the material and time constraints faced by teachers. They are constantly tasked with making decisions that impact the welfare of all students and may not have the luxury of dedicating significant time to addressing the inclusion of dyslexic students. When teachers have more time and flexibility, they can adopt innovative, constructive, and research-backed practices (Thornton, 2005; Gradwell, 2006; van Hover, 2006; Yeager & van Hover, 2006). These practices can better accommodate the diverse needs of students, including those with dyslexia, in an inclusive classroom setting.

While no specific studies focusing on the factors influencing multisensory teaching were identified, there is an extensive body of research that explores the factors influencing teaching practices, including the use of new technologies in education. Particularly, the research conducted up until 2020 demonstrates a significant interest in this area. It is also worth noting that no studies focusing on barriers specifically to the implementation of multisensory teaching in primary education have been identified. However, related research with a similar theme was found. Hew and Brush's literature review identified six categories of barriers that affect teacher adoption of technology: human, time, and technological resources. technology knowledge and skills, pedagogy and classroom management; school leadership, structures or design; technology beliefs or attitudes; high-stakes testing environments. and established institutional practices or the “grammar of schooling” (Selwyn, 2011).

Expanding upon the research conducted by Yang et al. (2022) on teachers' beliefs about the integration of children's literature in mathematics teaching and learning, the study identified several obstacles, including time constraints, a lack of pedagogical knowledge and self-confidence, limited resources, doubts about the expected outcome, and inhibiting social norms. These findings align with the conclusions of the present research, highlighting shared challenges in the teaching and learning environment.

Moreover, in Liu and Pange's (2015) study concerning the obstacles to integrating ICT in teaching practices, particularly from the perspective of Chinese preschool teachers in mainland China, it was found that the primary obstacle was the lack of logistical infrastructure, with a lesser obstacle being the lack of interest among teachers. The

research also suggests that the use of ICT in everyday life plays a pivotal role in shaping teachers' perceptions of barriers at both a general and specific level.

The issue of insufficient logistical infrastructure as an obstacle to implementing tools and programs is further supported by research conducted by Hébert, Jenson, and Terzopoulos (2021). They emphasize that this limitation not only hinders cognitive development and instructional variety but also undermines the broader development of 21st-century skills. Additionally, as mentioned by Thompson (2019), when a country's educational policy results in larger class sizes, it can negatively impact the future adoption of new technologies and programs in teaching practices. These insights collectively underscore the significance of addressing infrastructure challenges and align with the findings of the present research regarding barriers to multisensory teaching.

Black (1999) argues that multisensory experiences are uncomplicated and straightforward to implement, naturally supporting children's willingness and thereby influencing their holistic development. This perspective finds indirect confirmation in our research, where the vast majority of teachers and kindergarten educators in the Heraklion prefecture, spanning both general and special education, do not perceive a lack of students' desire as an obstacle to multisensory teaching.

Various committees established by the Ministry of Human Resource Development of India, have recommended the concept of 'Learning Without Burden,' emphasizing the urgent need to reduce and revise the overcrowded content burden within the curriculum. The aim is to transition towards a more engaging, holistic, experiential, and analytical-based form of learning (Kasturirangkan, 2019). However, Waite, Carrington, and Passy (2005) suggest that resistance among teachers to adopt creative teaching approaches often stems from a direct link between school performance and assessments. This connection can lead teachers to prefer didactic methods over multisensory ones.

Conversely, research by Heafner et al. (2014) indicates that in the absence of specific deadlines and syllabus pressure, teachers exhibit greater control over student learning contexts than the prescribed curriculum. This increased flexibility allows teachers to adopt innovative, constructive, and research-supported teaching practices (Gradwell, 2006; van Hover, 2006; Yeager & van Hover, 2006).

The findings regarding logistical infrastructure are in agreement with the international literature. Logistical infrastructure appears to be a significant factor in teachers' choices regarding multisensory teaching. There is a correlation suggesting that the more they value technological equipment, the more they perceive the absence of appropriate equipment as a barrier to utilizing logistical infrastructure. It's worth noting that while there has been a steady increase in the availability of technology in schools over the past two decades, the adoption of higher-level uses has not kept pace. Many teachers continue to face challenges when it comes to effectively integrating technology into their classrooms (Bice & Tang, 2022).

Regarding the influence of logistical infrastructure and teachers' background knowledge on the selection and use of educational support systems, Akinde and Adetimirin (2019) found that when teachers lack the necessary expertise and infrastructure, their use of technology decreases. Conversely, when both knowledge and infrastructure are available, technology usage increases. Khlaif's research (2018), also supports this idea by suggesting that technical support, instructional assistance, and infrastructure affect teachers' attitudes toward the use of mobile technology. Research by Wu et al. (2008) indicates that school size is connected to teachers' decisions to incorporate new technologies into their teaching, with smaller schools facilitating the use of new technologies. This relationship is often linked to factors such as class size and the number of students taught by teachers per hour. Additionally, Spiteri and Rundgren's study (2020) on the factors influencing the use of digital technology underscores the importance of teachers' background knowledge as a key factor in technology adoption. Furthermore, Wu et al. (2008) emphasized that for teachers in larger schools to integrate new technologies into their teaching, the curriculum should provide them with flexibility. Collectively, these research findings indirectly align with the conclusions reached in the present investigation, emphasizing the significant role of teachers' knowledge and the availability of necessary infrastructure in shaping teaching practices, including the use of multisensory methods.

The findings of the research conducted by Bice and Tang in 2022, which involved teachers in a school setting, revealed that teachers' beliefs about the role of technology varied based on their level of technological knowledge. Those classified as “Experiencers” regarded technology as an essential tool for their teaching, emphasizing its ability to engage students and enhance their learning. In contrast, “Beginners” and

some with moderate technological knowledge viewed technology more as a supportive tool for their instructional activities. This discrepancy in how teachers perceive the role of technology aligns with existing literature on the subject.

Ertmer and Ottenbreit-Leftwich (2010) emphasized the need to shift our perspective from regarding technology as a supplementary teaching tool to recognizing it as a necessity for achieving successful outcomes, particularly in terms of student learning. This perspective aligns with the findings of the present research, which revealed a distinct trend: individuals with a master's degree tend to employ multisensory teaching methods more frequently, while those without a master's degree tend to use them less often. Given that multisensory teaching methods often incorporate programs that utilize technology, it can be inferred that individuals with higher qualifications are more inclined to utilize multisensory teaching methods. Additionally, the research findings indicated that those who express a desire for retraining tend to use multisensory teaching methods more frequently, suggesting a connection between professional development and the adoption of innovative teaching practices. An array of researchers, teachers' unions, policymakers, and politicians have debated the benefits and costs of reducing class size. Experimental results indicate that smaller classes promote higher achievement at the beginning of elementary school, which seems reasonable, since the teacher has fewer students in his pedagogical responsibility and can differentiate instruction, implement innovative programs, etc. Whole-class teaching approaches can have a valuable impact on consolidating children's understanding in many cases (Muijs & Reynolds, 2018).

There are several studies that support the benefits of small classes in relation to learning benefits (Matta et al., 2015), however, there are also those that do not record any difference in terms of student achievement and, consequently, the effectiveness of a teaching method. For example, the research of Milesi and Gamoran (2006), reports that no effects of the number of students on their performance in language and mathematics were detected. In Konstantopoulos (2011) research, it is reported that although students benefit significantly from being in small classes in many schools, in other schools being in small classes is either not beneficial or a disadvantage.

The research by Wright et al. (2019), showed that when there are fewer students per section, then active learning strategies - such as multisensory practices - and feedback

increase, while also inclusive practices may arise without being an end in themselves. In the same survey, it is reported that teachers had a positive attitude towards the reduction of students per section.

Contrary to the findings of the present research, where the teachers of the prefecture of Heraklion clearly state that they find it difficult to implement multisensory practices in the whole class, the research of Tyk (2014) argues that it is easier for the teacher to teach the whole class and to manage time more effectively. On the other hand, balancing differentiated support, appropriate exposure, and pacing of whole-class teaching and learning, while encouraging the active participation of all students, can be difficult to achieve (Burns & Myhill, 2004; O'Connor et al., 2017). In the same direction, as mentioned in research by Slater and Chambers (2022) regarding the views of teachers, the main and statistically significant challenges perceived by the participants were largely related to the issue of adaptive teaching, in particular to ensuring the provision of differentiated support that effectively engages, challenges, and responds to the holistic needs of all learners (Burns and Myhill, 2004; O'Connor et al., 2017). According to the above, the results of most research, although they concern the wider field of education, converge with the results of the present research. It is worth noting that no existing literature was identified regarding whether there is a difference between teachers' and kindergarten teachers' views regarding whole-class teaching using multisensory practices. Indeed, assistive technology plays a crucial role in narrowing the gap between students with learning difficulties and their typically developing peers in mainstream education. However, the effective implementation of assistive technology requires teachers to be well-trained and competent in its use, as highlighted in the study by Atanga et al. (2019). This need for training is further emphasized by the fact that a significant proportion of the survey participants (83%) reported that their basic degree programs did not adequately equip them with the necessary resources and knowledge related to this type of teaching.

It's worth noting that multisensory teaching methods can be considered a form of assistive technology, as they provide valuable tools and techniques to enhance both digital and non-digital teaching. Multisensory approaches can cater to diverse learning needs, making them a valuable component of the educator's toolkit when supporting students with various learning difficulties and disabilities in inclusive classrooms.

Regarding the 3rd scientific objective aimed at identifying the effectiveness of using multisensory teaching methods/programs for students with dyslexia and non-dyslexic students, depending on the type of school (kindergarten, primary school), the specialization in special education, the number of students and students with dyslexia, the research findings led to the following conclusions.

The research reveals variations in the opinions of teachers and kindergarten teachers in the Heraklion prefecture regarding the effectiveness of multisensory teaching for students with dyslexia based on the number of students they teach per hour. Specifically, teachers who instruct one student per hour are more likely to believe that students with dyslexia can sufficiently improve their reading skills through multisensory activities compared to those who teach larger groups with eight students or more per hour. This implies that class size and student-teacher ratios can impact teachers' perceptions of the effectiveness of multisensory teaching, with smaller class sizes being associated with more positive views on the approach for students with dyslexia.

The majority of teachers and kindergarten educators, both in typical and special education, in Heraklion, agree or strongly agree that multisensory teaching is beneficial for students with dyslexia when it comes to achieving their learning objectives in language-related subjects. It's noteworthy that those with a master's degree tend to express higher levels of agreement compared to those with only a bachelor's degree. Furthermore, it is generally observed that teachers and kindergarten teachers in Heraklion who agree that multisensory teaching is effective for students with dyslexia in language-related subjects also tend to agree that it is effective in science-related subjects. Many individuals who strongly agree with the first statement also express complete agreement with the second statement. Additionally, those who express agreement or strong agreement that multisensory teaching benefits students with dyslexia in language-related subjects also tend to agree that it provides these students with equal educational opportunities alongside their typical classmates. There is a noticeable positive correlation between these two opinions. Another statistically significant finding that was identified concerns the positive correlation between their belief in the effectiveness of multisensory teaching in helping students with dyslexia

achieve learning goals in language-related subjects and their frequency of using multisensory activities or teaching methods in those subjects. It is noteworthy that there are generally more educators who agree or strongly agree with that multisensory teaching helps students with dyslexia achieve learning goals in subjects related to language and use multisensory teaching often or daily.

Regarding teachers' opinions on the effectiveness of multisensory teaching for students with dyslexia, the research conclusions indicate that a majority of teachers and kindergarten teachers in the Heraklion prefecture, both in typical and special education, agree or strongly agree that multisensory teaching is beneficial for all students, including those with dyslexia, in better understanding the teaching objectives. This belief appears consistent across teachers with different levels of education and specialization in special education. However, individuals with master's degrees and those specialized in special education tend to exhibit higher agreement levels with this statement.

An additional noteworthy finding is that those who agree or strongly agree that multisensory teaching benefits all students in understanding the teaching objectives also consider the inclusion of all students to be a very important or an absolutely essential factor when choosing to use multisensory teaching methods. This indicates that teachers who value inclusive education tend to perceive multisensory teaching as a valuable approach to support this goal.

The research findings also indicate that there are differences in the opinions of teachers based on the educational structure in which they work. Teachers in typical education settings tend to be less convinced that students with dyslexia can adequately develop their reading skills through multisensory activities when compared to those working in special education settings. This suggests that the context in which teachers work may influence their perceptions of the effectiveness of multisensory teaching for students with dyslexia. It appears that a significant majority of both teachers and kindergarten teachers in Heraklion prefecture, including those in typical and special education, tend to agree or strongly agree that the use of multisensory teaching is effective for kindergarten students (3-5 years old). However, it should be mentioned that there seems to be a tendency for teachers to agree more than kindergarten teachers about the benefits of multisensory teaching for students aged 3 to 5.

With reference to the 6-8 age group of students, it appears that the majority of teachers consider multisensory teaching to be particularly beneficial, although no statistically significant data are recorded. The chi-square tests of independence were performed to "The use of multisensory teaching works adequately for students in the first grades of primary school (6-8 years old)", crossing with other variables, and the Kruskal-Wallis non-parametric test did not give statistically significant results or results concerning the objective of the present study.

The existing literature converges with the above findings as according to research conducted by (Joshi et al., 2002), a multisensory teaching approach led the students of the 1st grade to have better results compared to the control group. Along the same lines, Hunter-Carsch (2001) found that many children benefited from experiencing a "variety" of teaching approaches in the classroom. Hunter-Carsch noted that the children in her study had a remarkably high level of literacy when there was a clear emphasis on multisensory, tactile experiences. Then, Flecker and Cogan (2000) believe that if something is visualized and manipulated, it will be remembered more effectively. Also, it appears that the majority of teachers and kindergarten teachers in Heraklion prefecture, agree that multisensory teaching works adequately for students 9 to 11 years old. However, the following peculiarities are observed: although there seems to be a tendency for slightly more teachers than kindergarten teachers to believe this, there is nonetheless a tendency for teachers who disagree with the above position to seem to be much more than kindergarten teachers. That is, the teachers are divided into two categories: those who agree and those who disagree with the above statement. While specific research exploring teachers' opinions regarding the effectiveness of multisensory teaching in relation to their specialty and the type of school is lacking, there is related research that sheds light on the broader topic of multisensory teaching and its benefits. For example, a study by Stephenson and Carter (2011), which examined teachers' opinions regarding the use of multisensory environments (MSE) in teaching students with severe disabilities, found that most teachers in the sample reported that even exposing students to such environments, without necessarily having specific teaching objectives, had a positive impact on their learning. This underscores the importance of engaging the senses in the teaching process. The findings of Cuturi et al. (2022) regarding the challenges of teaching geometrical concepts and mental transformations align with the results of the present research. Both studies highlight the

potential benefits of multisensory teaching methods, especially in subjects that involve abstract and challenging concepts. The fact that kindergarten teachers in the Heraklion prefecture opt for frequent use of multisensory teaching methods in science-related subjects implies their confidence in the effectiveness of such methods, particularly for younger students.

Regarding whether teachers' opinions differ concerning the effectiveness, frequency, and ease of implementing multisensory teaching based on the number of students taught per hour, the findings from this research indicate the following. Teachers and kindergarten teachers from both typical and special education settings generally agree that multisensory teaching is most effectively and easily implemented in one-on-one instructional settings, and there exists a positive correlation between these two factors. Additionally, it is evident that they believe multisensory teaching is effective and easy to implement in small group settings. Notably, a substantial portion of those who strongly agree that multisensory teaching is effective in small group settings also strongly agree that it is easy to implement in such settings.

The findings suggest that teachers' opinions about the effectiveness and ease of implementation of multisensory teaching in the whole class are closely linked. A majority of those who disagree with the effectiveness of multisensory teaching in the whole class also disagree with the ease of implementing it in that setting. Similarly, most individuals who disagree or strongly disagree with the effectiveness of multisensory teaching in the whole class tend to believe that the more students they teach per hour, the less they use multisensory teaching methods. Conversely, those who strongly disagree with the effectiveness of multisensory teaching in the whole class also tend to disagree with the idea that reducing the number of students in the class leads to an increased frequency of using multisensory teaching.

These findings highlight the impact of class size on teachers' perceptions of the effectiveness of multisensory teaching, suggesting that better outcomes are achieved in smaller class sizes or in one-on-one instructional settings. Collaborative work in pairs or small groups can serve as a valuable tool to help students with learning disabilities build knowledge and develop social skills. Students develop cooperative and social skills when they engage in activities like sharing, taking turns, negotiating roles, acting as leaders, and delegating tasks or responsibilities (Cowley, 2013). Through interaction,

students can express their thoughts, receive critique, gain different perspectives, and develop critical thinking skills. Discussing ideas with peers can enhance their understanding of concepts and clarify their thinking (Gregory & Kuzmich, 2010). Encouraging students to justify their problem-solving approaches can foster metacognitive and critical awareness of their reasoning (Mercer, 2013). Ultimately, learning is the result of co-constructing knowledge within a group (Mercer, 2013).

The finding that teachers and kindergarten teachers in Heraklion, Crete tend to find it difficult to implement multisensory teaching in the whole class, regardless of their specialty, aligns with existing literature. This literature suggests that multisensory approaches are often more effectively facilitated in small intervention groups (Davies, 2012; Moats & Farrell, 2005; Riddall-Leech, 2012). However, it's worth noting that an empirical study by Joshi, et al. (2002) suggests that a multisensory approach can be effective in whole-class instruction, provided that teachers receive proper training in its implementation.

Generally, teachers and kindergarten educators in Heraklion perceive the effectiveness of multisensory teaching for students with dyslexia, especially in language-related subjects. This perception extends to science-related subjects, with slightly lower agreement levels. Moreover, they believe that multisensory teaching promotes equal educational opportunities for students with dyslexia compared to their typical peers.

The existing research reveals a noticeable gap when it comes to understanding teachers' opinions regarding the effectiveness of multisensory teaching in subjects related to science. Most studies in this area have predominantly focused on the effectiveness of multisensory teaching methods and programs, particularly concerning reading, writing, and phonological awareness. Even studies that touch upon the effectiveness of multisensory teaching in science-related subjects often lack the perspective of teachers.

Research by O'Brien et al. (2021), examined the effect of a single session of physical activity on multisensory perception, i.e. the ability to appropriately merge inputs from different sensory modalities, and on working memory (verbal, visual-spatial and motor working memory) in 51 children (aged 6-8) years). The results also revealed that a single open skill session produced verbal working memory (digit span) benefits. a closed skill training session benefited motor working memory (O'Brien et al., 2021). The results of the research above indirectly converge with the results of the present

research in that in general both teachers and kindergarten teachers of typical and special education of the prefecture of Heraklion, tend to agree that multisensory teaching helps students with dyslexia, but those who are specialized in special education are twice as many.

The aforementioned finding aligns with research conducted by Flanagan et al.(2013) and Stoner et al.(2008), who emphasized that teachers recognize the benefits of assistive technologies for students. In particular, when assistive technology training is designed to be user-friendly, with ample time for teachers to become proficient in their use, educators are more likely to incorporate these technologies into their teaching practices (Biancarosa & Griffiths, 2012).

Research on multisensory teaching methods, including studies by Ayala and O'Connor (2013), Decker and Buggery (2014), and Evmenova et al. (2010), has consistently demonstrated the effectiveness of these methods in aiding children's development of grapheme-phonemic knowledge. This, in turn, leads to improvements in various areas, such as spelling skills, reading fluency, decoding skills, sight word recognition, and vocabulary performance. Additionally, studies by Dexter and Hughes (2011), Dexter, Park, and Hughes (2011), and Orr and Hammig (2009) have supported the positive impact of multisensory teaching methods on these critical aspects of literacy.

However, Taljaard's research in 2016, which examined the use of multisensory technologies in science-related subjects, showed promising results. The study found that these technologies enhance engagement and improve learning outcomes by catering to students' preferred learning styles. Additionally, they make learning more enjoyable and enable students to connect with real-life situations. The study also suggested that future multisensory learning tools have the potential to further enhance student engagement and learning outcomes.

Furthermore, research by Volpe and Gori in 2019 emphasized the importance of multisensory teaching in science courses, as it is considered suitable for conveying complex scientific concepts. Additionally, it advocated for the development of a multisensory integrated and active learning paradigm, along with a teaching ecosystem that promotes inclusion, ensuring that both typically developed and disabled students have equal access to opportunities and breaking down barriers between them.

These findings collectively highlight the potential benefits of multisensory teaching in science-related subjects, although more research is needed, especially from the perspective of teachers, to gain a comprehensive understanding of its effectiveness and implications in this specific domain.

The research conducted by Fazmina, Jazeet, and Saravanakumar in 2020, which focused on Sri Lankan students, highlighted the effectiveness of multisensory teaching strategies in teaching students with dyslexia, particularly in science classes. The findings suggest that these multisensory teaching methods significantly enhance student achievement, especially for students with dyslexia, in sub-sections related to Energy and Matter within the 6th-grade science curriculum. These strategies were found to be particularly useful in conveying abstract and complex scientific concepts, such as those related to energy and matter. Multisensory teaching methods were observed to help students with dyslexia reduce common mistakes and comprehension issues when reading instructional materials (Fazmina et al., 2020).

Regarding the 4$^{th}$ scientific objective aimed at identifying teachers' interest in receiving training and their beliefs about the need for specific training to implement multisensory teaching methods/programs, the research findings led to the following conclusions.

Regarding whether teachers' viewpoints differ on their desire to be trained in multisensory teaching methods, according to the findings of the present research, the following have been identified. It generally appears that most teachers and kindergarten teachers in Heraklion prefecture, both in typical and special education, express a strong desire to learn some multisensory teaching method, with many of them indicating they wish to do so very much or extremely. Additionally, it appears that most of these educators have up to 15 years of experience. This trend could be explained by the belief that teachers with fewer years of experience are more inclined to seek opportunities for improvement and professional development through training, including in multisensory teaching methods. What is more, specialized or not in special education, educators in Heraklion, try to reeducate themselves in order to follow new educational trends. However, there is a tendency for those trained in special education to pursue their training more. Still, it is observed that a large part of the teachers gives average answers. it appears that the majority of teachers and kindergarten teachers in Heraklion prefecture, specialized or not in special education, try to reeducate themselves.

However, there is a tendency for those trained in special education to pursue their training further.

Moreover, it is observed that a large portion of the participants gave medium values. This may be because teachers choose the middle of a scale, indicating they do not have a strong opinion (O'Muircheartaigh et al., 1999) or did not expend the cognitive effort required to decide on a clear answer and therefore chose towards the center of the scale. (Saris & Gallhofer, 2007). Regardless of explanation, teachers' mean scores towards the midpoint of the scale shed light on practitioners' and policymakers' decisions about inclusive education. Regarding the differentiation in relation to age, the present findings are confirmed by the research findings of Serafini (2018), where, among other things, they showed that in Italy, teachers who were over 50 years old, showed less desire to train and had a lower educational level. The research, also, indicates that teachers with specialization in special education tend to use multisensory teaching methods more frequently, regardless of the subject they are teaching, in comparison to those without special education expertise. This suggests that specialized training in special education may contribute to the more frequent use of multisensory teaching methods across various subjects.

There is a widely acknowledged consensus today that improving students' learning opportunities hinges on the education and professional development of teachers (Even & Ball, 2009; Krainer, 2011). Effective instruction for students with dyslexia necessitates well-rounded teacher preparation and specialized planning within the realm of special education (Tsakiridou & Polyzopoulou, 2014). In recent years, there has been significant international focus on the content and structure of teacher education, both for future educators and those already in practice. Educational reform advocates in the United States and across the globe have consistently emphasized the importance of high-quality professional development as a means for teachers to enhance their instructional techniques in order to optimize student learning (Haskings-Winner, 2014; Kennedy, 2016; Opfer & Pedder, 2011a). The notion that professional development can foster improvements in teaching is widely accepted (Kennedy, 2016). However, the actual implementation of professional development can vary significantly, both within and across nations, as does the research pertaining to professional development (Bautista et al., 2015; Desimone & Garet, 2015; Lam, 2015; Ling & Mackenzie, 2015; Martín, 2015; Niemi, 2015).

In light of various studies reflecting the evolving demographics, the aging population is not only living longer but also becoming smaller in numbers, emphasizing the importance of lifelong learning (Figel, 2016). To remain an indispensable part of the workforce, individuals must continually deepen and expand their knowledge and skills (Frk, 2014). This concept extends to teachers, who must also invest in their own development to be effective contributors to the well-being and progress of the school. Therefore, specialization is deemed highly significant, as it can likely enhance their efficiency. The findings of the present study demonstrate that specialization in special education has an impact on shaping the views of teachers and kindergarten teachers in Heraklion. Specifically, it was noted that those with specialization in special education, who also agree or strongly agree that they possess the necessary knowledge to teach multisensory techniques, are twice as numerous as those without such specialization. This underscores the value of specialized training and knowledge in promoting effective teaching.

The alignment between the research findings and the broader literature is evident. Specialization in special education and the acquisition of a master's degree have been found to contribute significantly to teacher professional development. Existing evidence supports the effectiveness of targeted, subject-specific professional development characterized by sustainability, content focus, active engagement, collaboration, continuity, alignment with school and curriculum standards, and a central emphasis on enhancing students' thinking and learning experiences. This comprehensive approach to professional development also underscores the value of instructional guidance and specific feedback (Sun et al., 2013).

Furthermore, established components of high-quality professional development programs include a strong emphasis on adult learning theories and the utilization of appropriate learning strategies (Darling-Hammond et al., 2009). These findings underscore the importance of structured and continuous professional development for educators, particularly in the context of specialized education.

Armstrong (2008) emphasized that understanding and accommodating various learning styles are crucial for effective teaching. To be the most effective instructor for all students, teachers must be equipped with a diverse range of techniques and approaches. Multisensory teaching, considered a part of assistive technology, plays a significant role

in bridging the gap between students with learning difficulties and their peers in mainstream education. However, this underscores the necessity for teachers to receive comprehensive training and develop competence in the use of such technologies (Atanga et al., 2019). Notably, in the same survey, it was revealed that 83% of the participants felt that their initial degree did not adequately prepare them with the requisite resources for this type of teaching.

Regarding whether the cost impacts teachers' willingness to undergo training in multisensory teaching methods/programs, according to the findings of this research, the following are mentioned. It generally appears that most teachers and kindergarten teachers in Heraklion prefecture, both in typical and special education, are interested in training on some multisensory method or program. However, it is observed that their opinions differ regarding the higher level of studies and specifically, there are more people who have a master's degree and wish to further their education compared to those who hold a bachelor's degree. It is still observed that most of those who completely disagree that learning a multisensory teaching method is provided free of charge by the state completely agree that, if they choose to educate themselves, they will educate themselves financially.

The research conducted by Stephenson and Carter (2011) aligns with the findings of the present research, highlighting that school units often do not offer substantial support in terms of professional learning opportunities related to multisensory teaching methods. Even when multisensory tools are available within a school unit, teachers may still lack the necessary training to effectively utilize them. This observation underscores the lack of free training from the state regarding multisensory teaching methods and suggests that teachers who wish to receive additional training to make use of available multisensory tools may have to incur the financial burden themselves. The previous studies you mentioned underscore the challenges that preschool and primary school teachers often face when it comes to feeling adequately prepared to teach students with disabilities, particularly in inclusive classroom settings. These teachers have reported a lack of specific knowledge and skills required for effectively instructing students with disabilities in inclusive classrooms. This deficiency aligns with the findings of your study, which indirectly highlights a similar concern.

Additional funding and training programs for teachers can play a crucial role in equipping them with the support they need to implement multisensory teaching approaches effectively, as suggested by Alwaqassi (2017). Positive professional philosophies and attitudes are essential for teachers when working with students with disabilities. This aligns with the idea that teachers should have constructive responses to the diverse learning needs of their students, as emphasized by Shute & Rahimi (2017).

The findings from the current research indicate that kindergarten teachers tend to be more familiar with multisensory practices compared to teachers in higher grades. This difference might be attributed to the fact that kindergarten teachers often have more experience in using assistive technology (AT) and have accepted or learned about specific philosophies that guide the selection and integration of AT in their learning environments (Koch, 2017).

Training programs for special education teachers are instrumental in preparing them to create valuable learning experiences for students with disabilities. These programs familiarize special education teachers with the built-in features of AT, enabling them to provide appropriate instruction and support to all children in their classrooms (Erdem, 2017). The active participation of trained special education teachers in the learning process is particularly important, given the sensitivity and specialized nature of their roles (Holstein et al., 2017).

Research conducted by Boardman (2020) suggests that teachers who recognize the benefits of multisensory teaching for all students are more likely to pursue further education and professional development. This finding is indirectly supported by existing research, as it becomes evident that teachers who express a desire for training in a multisensory method are already using multisensory techniques in both language and science-related subjects.

Regarding the 5$^{th}$ scientific objective aimed at identifying teacher's opinions about the inclusion of students with dyslexia through multisensory teaching methods/programs the following conclusions were found.

The research findings suggest that teachers and kindergarten teachers in the Heraklion prefecture, whether in special or typical education, tend to be more willing to apply multisensory activities and teaching methods in subjects related to science when they

perceive that multisensory teaching aids students with dyslexia in achieving their learning objectives in these subjects. This observation highlights the potential of multisensory teaching methods in enhancing the learning experiences of students, particularly in science-related subjects.

In the Greek kindergarten context, many pre-mathematical and mathematical concepts are introduced, and some of these concepts may be particularly challenging for young learners. The alignment between these findings underscores the importance of incorporating multisensory approaches to enhance understanding and engagement among students when dealing with complex mathematical and geometrical concepts. This approach can facilitate a more comprehensive and effective learning experience, especially at the early stages of education.

It's worth noting that primary school children often face challenges when acquiring mathematical skills, possibly due to the prevalent teaching methods that primarily rely on formal lessons with limited incorporation of multisensory activities within the classroom (Cuturi et al., 2022). By recognizing the value of multisensory approaches, educators can offer more engaging and effective learning experiences, especially in subjects that traditionally require abstract and conceptual understanding, such as mathematics and science. More generally, it seems that most teachers and kindergarten teachers in the prefecture of Heraklion consider that the choice of multisensory teaching is very important or absolutely essential for the inclusion of all students. It is worth noting that the teachers who consider it to be of little importance are ten times more than the kindergarten teachers. Also, it generally appears that most teachers and kindergarten teachers in Heraklion prefecture, both in typical and special education, regardless of their educational level, place significant importance on the inclusion of all students when choosing to implement multisensory teaching.

The distinction of teachers' opinions in relation to the level of study is noticeable as, there is a tendency for those with a master's degree to consider the selection of a multisensory method/program as very important or absolutely essential for the inclusion of students with dyslexia, compared to those without. Also, although the majority of teachers believe that by using multisensory practices they offer equal learning opportunities to all students without exception, however, those who have a master's degree and absolutely believe in it are clearly far more than those who have a

bachelor's degree. Another finding concerns that it seems that both teachers and kindergarten teachers in typical and special education in the Heraklion prefecture tend to agree or strongly agree that the participation of students with dyslexia in the lesson increases when they involve multisensory activities. However, it clearly appears that many more people with a master's degree agree or strongly agree with the above than those with a bachelor's degree.

It is worth noting that those who consider the inclusion of students as a very important or absolutely essential factor in their choice of multisensory teaching, agree or completely agree with that multisensory teaching helps all students to better understand the teaching objective. Also, it generally appears that the more typical and special education teachers and kindergarten teachers in the prefecture of Heraklion who strongly agree that through multisensory activities, they give students with dyslexia equal educational opportunities with their typical classmates, the more they also strongly agree that the participation of students with dyslexia in the lesson increases when they involve multisensory activities. This correlation suggests that these educators recognize the benefits of multisensory activities in promoting equal educational opportunities for students with dyslexia and increasing their participation in lessons. It appears that the teachers and kindergarten teachers of typical and special education of the prefecture of Heraklion, whether they are specialized in special education or not tend to agree that multisensory teaching helps students with dyslexia. However, almost twice as many special education majors strongly agree with this statement. Specialized in special education or not, teachers and kindergarten teachers of the prefecture of Heraklion, tend to agree tend to agree that multisensory teaching helps all students to better understand the teaching objective. However, approximately twice as many individuals specialized in special education tend to strongly agree with this statement.

In the present study it was found that those teachers and kindergarten teachers of Heraklion prefecture, who have expertise in special education tend to agree that multisensory teaching helps students with dyslexia to achieve learning goals in subjects related to science and language, compared to those who do not. Also, it was found that there are more of those who have the necessary knowledge to teach multisensory and are specialized in special education than those who are not. Unfortunately, in contrast to research on typical educators, studies about the viewpoints of special educators are

rare (Huang et al., 2022). However, it could be said that the above findings indirectly converge with the existing literature as it is reported that compared to typical educators, special education teachers may have more extensive knowledge of students with learning differences, use different professional knowledge structures, and use more multimodal assessment practices when interpreting classroom events, solving educational problems, monitoring progress, and responding to students (Blanton et al., 1994; Byrd & Alexander, 2020; Stough & Palmer, 2003).

Furthermore, research by Puspitaloka and Syarif (2020) has specifically highlighted the suitability of multisensory education for teaching dyslexic students. Their findings indicate significant benefits in improving the reading abilities of dyslexic students through the implementation of multisensory teaching practices. These insights collectively underline the effectiveness of multisensory methods, especially in assisting students with dyslexia in their reading development.

Multisensory approaches are commonly used in interventions for students with dyslexia, as they can address the various cognitive challenges associated with this condition. However, the effectiveness of multisensory interventions can vary depending on the specific study. For example, Schlesinger and Gray (2017) found that multisensory interventions did not necessarily provide an advantage over structured interventions for students with typical development or dyslexia. Nevertheless, both types of interventions yielded positive overall treatment effects for the participants.

On the other hand, Boardman's (2020) research, which focused on teachers' opinions, indicated that teaching with a multisensory approach is highly valuable for individual learners and whole-class instruction. Moreover, positive language development, particularly in expressive vocabulary skills, has been associated with multisensory storytelling programs, as supported by previous literature and research, such as Caldwell (2007) and Hettiarachchi et al. (2022).

Hettiarachchi et al. (2022) demonstrated that a multisensory approach, which includes visual, auditory, tactile, and kinesthetic stimuli, has the potential to facilitate vocabulary learning in children with disabilities. These studies collectively emphasize the significance of multisensory approaches in enhancing the learning experiences and outcomes of students with diverse needs.

Students can also enhance their learning through social interactions with others, as the brain is inherently social (Caine et al., 2009; Gregory & Kuzmich, 2010; Mercer, 2013). When students engage in well-planned and positive interactions with their peers during group activities, it can lead to an increase in the release of feel-good neurotransmitters in the brain (Gregory & Kuzmich, 2010). These neurotransmitters play a crucial role in consolidating information in long-term memory and motivate students to continue participating in activities that generate positive emotions, such as teamwork (Gregory & Kuzmich, 2010).

Connecting students' prior experiences and existing knowledge with new information is a valuable approach for improving the focus and learning outcomes of students with learning disabilities. Researchers like Tate (2011) and Caine et al. (2009) argue that learning is most effective when it is meaningful and relevant to the learner. When students can see the practical relevance of new knowledge to their lives, this new information becomes embedded in their relational memory (Willis, 2006, 2007). This, in turn, facilitates long-term memory retention and improves the ability to recall the information when needed (Willis, 2007). Moreover, when prior knowledge is effectively linked to new information, it can reach the frontal lobe region of the brain, which is responsible for the highest level of cognitive processing, turning the learned information into wisdom (Willis, 2007). Gregory & Kuzmich (2010) further discuss the emotional nature of the brain and emphasize that learning tools that connect with students' prior knowledge can help them form emotional connections to the material, thus enhancing the learning experience.

The trend toward co-education, which involves the inclusion of students with special needs in regular classrooms, is a global phenomenon that has gained momentum in recent years. While it is a promising approach, its effective implementation presents challenges for educators. To successfully implement inclusive education, it is essential for teachers to believe that all students, including those with special needs, belong in a regular classroom (Specht et al., 2016).

However, recent research, as highlighted by Dignath et al. (2022), has identified a gap in the existing literature regarding teachers' belief systems about the inclusion of students with special needs. This gap has led to contradictory findings and limited understanding of why teachers differ in their belief systems about inclusive education

and how their training experiences contribute to the development of these professional beliefs. According to their research, the mean values of teachers' beliefs about inclusive education tend to fall around the middle, indicating that, on average, teachers hold moderate beliefs in this regard (Dignath et al., 2022).

Previous qualitative research syntheses have also shown that, on average, teachers' attitudes toward co-education are neither strongly negative nor particularly favorable (De Boer et al., 2011). However, these researches often fail to explore other characteristics of teachers, such as demographic factors, that may influence their beliefs and attitudes toward inclusive education. This highlights the complexity of the issue and the need for more comprehensive research to better understand the factors at play in teachers' beliefs about inclusive education.

Previous studies have also highlighted that preschool and primary school teachers do not feel prepared to teach students with disabilities. They reported that there was a lack of specific knowledge and skills for teaching in inclusive classrooms (e.g. Ruppar et al., 2016, 2018; Sucuoğlu et al., 2013), which is indirectly confirmed in this study. Further, additional funding and training programs for the teachers would provide teachers with the support they need to properly apply multisensory approaches to their classrooms (Alwaqassi, 2017).

If students with severe disabilities can only benefit from exposure to multicurricular environments, it would not be a stretch to claim that students with special learning disabilities or even mainstream students could benefit greatly from specific and targeted activities and trials.

The differences in underlying beliefs about MSEs among the teachers who participated in the present research appear to parallel, to some extent, a dichotomy in the literature between passive exposure to MSEs, often but not exclusively related to their recreational use, and the use MSEs prior to active instructional planning and teaching specific goals (Bozic 1997; Pagliano 1997). More generally, it appears from the existing research and from the international literature that all teachers agree that students with disabilities benefit from the multisensory approach of teaching (Alwaqassi, 2017). Additional research regarding the multisensory method and effective tools for teaching is necessary (Alwaqassi, 2017).

A large literature gap was identified regarding the effectiveness of multisensory education in relation to the specialty of the teacher and the type of school, the subjects related to science (typical or special education school) and the frequency of using multisensory teaching. Still, a gap was identified regarding the factors that influence the frequency of using multisensory practices, the barriers to the implementation of multisensory practices in kindergarten and elementary school, and finally regarding who is the most suitable teacher to teach multisensory.

Conducting the current research, a gap in the literature regarding the viewpoints of the educators regarding to who is the best suited to teach a child with dyslexia, highlighting the need for further research in this area.

Also, research could be done to weigh two tools, one of which would be about shallow and the other about opaque spellings, so that they can be translated into many languages and subsequent research can produce more generalizable results and contribute to further improve or modify the tool. Furthermore, it is considered necessary for teachers to come into contact with multisensory techniques through the study programs from the universities and also in their subsequent course as active teachers. Additional funding and training programs for the teachers would provide teachers with the support they need to properly apply multisensory approaches to their classrooms (Alwaqassi, 2017).

As educators, it is our responsibility to continually explore and adopt successful teaching approaches, supported by relevant theories and learning strategies (Yin et al., 2017). One noteworthy example is the internationally renowned Finnish education system, which places a strong emphasis on the multisensory approach to learning. This focus on multisensory learning has contributed to Finland's consistent high performance on international assessments like the PISA tests (Puustinen et al., 2018).

Multisensory learning is regarded as a catalyst for long-term change (Mackay, 2012). This approach aligns with Vygotsky's theory, which highlights that what children can do with adult support today, they can achieve independently tomorrow. In a multisensory approach, children are active agents in their own learning and development (Vygotsky, 1978; Wood, 2010).

Research by Boardman (2019) supports the idea that a creative, multisensory approach is the most effective and inclusive way to teach and engage all students. This aligns with the findings of Melhuish (2014) and Finnegan (2016), who argue that the brain learns best when exposed to rich, complex, and multisensory environments and activities.

Understanding teachers' beliefs is essential to comprehend their intentions and actions in the classroom. Identifying teachers' deeply held beliefs about the role of technology in teaching and learning is a crucial step in driving meaningful change in educational practices (Bice & Tang, 2022).

### 10.2. Significance and innovation of the research

In this research, the views of teachers and kindergarten teachers of general and special education in the prefecture of Heraklion are examined, as detailed in previous subsections. Examining the opinions of teachers is particularly important because they are the official/formal teaching bodies of the Greek state. The requirements of the European Union and the recommendations of the OECD for inclusive practices are a fact and the views of the teachers are those that capture whether we have moved from theory to their practical application for a school that provides equal educational opportunities to all students without exception.

The role of educators is crucial, not only because they lead the teaching process, but also because they, together with the students, sense the dynamics of the learning experience. They can enhance, adjust, enrich, transform, or tailor it to ensure its effectiveness and attainment of educational objectives.

Teachers' perspectives on the effectiveness of teaching have been a topic of research on the global stage. In Greece, numerous studies have investigated teaching effectiveness in general; however, no identified research has specifically explored teachers' viewpoints on multisensory teaching. The insights provided by teachers' opinions hold particular significance as they shed light on how educators comprehend and implement multisensory teaching. Furthermore, this research delves into teachers' opinions in connection with variables such as gender, years of experience, and educational

background, which have either not been systematically explored in Greece or have been examined sporadically.

Crete stands as Greece's largest and most populous island, ranking as the fifth largest in the Mediterranean both in terms of size and population, boasting 623,065 residents. The Region of Crete, spanning 8,336 square kilometers, claims the fifth spot in population size among Greek regions. Its capital and largest city, Heraklion, serves as the regional seat and encompasses adjacent islands and islets. Heraklion Prefecture, a constituent part of the region, ranks as the fourth most populous prefecture in Greece, housing 302,405 inhabitants according to the 2021 population census. This demographic data underscores the presence of a significant student population, numerous educational institutions, and consequently, a substantial number of teachers.

Moreover, Crete's varied geomorphology, particularly within Heraklion, which features both mountainous terrain and fertile plains, has encouraged residents to engage in agricultural pursuits. As a result, teachers employed in the Heraklion prefecture hail from diverse geographical origins across Greece, rather than being predominantly local.

Furthermore, Greece's economic crisis, which has persisted since 2008, has led to the suspension of permanent teaching appointments, necessitating seasonal contracts for each academic year. Many of the educators in this system were substitutes, rotating to different locations and schools annually. The resulting job insecurity has driven teachers to enhance their competitiveness in the labor market and acquire specialized skills. While limited permanent appointments began to be reinstated in 2020, a considerable portion of teachers remained unable to transfer to their preferred locations, continuing to work in their initial place of assignment.

Heraklion, due to its numerous teaching positions and kindergarten teacher roles, has attracted newly appointed educators from various parts of Greece. While findings from this study cannot be broadly generalized to the entire country, they may offer insights that could be indicative of more widespread trends at the national level.

### 10.3. Limitations of the research

Every research endeavor must acknowledge the constraints of the real world since it operates within this context (Robson, 2007). Therefore, both the research objectives

and the methods of data collection must align with the practical constraints of time and resources.

One limitation associated with the tight time frame for conducting this research is the utilization of a questionnaire as a data collection tool. Consequently, the research inherits the inherent limitations of surveys as data collection instruments, which include the inability to provide clarifications or ask follow-up questions, the absence of additional data collection options, the lack of control over respondents' honesty, and other potential issues (Bryman, 2016).

Furthermore, the questionnaire's length and time required for completion represent practical constraints that must be considered. While additional questions could have been included to investigate how teachers define the effectiveness and ease of multisensory teaching, this would have extended the questionnaire and potentially discouraged respondents from completing it (Vamvoukas, 2010). Also, some open-ended questions could be included to allow the participants to add what the participants themselves want and was not foreseen by the researcher.

These weaknesses could be alleviated to a certain extent by using a second means of data collection, such as the interview. But this could not be done because after COVID-19, in public services and in schools in particular, strict health protocols were followed. Also, due to the lack of time margins, the interviews would significantly delay the completion of this research.

### 10.4. Research ethics

Research ethics pertains to the application of fundamental ethical principles to various aspects of scientific research. These principles guide researchers in areas such as research design, implementation, data handling, plagiarism prevention, data falsification avoidance, and ensuring the dignity and rights of research participants. Research ethics plays a crucial role in maintaining the integrity, credibility, and responsible conduct of research endeavors.

In the present work the following principles were taken into account:

- Respecting the personality of the interviewees and not causing any harm.
- The anonymity of the respondents and their non-traceability.

- Voluntary participation, informed consent, and the ability of respondents to withdraw from research.
- Confidentiality of information.
- Information about the purpose of the research, etc.

(Cohen et al., 2008)

All of the above was ensured by a relevant letter that accompanied the questionnaire. In particular, the letter mentions: The purpose of the research, anonymity, time to complete the questionnaire and voluntary participation.

# APPENDIX

Questionnaire given in Greek translated into English

**Section 1**

Questionnaire on the opinions of Primary Education teachers on the effectiveness of the implementation of multisensory teaching in the classroom for students with dyslexia.

The present research is carried out by Lambrini - Anna Gaitanidi as part of her doctoral thesis with coordinator professors Maria del Carmen Corujo Vélez and Esther Vega Gea and is addressed to special and typical education teachers of Primary Education. The purpose of the research is to investigate the opinions of the teachers and kindergarten teachers of Heraklion Crete, regarding the effectiveness of the implementation of multisensory activities and teaching methods in the classroom for students with dyslexia. It is hereby declared that anonymity and confidentiality will be observed. Your information and responses will not be used for purposes other than the survey.

Questionnaire completion time: Short (~5 -10 minutes)

**I agree to participate voluntarily and anonymously in this study, having understood the purposes of ***

*Mark only one answer.*

Yes

No

**Section 2**

**Demographics**

**Sex ***

*Mark only one answer.*

Man

Woman

Other: [specify]

**Years of prior service ***

*Mark only one answer.*

1-5

6-10

11-15

16-20

21+

**Specialty ***

*Mark all that apply.*

Teacher

Kindergarten teacher

Special education teacher

Special education kindergarten teacher

**Highest level of studies ***

*Mark only one answer.*

Bachelor

Master

Doctorate

**Specialization in special education ***

*Mark only one answer.*

Yes

No

**Type of school you are working in the current school year ***

*Mark only one answer.*

Typical education school

Special education school

**Educational role ***

*Mark only one answer.*

Integration class kindergarten teacher

Integration class teacher

Kindergarten teacher in a special education school

Parallel support kindergarten teacher

Parallel support teacher

Teacher in a special education school

Typical education kindergarten teacher

Typical education teacher

**Employment relationship ***

*Mark only one answer.*

Permanent

Temporary (Deputy)

**Number of students taught per hour the current school year ***

*Mark only one answer.*

1

2-4

5-7

8+

**Section 3**

The multisensory teaching approach is based on Orton's theory. It is based on the interaction of the neural networks of the senses and combines repetitive activities involving many types of stimuli (visual, auditory, kinesthetic, etc.). The goal is for the student to acquire as much information as possible through different neural pathways.

1. **When I hear the phrase multisensory teaching I think… ***
   *Mark all that apply.*

   A specific teaching method

   Special education students

   Rich logistical infrastructure

   Syllabus

   Attractive course

   Time expenditure

   Visual aids

   Simultaneous activation of multiple senses

   None of the above

   Other: [specify]

2. **Multisensory teaching helps students with dyslexia better understand the teaching objective ***
   *Mark only one answer.*

   Strongly disagree

Disagree

Neither agree nor disagree

Agree

Strongly agree

3. **Multisensory teaching helps all students to better understand the teaching objective ***

*Mark only one answer.*

Strongly disagree

Disagree

Neither agree nor disagree

Agree

Strongly agree

4. **I have the necessary knowledge to teach my students multisensorily ***

*Mark only one answer.*

Strongly disagree

Disagree

Neither agree nor disagree

Agree

Strongly agree

5. **I have professional confidence to teach my students multisensorily ***

*Mark only one answer.*

Strongly disagree

Disagree

Neither agree nor disagree

Agree

Strongly agree

6. **The school I work has the necessary resources to be able to teach my students multisensorily ***

*Mark only one answer.*

Strongly disagree

Disagree

Neither agree nor disagree

Agree

Strongly agree

7. **Multisensory teaching helps students with dyslexia to achieve learning goals in subjects related to language ***

*Mark only one answer.*

Strongly disagree

Disagree

Neither agree nor disagree

Agree

Strongly agree

8. **Multisensory teaching helps students with dyslexia achieve learning goals in subjects related to science ***

*Mark only one answer.*

Strongly disagree

Disagree

Neither agree nor disagree

Agree

Strongly agree

9. **I use multisensory activities/teaching methods in subjects related to language ***

*Mark only one answer.*

Never

Occasionally

Sometimes

Usually

Daily

10. **I use multisensory activities/teaching methods in subjects related to science***

*Mark only one answer.*

Never

Occasionally

Sometimes

Usually

Daily

11. **I use multisensory activities/teaching methods regardless of the teaching subject ***

*Mark only one answer.*

Never

Occasionally

Sometimes

Usually

Daily

**12. I use multisensory teaching ***

*Mark only one answer.*

Never

Occasionally

Sometimes

Usually

**13. Multisensory teaching requires more teaching time than I can spare ***

*Mark only one answer.*

Strongly disagree

Disagree

Neither agree nor disagree

Agree

Strongly agree

**14. The syllabus is very stressful and I don't have time to implement multisensory activities with my students ***

*Mark only one answer.*

Not at all

Slightly

Probably

Very much

Extremely

**15. I would like to become more familiar with the use of multisensory teaching methods before applying it to my students ***

*Mark only one answer.*

Strongly disagree

Disagree

Neither agree nor disagree

Agree

Strongly agree

**16. During the current academic year I have in my class students with dyslexia***

*Mark only one answer.*

None

1

2-3

4-6

7+

**17. Multisensory teaching can only be implemented by a special educator ***

*Mark only one answer.*

Strongly disagree

Disagree

Neither agree nor disagree

Agree

Strongly agree

**18. Multisensory teaching is effectively implemented one-on-one ***

*Mark only one answer.*

Strongly disagree

Disagree

Neither agree nor disagree

Agree

Strongly agree

**19. Multisensory teaching is implemented effectively in a small group of students ***

*Mark only one answer.*

Strongly disagree

Disagree

Neither agree nor disagree

Agree

Strongly agree

**20. Multisensory teaching is implemented effectively in the whole class ***

*Mark only one answer.*

Strongly disagree

Disagree

Neither agree nor disagree

Agree

Strongly agree

**21. Multisensory teaching is easily implemented one-on-one ***

*Mark only one answer.*

Strongly disagree

Disagree

Neither agree nor disagree

Agree

Strongly agree

**22. Multisensory teaching is easily implemented in a small group of students ***

*Mark only one answer.*

Strongly disagree

Disagree

Neither agree nor disagree

Agree

Strongly agree

**23. Multisensory teaching is easily implemented in the whole class ***

*Mark only one answer.*

Strongly disagree

Disagree

Neither agree nor disagree

Agree

Strongly agree

**24. I use a specific method of multisensory teaching ***

*Mark only one answer.*

No

Yes

**25. Choosing or not to use multisensory teaching depends on: ***

*Mark only one answer per row.*

| | Not important at all | Of little importance | Very Important | Absolutely essential |
|---|---|---|---|---|
| The lesson | | | | |
| The teaching objective | | | | |
| My background knowledge | | | | |
| The technological equipment I have | | | | |
| The time I can spare | | | | |
| The inclusion of all students | | | | |

**26. I am familiar with the following multisensory teaching methods and programs: ***

*Mark only one answer per row.*

| | Not at all | Slightly | Very much | Extremely |
|---|---|---|---|---|
| Orton-Gillingham | | | | |
| LiPS | | | | |
| BDTS | | | | |
| BRSS | | | | |
| Jolly Phonics | | | | |
| Alphabetic Phonics | | | | |
| PRS VRS | | | | |
| visualization-verbalization | | | | |
| Letterland | | | | |
| SMT | | | | |
| Wilson Reading System | | | | |
| BGI | | | | |
| Hickey | | | | |
| D.I.S.T.A.R. | | | | |
| Toe by Toe | | | | |
| Dyslexia Box | | | | |

**27. I use the following multisensory teaching methods and programs: ***

*Mark only one answer per row.*

| | Not at all | Slightly | Very much | Extremely |
|---|---|---|---|---|
| Orton-Gillingham | | | | |
| LiPS | | | | |
| BDTS | | | | |

| |
|---|
| BRSS |
| Jolly Phonics |
| Alphabetic Phonics |
| PRS VRS |
| visualization-verbalization |
| Letterland |
| SMT |
| Wilson Reading System |
| BGI |
| Hickey |
| D.I.S.T.A.R. |
| Toe by Toe |
| Dyslexia Box |

**28. The more students I teach per hour, the less I use multisensory teaching methods***

*Mark only one answer.*

Strongly disagree

Disagree

Neither agree nor disagree

Agree

Strongly agree

**29. The fewer students I teach per hour, the more I use multisensory teaching methods ***

*Mark only one answer.*

Strongly disagree

Disagree

Neither agree nor disagree

Agree

Strongly agree

30. **Through multisensory activities, I give students with dyslexia equal educational opportunities with their typical classmates ***

*Mark only one answer.*

Strongly disagree

Disagree

Neither agree nor disagree

Agree

Strongly agree

31. **The participation of students with dyslexia in the lesson increases when I involve multisensory activities ***

*Mark only one answer.*

Strongly disagree

Disagree

Neither agree nor disagree

Agree

Strongly agree

**32. Barriers in using multisensory teaching are: ***

*Mark only one answer per row.*

| | Strongly disagree | Disagree | Agree | Strongly Agree |
|---|---|---|---|---|
| The Syllabus | | | | |
| The limited teaching time | | | | |
| My background knowledge | | | | |
| The number of students | | | | |
| The class size | | | | |
| The lack of logistical infrastructure | | | | |
| The lack of interest on my part | | | | |
| The students' lack of interest | | | | |

**33. I adapt my teaching multisensorily, without following any specific method***

*Mark only one answer.*

Strongly disagree

Disagree

Neither agree nor disagree

Agree

Strongly agree

**34. I reeducate myself regularly trying to follow new educational trends ***

*Mark only one answer.*

Strongly disagree

Disagree

Neither agree nor disagree

Agree

Strongly agree

**35. The use of multisensory teaching works adequately for kindergarten students (3-5 years old) ***

*Mark only one answer.*

Strongly disagree

Disagree

Neither agree nor disagree

Agree

Strongly agree

**36. The use of multisensory teaching works adequately for for students in the first grades of primary school (6-8 years) ***

*Mark only one answer.*

Strongly disagree

Disagree

Neither agree nor disagree

Agree

Strongly agree

**37. The use of multisensory teaching works adequately for students in the last grades of primary school (9-11 years old) ***

*Mark only one answer.*

Strongly disagree

Disagree

Neither agree nor disagree

Agree

Strongly agree

**38. Students with dyslexia can adequately master graphophonemic matching through multisensory activities ***

*Mark only one answer.*

Strongly disagree

Disagree

Neither agree nor disagree

Agree

Strongly agree

**39. Students with dyslexia can adequately master the reading skill through multisensory activities ***

*Mark only one answer.*

Strongly disagree

Disagree

Neither agree nor disagree

Agree

Strongly agree

**40. I would be interested in training in some multisensory method ***

*Mark only one answer.*

Not at all

Slightly

Indifferent

Very much

Extremely

**41. Training in multisensory teaching methods is provided free of charge by the state ***

*Mark only one answer.*

Strongly disagree

Disagree

Neither agree nor disagree

Agree

Strongly agree

**42. Training in multisensory teaching methods will burden me financially ***

*Mark only one answer.*

Strongly disagree

Disagree

Neither agree nor disagree

Agree

Strongly agree

**43. I know of a multisensory teaching program designed or translated into Greek language** *

*Mark only one answer.*

None

Slightly

Some

Many

Extremely

# REFERENCES


Abduh, B. & Tahar, M. M. (2018). The Effectiveness of Brain Gym and Brain Training Intervention on Working Memory Performance of Student with Learning Disability. *Journal of ICSAR, 2*(2), 105-111. Doi: 10.17977/um005v2i22018p105

Ainscow, M. (2004). Special needs through school improvement School improvement through special needs. In Mitchell, D. (Ed.) *Special educational needs and inclusive education: Major themes in education*, 2. Routledge.

Ainscow, M. (2019). *The UNESCO Salamanca Statement 25 years on: Developing inclusive and equitable education systems*. Discussion paper prepared for the International Forum on inclusion and equity in education—every learner matters, Cali, Colombia, 11–13 September 2019. https://tinyurl.com/nfyr55vk

Akamatsu, N. (1999). The effects of first language orthographic features on word recognition processing in English as a second language. *Reading and Writing, 11*(4), 381–403. Doi: 10.1023/A:1008053520326

Akinde, T. A. & Adetimirin, A. E. (2019). Administrative and infrastructural factors affecting library and information science educators' actual use of educational support systems for teaching in Nigerian universities. *Journal of Librarianship and Information Science, 51*(1), 180-195. Doi:10.1177/0961000618773140

Allan, J. (2014). Inclusive Education and the Arts. *Cambridge Journal of Education, 44*(4), 511–523. Doi: 10.1080/0305764X.2014.921282

Alexander, A. N. & Slinger-Constant, A. M. (2004). Current Status of Treatments for Dyslexia: Critical Review. *Journal of Child Neurology*, *19*(10), 744-758.

Alexander, R. J. (2017). *Towards Dialogic Teaching: Rethinking Classroom Talk*. Dialogos.

All about reading review (2023). The smarter learner guide. https://smarterlearningguide.com/all-about-reading-review/

Alsolami, A. S. (2022). Teachers of Special Education and Assistive Technology: Teachers' Perceptions of Knowledge, Competencies and Professional Development. *SAGE Open*, *12*(1). Doi:10.1177/21582440221079900

Altarac, M. & Saroha, E. (2007). Lifetime prevalence of learning disability among US children. *Pediatrics*, *119 Suppl 1*, S77–S83. Doi:10.1542/peds.2006-2089L

Alwaqassi, S. A. (2017). *The use of multisensory in schools today* (Doctoral dissertation, [Bloomington, Ind.]: Indiana University).

American Psychiatric Association [APA]. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). American Psychiatric Association.

American Psychiatric Association [APA]. (2022). *Diagnostic and statistical manual of mental disorders* (5th ed., text rev.). Doi:10.1176/appi.books.9780890425787

Anderson, C. J. K., Klassen, R. M. & Georgiou G. K. (2007). Inclusion in Australia: What Teachers Say They Need and What School Psychologists Can Offer. *School Psychology International, 5*(28), 131 – 147. Doi:10.1177/0143034307078086

Anderson, S. E. & Putman, R. S. (2023). Elementary special education teachers' thinking while planning and implementing technology-integrated lessons. *Educ Inf Technol,* 28, 9459–948. Doi:10.1007/s10639-022-11358-0

Andersson, U. (2008). Mathematical competencies in children with different types of learning difficulties. *J Educ Psychol, 100*(1), 48-66. Doi:10.1037/0022-0663.100.1.48

Angelidis, P. (2011). Pedagogies of Inclusion. In P. Angelidis (Ed.), *Introduction*. Diadrasi.

Anobile, G., Stievano, P. & Burr, D. C. (2013). Visual sustained attention and numerosity sensitivity correlate with math achievement in children. *J Exp Child Psychol*, *116*, 380–391. Doi:10.1016/j.jecp.2013.06.006

Ansari, D. (2008). The brain goes to school: Strengthening the education-neuroscience connection, *Education Canada, 48*(4), 6–10.

Apel K. (2011). What is orthographic knowledge? *Language, Speech, and Hearing Services in Schools*, *42*(4), 592–603. Doi:10.1044/0161-1461(2011/10-0085)

Archer, A. L., Gleason, M. M., & Vachon, V. L. (2003). Decoding and Fluency: Foundation Skills for Struggling Older Readers. *Learning Disability Quarterly, 26*(2), 89-101. Doi:10.2307/1593592

Ariati, N. P. B., Padmadewi, N. N. & Suarnajaya, I. W. (2018). *Jolly phonics: effective strategy for enhancing children english literacy*. In SHS Web of Conferences 42:00032. Doi:10.1051/shsconf/20184200032

Armstrong, T. (2009). *Multiple Intelligences in the Classroom* (3rd ed.). Association for Supervision & Curriculum Development.

Arun, P., Chavan, B. S., Bhargava, R., Sharma, A. & Kaur, J. (2013). Prevalence of specific developmental disorder of scholastic skill in school students in Chandigarh, India. *The Indian journal of medical research*, *138*(1), 89–98.

Atanga, C., Jones, B. A., Krueger, L. E. & Lu, S. (2020). Teachers of Students With Learning Disabilities: Assistive Technology Knowledge, Perceptions, Interests, and Barriers. *Journal of Special Education Technology, 35*(4), 236-248. Doi:10.1177/0162643419864858

Auer, M. (2008). Sensory Perception, Rationalism and Outdoor Environmental Education, *International Research in Geographical and Environmental Education, 17*(1), 6-12. Doi: 10.2167/irgee225.0

Augur, J. (1986). The concept of dyslexia, specific policies, strategies and techniques for its remediation and their more general application in the ordinary classroom. *Early Child Development and Care*, *23*(4), 215-261.

Avramidis, E. & Kalyva, E. (2007). The influence of teaching experience and professional development on Greek teachers' attitudes towards inclusion. *European Journal of Special Needs Education, 22(4),* 367–89. Doi: 10.1080/08856250701649989

Avramidis, E. & Norwich, B. (2002). Teachers' attitudes towards integration/inclusion: A review of the literature. *European Journal of Special Needs Education, 17(2),* 129–147. Doi: 10.1080/08856250210129056

Ayala, S. M. & O'Connor, R. (2013). The Effects of Video Self-modeling on the Decoding Skills of Children at Risk for Reading Disabilities. *Learning Disabilities Research & Practice,* 28(3), 142–154. Doi: 10.1111/ldrp.12012

Ayres, J. (1972). Improving academic scores through sensory integration. *Journal of Learning Disabilities, 5,* 338–343.

Baars, B. J. (1986). *The Cognitive Revolutions in Psychology*. The Guildford Press.

Babiniotis, G. (2004). *Dictionary for School and Office*. Center for Lexicology Ltd.

Bacon, A. M. & Handley, S. (2010). Dyslexia and reasoning: The importance of visual Processes. *British Journal of Psychology, 101,* 433–452. Doi: 10.1348/000712609X467314

Bacon, A. M. & Handley, S. J. (2014). Reasoning and dyslexia: Is visual memory a compensatory resource? *Dyslexia, 20*(4), 330–345.

Baddeley, A. D. (1986). *Working memory*. Oxford University Press.

Baddeley, A. D. & Patterson, K. (1971). The relation between long-term and short-term memory. *British Medical Bulletin, 27*(3), 237-242. Doi: 10.1093/oxfordjournals.bmb.a070860

Baddeley, A. D. & Patterson, K. (1971). The relation between long-term and short-term memory. *British Medical Bulletin, 27*(3), 237-242. Doi: 10.1093/oxfordjournals.bmb.a070860

Baddeley, A. D. (1979). Working Memory and Reading. In P.A. Kolers, M. E. Wrolstad & H. Bouma (Eds), *Processing of Visible Language.* Nato Conference Series, 13. Doi:10.1007/978-1-4684-0994-9_21

Baddeley, A. D. (2000). The episodic buffer: a new component of working memory? *Trends in cognitive sciences, 4*(11), 417-423.

Baddeley, A. D. (2010). Working Memory, *Current Biology, 20*(4), 136-140. Doi: 10.1016/j.cub.2009.12.014

Baddeley, A. D. & Hitch, G. J. (1974). Working Memory. In G. A. Bower (Ed.). *The psychology of learning and motivation: Advances in research and theory*, 8, 47-89. Academic Press.

Bahrick, L. E. & Lickliter, R. (2000). Intersensory redundancy guides attentional selectivity and perceptual learning in infancy. *Developmental psychology*, *36*(2), 190–201. Doi:10.1037//0012-1649.36.2.190

Balıkcı, O. S. & Melekoglu, M. A. (2020). Early signs of specific learning disabilities in early childhood. *International Journal of Early Childhood Special Education, 12*(1), 84-95. Doi:10.20489/intjecse.722383

Ball, A. F. & Tyson, C. A. (2011). Preparing Teachers for Diversity in the Twenty-first Century. In A. F. Ball & C. A. Tyson (Eds), *Studying Diversity in Teacher Education* (399–416). Rowman & Littlefield.

Banse, R. & Scherer, K. R. (1996). Acoustic profiles in vocal emotion expression. *Journal of personality and social psychology*, *70*(3), 614–636. Doi:10.1037//0022-3514.70.3.614

Baranek, G. T. (2002). Efficacy of Sensory and Motor Interventions for Children with Autism. *Journal of Autism and Developmental Disorders* 32, 397–422. Doi:10.1023/A:1020541906063

Barbiero, C., Lonciari, I., Montico, M., Monasta, L., Penge, R., Vio, C., Tressoldi, P. E., Ferluga, V., Bigoni, A., Tullio, A., Carrozzi, M. & Ronfani, L. (2012). The submerged dyslexia iceberg: How many school children are not diagnosed? Results from an Italian study. *PLOS ONE*, *7*(10), 1–10. Doi:10.1371/journal.pone.0048082

Barnett, A. L., Connelly, V. & Miller, B. (2019). The Interaction of Reading, Spelling, and Handwriting Difficulties With Writing Development. *Journal of Learning Disabilities*. Doi:10.1177/0022219419894565

Baron, N. S. (2001). Commas and canaries: The role of punctuation in speech and writing. *Language Sciences*, *23*, 15-67. Doi: 10.1016/S0388-0001(00)00027-9

Barrett, P. & Barrett, L. (2010) The potential of positive places: Senses, brain and spaces, *Intelligent Buildings International, 2*(3), 218-228. Doi: 10.3763/inbi.2010.0042

Barton, L. (2004). The Politics of Special Education: A Necessary or Irrelevant Approach?. In L. Ware (Ed.), *Ideology and the Politics of (In)Exclusion* (pp. 63–75). Peter Lang.

Barton Reading and Spelling System. (2021). https://bartonreading.com/tutors/#bat

Bautista, A., Wong, J. & Gopinathan, S. (2015). Teacher professional development in Singapore: Depicting the landscape. Psychology, *Society and Education, 7*(3), 311–326.

Becker, W. C. & Engelmann, S. (1978). *Analysis of achievement data on six cohorts of low-income children from 20 school districts in the University of Oregon direct instruction follow through model*. University of Oregon Follow Through Project.

Bell, N. (1991). Gestalt imagery: A critical factor in language comprehension. *Annals of Dyslexia, 41*, 246–260.

Beller, E. K. (1973). Research on organized programs of early education. In R. M. W., Travers (Ed), *second handbook of research on teaching*, 530-600. Rand McNally.

Bereiter, C. & Engelmann, S. (1966). *Teaching disadvantaged children in the preschool*. Prentice-Hall.

Berent, I., Vaknin-Nusbaum, V., Balaban, E. & Galaburda, A. (2013). Phonological generalizations in dyslexia: The phonological grammar may not be impaired, *Cognitive Neuropsychology, 30*(5), 285-310. Doi: 10.1080/02643294.2013.863182

Berg, L. S. (2004). *The advantages and disadvantages of the inclusion of students with disabilities into regular education classrooms. The Graduate School, University of Wisconsin-Stout.* Retrieved May 26, 2021 from https://tinyurl.com/a8czvwh7

Berninger, V. W., Richards, T. L. & Abbott, R. D. (2015). Differential diagnosis of dysgraphia, dyslexia, and OWL LD: behavioral and neuroimaging evidence. *Read Writ 28*, 1119–1153. Doi:10.1007/s11145-015-9565-0

Bhatnagar, N. & Das, A. (2014). Attitudes of secondary school teachers towards inclusive education in New Delhi, India. *Journal of Research in Special Educational Needs, 14*(4), 255-263. Doi:10.1111/1471-3802.12016

Biancarosa, G. & Griffiths, G. G. (2012). Technology tools to support reading in the digital age. *The Future of Children, 22*, 139–160. Doi:10.1353/foc.2012.0014

Bice, H. & Tang, H. (2022). Teachers' beliefs and practices of technology integration at a school for students with dyslexia: A mixed methods study. *Educ Inf Technol 27*, 10179–10205. Doi:10.1007/s10639-022-11044-1

Bigozzi, L., Tarchi, C., Pinto, G. & Gamannossi, B. A. (2015). Predicting Dyslexia in a Transparent Orthography From Grade 1 Literacy Skills: A Prospective Cohort Study. *Reading & Writing Quarterly*, *32*(4), 353-372. Doi:10.1080/10573569.2014.988310

Bishop, D. V. M. (2007). Curing dyslexia and attention-deficit hyperactivity disorder by training motor co-ordination: Miracle or myth? *Journal of Paediatrics and Child Health, 43*(10):653-655. Doi:10.1111/j.1440-1754.2007.01225.x

Black, S. (1999). Alternate Doorways. *Gifted Child Today Magazine, 22*(3), 18–22.

Blanton, L. P., Blanton, W. E. & Cross, L. S. (1994). An exploratory study of how general and special education teachers think and make decisions about students with special needs. *Teacher Education and Special Education, 17*(1), 62–74. Doi:10.1177/088840649401700107

Block, C. C., Parris, S. R. & Whiteley, C. S. (2008). CPMs: A Kinesthetic Comprehension Strategy. *The reading teacher, 61*(6), 460-470. Doi: 10.1598/RT.61.6.3

Blume, F., Hudak, J., Dresler, T., Ehlis, A. C., Kühnhausen, J., Renner, T. J. & Gawrilow, C. (2017). NIRS-based neurofeedback training in a virtual reality classroom for children with attention-deficit/hyperactivity disorder: study protocol for a randomized controlled trial. *Trials, 18*(1), 41. Doi:10.1186/s13063-016-1769-3.

Boardman, K. (2020). An exploration of teachers' perceptions and the value of multisensory teaching and learning: a perspective on the influence of Specialist Dyslexia Training in England, *Education 3-13, 48*(7), 795-806. Doi: 10.1080/03004279.2019.1653349

Boets, B., Vandermosten, M., Cornelissen, P., Wouters, J. & Ghesquière, P. (2011). Coherent motion sensitivity and reading development in the transition from prereading to reading stage. *Child Development, 82*(3), 854–869. Doi:10.1111/j.1467-8624.2010.01527.x

Bohil, C., Alicea, B. & Biocca, F. (2011). Virtual reality in neuroscience research and therapy. *Nat Rev Neurosci 12*, 752–762. Doi:10.1038/nrn3122

Bonacina, S., Krizman, J., White-Schwoch, T., Nicol, T. & Kraus, N. (2020). Distinct rhythmic abilities align with phonological awareness and rapid naming in school-age children. *Cognitive processing*, *21*(4), 575–581. Doi:10.1007/s10339-020-00984-6

Booth, T. & Ainscow, M. (2002). *The index for inclusion* (2nd Edition). ICIE.

Bordegoni M., Carulli M. & Ferrise F. (2019). Improving Multisensory User Experience Through Olfactory Stimuli. In S. Fukuda (Eds), *Emotional Engineering, 7*. Doi:1007/978-3-030-02209-9_13

Botts, B. H., Hershfield, P. A. & Christensen-Sandfort, R. J. (2008). Snoezelen®: empirical review of product representation. *Focus on Autism and Other Developmental Disorders, 23*, 138–147. Doi:10.1177/1088357608318949.

Bottsford-Miller, N., Thurlow, M.L., Stout, K. E. & Quenemoen, R. F. (2006). *A comparison of IEP/504 accommodations under classroom and standardized testing conditions: A preliminary report on SEELS Data* (Synthesis Report 63). Available at https://tinyurl.com/mszdastf

Bozic, N. (1997). Constructing the room: multi-sensory rooms in educational contexts. *European Journal of Special Needs Education, 12,* 54–70. Doi:10.1080/0885625970120106.

Brady, S. (2019). The 2003 IDA definition of dyslexia: A call for changes. *Perspectives on Language and Literacy*, *45*(1), 15–21

Brazeau-Ward, L. (2005). *The SMT Method A Multisensory Teaching Method for Students with Dyslexia.* Canadian Dyslexia Centre.

Brown, A. L., Palinscar, A. S. & Purcell, L. (1986). Poor Readers: Teach, Don't Label. In U. Neisser (Eds.), *The School Achievement of Minority Children New Perspectives.* Routledge.

Bryman, A. (2016). *Methods of social research*. Gutenberg.

Bualar, J. (2016). What has gone wrong with inclusive education in Thailand? *Journal of Public Affairs, 16*(2), 156-161.

Büber, A., Başay, Ö. & Şenol, H. (2020). *The prevalence and comorbidity rates of specific learning disorder among primary school children in Turkey. Nordic Journal of Psychiatry, 74(6), 453–460.* Doi:10.1080/08039488.2020.1740782

Burden, R. & Burdett, J. (2005). Factors associated with successful learning in pupils with dyslexia: A motivational analysis. *British Journal of Special Education, 32*(2), 100–104. Doi:10.1111/j.0952-3383.2005.00378.x

Burns, C. & Myhill, D. (2004). Interactive or Inactive? A Consideration of the Nature of Interaction in Whole Class Teaching. *Cambridge Journal of Education, 34*(1), 35–49. Doi:10.1080/0305764042000183115

Byrd, D. R. & Alexander, M. (2020). Investigating special education teachers' knowledge and skills: Preparing general teacher preparation for professional development. *Journal of Pedagogical Research, 4*(2), 72–82. Doi:10.33902/JPR.2020059790

Byrne, B., Fielding-Barnsley, R. & Ashley, L. 2000. Effects of pre-school phoneme identity training after six years: outcome level distinguished from rate of response. *Journal of Educational Psychology*, 92, 659–667.

Caetano, J. M. & Oliveira, R. M. (2012). Illustration and childhood imagination: narrative paths through the image in books for children. In H. Barbosa & J. Quental (Eds.), *2nd International Conference: Art, Illustration and Visual Culture in Infant and Primary Education. Creative processes and childhood-oriented cultural resources, December 2012* (pp.103-107). Universidade de Aveiro.

Cain, K. (2006). Children's reading comprehension: The role of working memory in normal and impaired development. In S. Pickering (Ed.), *Working memory and education* (pp. 62–93). Elsevier.

Caine, R. N., Caine, G., McClintic, C. L. & Klimek, J. (2009). *12 Brain/Mind Learning Principles in Action: Developing Executive Functions of the Human Brain*. 2nd ed. Corwin.

Caldwell, J. E. (2007). *Clickers in the Large Classroom: Current Research and Best-Practice Tips. CBE-Life Sciences Education, 6*, 9-20. Doi:10.1187/cbe.06-12-0205

Cameron, A., Burns, P., Garner, A., Lau, S., Dixon, R., Pascoe, C. & Szafraniec, M. (2019). Making Sense of Multi-Sensory Environments: A Scoping Review. International Journal of Disability, *Development and Education 67*(6), 1–27. Doi:10.1080/1034912X.20191634247

Campbell, F. A., Helms, R., Sparling, J. J. & Ramey, C. T. (1998). Early childhood programs and success in school: The Abecedarian study. In W. S. Barnett & S. S. Boocock (Eds.), *Early care and education for children in poverty: Promises, programs and long-term results* (pp. 145–166). State University of New York Press.

Caravolas, M. (2004). Spelling development in alphabetic writing systems: A cross-linguistic perspective. *European Psychologist*, *9*, 3–14. Doi:10.1027/1016-9040.9.1.3

Caravolas, M., Lervåg, A., Mousikou, P., Efrim, C., Litavský, M., Onochie-Quintanilla, E., Salas, N., Schöffelová, M., Defior, S., Mikulajová, M., Seidlová-Málková, G. & Hulme, C. (2012). Common Patterns of Prediction of Literacy Development in Different Alphabetic Orthographies. *Psychological Science, 23*(6), 678–686. Doi:10.1177/0956797611434536

Caravolas, M., Volín, J. & Hulme, C. (2005). Phoneme awareness is a key component of alphabetic literacy skills in consistent and inconsistent orthographies: Evidence from Czech and English children. *Journal of Experimental Child Psychology*, *92*(2), 107-139. Doi: 10.1016/j.jecp.2005.04.003

Carter, M. & Stephenson, J. (2010). The use of multi-sensory environments in schools servicing children with severe disabilities. *Journal of Developmental and Physical Disabilities, 23*(4), 339-357. Doi:10.1007/s10882-011-9232-6

Castles A. & Coltheart, M. (1993). Varieties of developmental dyslexia. *Cognition*, *47*(2), 149–180. Doi:10.1016/0010-0277(93)90003-E

Castles, A., Bates, T. & Coltheart, M. (2006). John Marshall and the developmental dyslexias. *Aphasiology, 20*(9), 871-892. Doi:10.1080/02687030600738952

Catts, H. W. & Adolph, S. M. (2011). Phonological and other language deficits associated with dyslexia. In S. A. Brady, D. Braze, & C. A. Fowler (Eds.), *Individual differences in reading: Theory and evidence* (pp. 137–151). Psychology Press.

Catts, H. W., McIlraith, A., Bridges, M. S. & Nielsen, D. C. (2017). Viewing a phonological deficit within a multifactorial model of dyslexia. *Reading and Writing*, *30*(3), 613–629. Doi:10.1007/s11145-016-9692-2

Chan S. W., Thompson D. R., Chau J. P., Tam W. W., Chiu I. W. & Lo S. H. (2010). The effects of multisensory therapy on behaviour of adult clients with developmental disabilities—*A systematic review. International Journal of Nursing Studies, 47*, 108–122. Doi:10.1016/j.ijnurstu.2009.08.004

Chan, J. S. L. & Chien, W. T. (2017). A randomised controlled trial on evaluation of the clinical efficacy of massage therapy in a multisensory environment for residents with severe and profound intellectual disabilities: a pilot study. *Journal of intellectual disability research: JIDR*, *61*(6), 532–548. Doi.org/10.1111/jir.12377

Chatzisotiriou, C. (2013). Clarifying the meaning of interculturalism: From assimilative state policy to inclusive schooling. In P. Angelidis & X. Chatzisotiriou (Eds.), *Intercultural Dialogue in Education: Theoretical Approaches, Political Beliefs and Pedagogical Practices* (pp. 25-62). Diadrasi.

Chither, H. (2020). Effect of Vernald Way (VAKT) for Multiple Senses, Health Care and Clinical Learning in Dealing with Hardship and Written to the Reading First Stage Pupils. *Indian Journal Of Public Health Research & Development, 11*(2), 2452-2456. Doi:10.37506/v11/i2/2020/ijphrd/195205

Chomsky, N. (1968). *Remarks on nominalization*. Linguistics Club, Indiana University.

Choudhary, M., Jain, A., Chahar, C. & Singhal, A. K. (2012). A case control study on specific learning disorders in school going children in Bikaner city. *Indian journal of pediatrics*, *79*(11), 1477–1481. Doi:10.1007/s12098-012-0699-7

Chudasama, Y. (2015). Short-Term and Working Memory in Animals. In I. P. Stolerman & L.H. Price (Eds), *Encyclopedia of Psychopharmacology*. Doi:10.1007/978-3-642-36172-2_236

Circular of Greek Government (GG.152/42433/A5/2019).

Clark, J. M. & Paivio, A. (1991). Dual coding theory and education. *Educational Psychology Review, 3*(3), 149–210. Doi.org/10.1007/BF01320076

Classen, C. 1999. Other Ways to Wisdom: Learning through the Senses across Cultures. *International Review of Education, 45*(3–4), 269–280. Doi:10.1023/A:1003894610869.

Cohen, L., Manion, L. & Morisson, K. (2008). *Educational research methodology.* Metaichmio.

Coleman, M. R., Buysse, V. & Neitzel, J. (2006). Establishing the evidence base for an emerging early childhood practice: Recognition and response. In V. Buysse & P. Wesley (Eds.), *Evidence-based practice in the early childhood field* (pp. 195-225). Zero to three.

Coltheart, M. (2005). Modelling reading: The dual-route approach. In M. J. Snowling & C. Hulme (Eds.), *The Science of Reading: A handbook* (pp. 6–23). Blackwell.

Coltheart, M., Rastle, K., Perry, C., Langdon, R. & Ziegler, J. (2001). DRC: A dual route cascaded model of visual word recognition and reading aloud. *Psychological Review*, *108*(1), 204–256. Doi:10.1037/0033-295x.108.1.204

Coltheart, V., Laxon, V., Rickard, M. & Elton, C. (1988). Phonological recoding in reading for meaning by adults and children. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *14*(3), 387–397. Doi:10.1037/0278-7393.14.3.387

Conradi, K., Jang, B. G. & McKenna, M. C. (2014). Motivation terminology in reading research: A conceptual review. *Educational Psychology Review, 26*(1), 127–164. Doi:10.1007/s10648-013-9245-z

Cortiella, C. & Horowitz, S. H. (2014). *The state of learning disabilities: Facts, trends, and emerging issues*. National Center for Learning Disabilities.

Cowley, S. (2013). *The Seven R's of Great Group Work*. Sue Coley books.

Cox, S. (2012). Approaches to Learning and Teaching. In A. D. Cockburn, and G. Handscomb (Eds.), *Teaching Children 3-11: A Student's Guide* (pp. 33–50). SAGE Publications Ltd.

Cox, A. R. (1985). Alphabetic Phonics: An organization and expansion of orton-gillingham. *Annals of Dyslexia* 35**,** 187–198. Doi:10.1007/BF02659187

Cuturi, L. F. & Gori, M. (2019). Biases in the visual and haptic subjective vertical reveal the role of proprioceptive/vestibular priors in child development. *Front Neurol, 9*, 1–10. Doi:10.3389/fneur.2018.01151

Cuturi, L. F., Cappagli, G., Yiannoutsou, N., Price, C. & Gori, M. (2022). Informing the design of a multisensory learning environment for elementary mathematics learning. *J Multimodal User Interfaces 16*, 155–171. Doi:10.1007/s12193-021-00382-y

Cuvo, A. J., May, M. E. & Post, T. M. (2001). Effects of living room, Snoezelen room, and outdoor activities on stereotypic behaviour and engagment by adults with profound mental retardation. *Research in Developmental Disabilities, 22*(3), 183-204. Doi:10.1016/S0891-4222(01)00067-1

Dallacqua, A. K. (2012). Exploring Literary Devices in Graphic Novels, *Language Arts 89*(6), 365–378.

Darling-Hammond, L., Wei, R. C., Andree, A., Richardson, N. & Orphanos, S. (2009). *Professional learning in the learning profession: A status report on teacher development in the United States and abroad*. National Staff Development Council.

Davies, C. (2012). *Creating Multisensory Environments*. Routledge.

De Boer, A., Pijl, S. J. & Minnaert, A. (2011). Regular primary school teachers' attitudes towards inclusive education: A review of the literature. *International Journal of Inclusive Education, 15*(3), 331–353. Doi:10.1080/13603110903030089

de Jong, P. F. (1998). Working memory deficits of reading disabled children. *Journal of Experimental Child Psychology, 70,* 75–96.

de Jong, P. F. & van Bergen, E. (2017). Issues in diagnosing dyslexia. In E. Segers, & P. van den Broek (Eds.), *Developmental perspectives in written language and literacy: In honor of Ludo Verhoeven* (pp. 349–361). John Benjamins Publishing Company.

Decker, M. M. & Buggey, T. (2014). Using video self- and peer modeling to facilitate reading fluency in children with learning disabilities. *Journal of learning disabilities*, *47*(2), 167–177. Doi:10.1177/0022219412450618

Decker, S. L., Hale, J. B. & Flanagan, D. P. (2013). Professional practice issues in the assessment of cognitive functioning for educational applications. *Psychology in the Schools*, *50*(3), 300–313.

Degani, T., Yagev, B. D., O. & Levy, A. L. (2023). Does brief exposure to a written text affect spelling performance in a second language?. *Read Writ* 36, 1901–1935. Doi:10.1007/s11145-022-10349-4

Desimone, L. M. & Garet, M. S. (2015). Best practices in teachers' professional development in the United States. Psychology, *Society and Education, 7*(3), 252–263.

Devaney, A. A., Begeny, J. C., Haskett, M. E. & Ginns, D. S. (2019). Effects of a Reading Fluency Intervention on Middle School Students Attending a Residential Treatment Center for Youth with Emotional and Behavioral Disorders. *Contemp School Psychol*, *23*, 367–378. Doi:10.1007/s40688-018-0184-z

Dickman, E. (2017). *Do we need a new definition of dyslexia?* (Vol. 6). The Examiner, International Dyslexia Association. https://dyslexiaida.org/do-we-need-a-new-definition-of-dyslexia/

Didehbani, N., Allen, T., Kandalaft, M., Krawczyk, D. & Chapman, S. (2016). Virtual reality social cognition training for children with high functioning autism. *Computers in Human Behavior, 62,* 703–711. Doi:10.1016/j.chb.2016.04.033.

Dignath, C., Rimm-Kaufman, S., van Ewijk, R. & Kunter, M. (2022). Teachers' Beliefs About Inclusive Education and Insights on What Contributes to Those Beliefs: a Meta-analytical Study. *Educ Psychol Rev 34,* 2609–2660. Doi:10.1007/s10648-022-09695-0

Dimitriou, A., Koiranidou, M. N. & Filippou, X. (2008). The role of the cerebellum in the central nervous system. *Brain, 45*(3). http://www.encephalos.gr/45-3-01g.htm

Donegan, P. (2015). The Emergence of Phonological Representation. In B. MacWhinney & W. O' Grady (Eds.), *The handbook of language emerge* (34-52). John Wiley & Sons, Inc. Doi:10.1002/9781118346136

Dore, W. (2013). The Breakthrought -and the Hope. In W. Dore (Ed*), Dyslexia and ADHD- the miracle cure*. John Blake.

Dore, W. (2017). *The Dore Program- Helping People Who Suffer From Dyslexia*. https://tinyurl.com/cvpjp93j

Driver, J. & Noesselt, T. (2008). Multisensory interplay reveals crossmodal influences on 'sensory-specific' brain regions, neural responses, and judgments. *Neuron, 57*, 11–23.

Drummond, C. R., Ahmad, S. A. & Rourke, B. P. (2005). Rules for the classification of younger children with nonverbal learning disabilities and basic phonological processing disabilities. *Archives of clinical neuropsychology: the official journal of the National Academy of Neuropsychologists*, *20*(2), 171–182. Doi:10.1016/j.acn.2004.05.001

DuBard, E. & Martin, M. K. (2000). *Teaching language-deficient children: Theory and application of the association method for multisensory teaching*. Educators Publishing Service.

Ehri, L. C. (2000). Learning to read and learning to spell: Two sides of a coin. *Topics in Language Disorders, 20*(3), 19–36. Doi:10.1097/00011363-200020030-00005

Ehri, L. C., Nunes, S. R., Stahl, S. A., Willows, D. M. (2001). Systematic phonics instruction helps students learn to read: Evidence from the national reading panel's meta-analysis. *Review of Educational Research, 71*(3), 393–447. Doi:10.3102/00346543071003393

Elbeheri, G. & Everatt, J. (2007). Literacy Ability and Phonological Processing Skills amongst Dyslexic and Non-Dyslexic Speakers of Arabic. *Reading and Writing, 20*, 273-294. Doi:10.1007/s11145-006-9031-0

Elsner, R. (2015). *Chemical Senses*. In S. Krauss Whitbourne (Ed.), *The Encyclopedia of Adulthood and Aging.* John Wiley & Sons, Inc.

Elsner, R. J. F. (2002). Changes in eating behavior during the aging process. *Eating Behaviors, 3,* 15–43. Doi: 10.1016/S1471-0153(01)00041-1

Engelmann, S. & Bruner, E. (1975). *Distar Reading II: An Instructional System*. Science Research Associates.

Erdem R. (2017). Students with special educational needs and assistive technologies: A literature review. *Turkish Online Journal of Educational Technology: TOJET*, 16(1), 128–146.

Ericsson, K. A. & Kintsch, W. (1995). Long-term working memory. *Psychological Review, 102*, 211–245.

Ernst, M. O. & Banks, M. S. (2002). Humans integrate visual and haptic information in a statistically optimal fashion. *Nature, 415*, 429–433. Doi:10.1038/415429a

Ernst, M. O. & Bülthoff, H. H. (2004). Merging the senses into a robust percept. *Trends in Cognitive Sciences, 8*(4), 162–169. Doi:10.1016/j.tics.2004.02.002

European Agency for Special Needs and Inclusive Education (2015). *Empowering Teachers to Promote Inclusive Education*. Retrieved April 12, 2021 from https://tinyurl.com/4yjukfay

Even, R. & Ball, D. L. (2009). *The professional education and development of teachers of mathematics – the 15th ICMI study*. New York.

Evmenova, A. S., Graff, H. J., Jerome, M. K. & Behrmann, M. M. (2010). Word Prediction Programs with Phonetic Spelling Support: Performance Comparisons and Impact on Journal Writing for Students with Writing Difficulties. *Learning Disabilities Research & Practice 25*(4), 170–182. Doi:10.1111/j.1540-5826.2010.00315.x

Faber, G. (2006a). The systematic Use of Visualizing and Verbalizing Methods in Remedial Spelling Training: Conceptual Issues, Practical Applications, And Empirical Findings. In C. Hayes (Ed), *Dyslexia in Children: New Research*. Nova Science Pub Inc.

Faber, G. (2006b). The Effects Of Visualizing And Verbalizing Methods In Remedial Spelling Training: Individual Changes In Dyslexic Students' Spelling Test Performance. *International Journal Of Special Education, 21*(3), 85-95.

Falchier, A., Clavagnier, S., Barone, P. & Kennedy, H. (2002). Anatomical evidence of multimodal integration in primate striate cortex. *The Journal of neuroscience: the official journal of the Society for Neuroscience*, *22*(13), 5749–5759. Doi:10.1523/JNEUROSCI.22-13-05749.2002

Farrell, M. L. & Sherman, G. F. (2011). Multisensory Structured Language Education. In J. R. Birsh (Ed), *Multisensory Teaching of Basic language Skills*, (25–48). Paul H. Brookes.

Fazmina, A. F., Jazeet, A. M. & Saravanakumar, A. R. (2020). Enhancing the Attainment of Students with Dyslexia in Science through Multisensory Instructional Strategies. *J. Xidian Univ*, *14*(6), 1812-1818.

Fender, M. (2008). Spelling knowledge and reading development: Insights from Arab ESL learners. *Reading in a Foreign Language, 20*(1), 19–42.

Ferguson, J. M. (1999). High School Students' Attitudes toward Inclusion of Handicapped Students in the Regular Education Classroom. *The Educational Forum, 63*(2), 173-179. Doi: 10.1080/00131729908984409

Fernald, G. M. & Keller, H. (1921). The Effect of Kinaesthetic Factors in the Development of Word Recognition in the Case of Non-Readers. *Journal of Educational Research, 4,* 355-377.

Figeľ, J. (2016). Vzdelanie – kľúč k budúcnosti Európy. http://tinyurl.com/3wbjych4

Finnegan, J. (2016). *Lighting up Young Brains. How Parents, Carers and Nurseries Support Children's Brain Development in the First Five Years*. Save the Children.

Fishley, K. M., Konrad, M., Hessler, T. & Keesey. S. (2012). Effects of GO FASTER on Morpheme Definition Fluency for High School Students with High-Incidence Disabilities. *Learning Disabilities Research & Practice,* 27(3), 104–115. Doi: 10.1111/j.1540-5826.2012.00356.x

Flanagan, S., Bouck, E. C. & Richardson, J. (2013). Middle school special education teachers' perceptions and use of assistive technology in literacy instruction. *Assistive Technology, 25*, 24–30. Doi:10.1080/10400435.2012.682697

Flecker, M. & Cogan, J. (2000). The Learning Skills. In *Dyslexia in Practice: A Guide for Teachers*. In J. Townend & M. Turner (Eds.), 209–249. Kluwer Academic/Plenium Publishers.

Fleischmann, A., Shykind, B. M., Sosulski, D. L., Franks, K. M., Glinka, M. E., Mei, D. F., Sun, Y., Kirkland, J., Mendelsohn, M., Albers, M. W. & Axel, R. (2008). Mice with a "monoclonal nose": perturbations in an olfactory map impair odor discrimination. *Neuron*, *60*(6), 1068–1081. Doi: 10.1016/j.neuron.2008.10.046

Fletcher, J. M., Lyon, G. R., Fuchs, L. S. & Barnes, M. A. (2019). *Learning disabilities: From identification to intervention* (2nd ed.). Guilford Press.

Flink, D. (2014). *Thinking differently: An inspiring guide for parents of children with learning disabilities.* Harper Collins.

Fokides, E., Chronopoulou, M. & Kaimara, P. (2019). Comparing videos and a 3D virtual environment for teaching school-related functional skills and behaviors to students with ADHD or developmental dyslexia, displaying challenging behaviors: a case study. *RPTEL 14*, 22. Doi:10.1186/s41039-019-0117-0

Foorman, B. R., Francis, D. J., Shaywitz, S. E., Shaywitz, B. A. & Fletcher, J. M. (1997). The case for early reading intervention. In B. A. Blachman (Ed.), *Foundations of reading acquisition and dyslexia: Implications for early intervention* (pp. 243–264). Lawrence Erlbaum Associates Publishers.

Fortes, I. S., Paula, C. S., Oliveira, M. C., Bordin, I. A., de Jesus Mari, J. & Rohde, L. A. (2016). A cross-sectional study to assess the prevalence of DSM-5 specific learning disorders in representative school samples from the second to sixth grade

in Brazil. *European child & adolescent psychiatry*, *25*(2), 195–207. Doi:10.1007/s00787-015-0708-2

Foss, B. (2016). *The dyslexia empowerment plan: A blueprint for renewing your child's confidence and love of learning.* Ballantine Books.

Foxe, J. J. & Schroeder, C. E. (2005). The case for feedforward multisensory convergence during early cortical processing. *Neuroreport, 16,* 419–423.

Frances, A. (2013). *Saving normal: An insider's revolt against out-of-control psychiatric diagnosis, DSM5, big pharma, and the medicalization of ordinary life*. William Morrow.

Freese, G. (2003). *Letterland: Teacher's Guide*. Cambridge: Letterland International Ltd.

Freina, L. & Ott, M. (2015). A literature review on Immersive Virtual Reality in education: State of the art and perspectives. International Scientific Conference, 131-143, *eLearning & Software for Education, 1*.

Frk, V. (2014). Zmeny, očakávania a výzvy profesijného vzdelávania zamestnancov, Vzdelávanie asociálna stratifikácia, University of Prešov, pp. 50-71. https://tinyurl.com/yc248nt2

Fulbright, R. K., Shaywitz, S. A., Shaywitz, B. A., Pugh, K. R., Skudlarski, P., Constable, R. T., Fletcher, J. M., Liberman, A. M., Shankweiler, D. P., Katz, L., Lacadie, C., Bronen, R. A., Marchione, K. E. & Gore, J. C. (1997). Neuroanatomy of reading and dyslexia. In B.S. Peterson (Ed.), *Child and adolescent psychiatric clinics of North America: Neuroimaging*, *6*(2), 431-445.

Gaitanidi, L.-A., Corujo-Vélez, C. & Vega-Gea, E. (2023). The Impact of Dyslexia Box: A Case Study on Students in an Integration Class in Greece. *Education Sciences*, *13*(5), 486. MDPI AG. Doi:10.3390/educsci13050486

Galuschka, K., Görgen, R., Kalmar, J., Haberstroh, S., Schmalz, X. & Gerd Schulte-Körne (2020). Effectiveness of spelling interventions for learners with dyslexia: A meta-analysis and systematic review, *Educational Psychologist, 55*(1), 1-20, Doi:10.1080/00461520.2019.1659794

Galuschka, K., Ise, E., Krick, K. & Schulte-Körne, G. (2014). Effectiveness of treatment approaches for children and adolescents with reading disabilities: A meta-analysis of randomized controlled trials. *PLoS One, 9*(2), e89900. Doi:10.1371/journal.pone.0089900

García, J. L., Heckman, J. J. & Ziff, A. L. (2019). Early childhood education and crime. *Infant Mental Health Journal, 40,* 141–151. Doi:10.1002/21760

Garrington, A. (2010). Touching Texts: The Haptic Sense in Modernist Literature. *Literature Compass, 7*(9), 810–823. Doi: 10.1111/j.1741-4113.2010.00740.x

Gathercole, S. E. & Baddeley, A. D. (1993). *Working memory and language*. LEA.

Gavriilidou-Tsielepi, E. (2011). Barren ground for change: Difficulty in implementing inclusive education in Cyprus. In P. Angelidis (Ed.), *Pedagogies of Inclusion* (pp. 351-377). Diadrasi.

Geiss, S., Rivers, K. O., Kennedy, K. & Lombardino, L. J. (2012). Effects of multisensory phonics-based training on the word recognition and spelling skills of adolescents with reading disabilities. *International Journal of Special Education, 27*(1), 60–73.

Genova, A. (2015). Barriers to inclusive education in Greece, Spain and Lithuania: results from emancipatory disability research. *Disability and Society, 30*(7), pp.1042-1054. Doi: 10.1080/09687599.2015.1075867

Gharaibeh, M. & Dukmak, S. (2022). Effect of computer-based multisensory program on English reading skills of students with Dyslexia and reading difficulties, *Applied Neuropsychology: Child, 11*(3), 504-517, Doi: 10.1080/21622965.2021.1898395

Ghazanfar, A. A. & Schroeder, C. E. (2006). Is neocortex essentially multisensory? *Trends Cogn. Sci, 10*, 278–285.

Gibbs, S. J. & Elliott, J. G. (2020). The dyslexia debate: life without the label. *Oxf. Rev. Educ.* 46, 487–500. Doi:10.1080/03054985.2020.1747419

Gibby-Leversuch, R., Hartwell, B. K. & Wright, S. (2019). Dyslexia, Literacy Difficulties and the Self-Perceptions of Children and Young People: a Systematic Review**.** *Current Psychology*, *38*, 1-18. Doi:10.1007/s12144-019-00444-1

Gibson, S. & Kendall, L. (2010). Stories from school: Dyslexia and learners' voices on factors impacting on achievement. *Support for Learning, 25*(4), 187–193. Doi:10.4102/ajod.v7i0.363

Giess, S., Rivers, K. O., Kennedy, K. & Lombardino, L. J. (2012). Effects of multisensory phonics-based training on the word recognition and spelling skills of adolescents with reading disabilities. *International Journal of Special Education, 27*(1), 60–73.

Gillam, R., Gillam, S., Holbrook, S. & Orellana, C. (2017). Language disorder in children. In S. Goldstein & M. DeVries (Eds), *Handbook of DSM-5 Disorders in Children and Adolescents* (pp.57-76). Doi: 10.1007/978-3-319-57196-6

Gillingham, A. & Stillman, B. W. (1997). *The Gillingham manual*. Educators Publishing Service.

Gillingham, A. & Stillman, B. (1956). *Remedial Training for Children with Specific Disability in Reading, Spelling and Penmanship* (5th ed). Educators Publishing Service.

Giofrè, D., Toffalini, E., Provazza, S., Calcagnì, A., Altoè, G. & Roberts, D. J. (2019). Are children with developmental dyslexia all the same? A cluster analysis with more than 300 cases. *Dyslexia 25(*3), 284-295. Doi:10.1002/dys.1629

Giraldo-Chica, M., Hegarty, J. P. & Schneider, K. A. (2015). Morphological differences in the lateral geniculate nucleus disabilities. *Neuroimage clinical, 5,* 81–101. Doi: 10.1016/j.nicl.2015.03.011.

Glazzard, J. (2010). The impact of dyslexia on pupils' self-esteem. *Support for Learning, 25*(2), 63–69. Doi:10.1111/j.1467-9604.2010.01442.x

Gnardellis, Ch. (2022). *Data analysis with the IBM SPSS Statistics 28*. Papazisi.

Gonzalez, M. T. D., Phillips-Silver, J., Maurno, N. G., Fernández García, L. & Ruiz-Castañeda, P. (2023). Improving phonological skills and reading comprehension in deaf children: A new multisensory approach, *Scientific Studies of Reading*, *27*(2), 119-135. Doi:10.1080/10888438.2022.2095280

Gori, M., Del Viva, M., Sandini, G. & Burr, D. C. (2008). Young children do not integrate visual and haptic form information. *Curr Biol, 18*, 694–698. Doi:10.1016/j.cub.2008.04.036

Goswami, U. (2006). Neuroscience and education: From research to practice? *Nature Reviews Neuroscience, 7*(5), 406–413. Doi:10.1038/nrn1907

Goswami, U. (2015). *Children's Cognitive Development and Learning*. Cambridge Review Trust.

Goswami, U., Power, A. J., Lallier, M. & Facoetti, A. (2014). Oscillatory "temporal sampling" and developmental dyslexia: Towards an overarching theoretical framework. *Frontiers in Human Neuroscience*. Doi:10.3389/fnhum.2014.00904

Gradwell, J. M. (2006). Teaching in spite of, rather than because of, the test. *Measuring history: Cases of state-level testing across the United States*, 157-176.

Gregory, G. H. & Kuzmich, C. (2010). *Student Teams that Get Results. Teaching Tools for the Differentiated Classroom*. Corwin.

Gresham, F. M. & Vellutino, F. R. (2010). What is the role of intelligence in the identification of specific learning disabilities?: Issues and clarifications. *Learning Disabilities Research & Practice*, *25*(4), 194–206. Doi:10.1111/j.1540-5826.2010.00317.x

Grigorenko E. L., Compton D., Fuchs L., Wagner R. K., Willcutt E. & Fletcher J. M. (2019). Understanding, educating, and supporting children with specific learning disabilities: 50 Years of science and practice. *American Psychologist*, *75*, 37–51. Doi:10.1037/amp0000452

Gundi, P. (2015). Dyslexia in Foreign and Greek Students. (Dissertation Thesis). National and Kapodistrian University of Athens.

Guðjónsdóttir, H. & Óskarsdóttir, E. (2020). Dealing with diversity: debating the focus of teacher education for inclusion. *European Journal of Teacher Education, 43*(1), 95-109. Doi:10.1080/02619768.2019.1695774

Hanley, J. R., Hastie, K. & Kay, J. (1992). Developmental surface dyslexia and dysgraphia: An orthographic processing impairment. *The Quarterly Journal of Experimental Psychology Section A*, *44*(2), 285–319. Doi:10.1080/02724989243000046

Harari, Y. N. (2015). Sapiens: *A brief history of humankind*. Alexandreia.

Hardiana, N. & Suyata P. (2018). The effectiveness of VAK (visual, auditory, kinesthetic) model in learning of summary writing. *International Journal of Research and Review*, *5*(8), 43-49.

Hardman, J. (2020). Analysing Student Talk Moves in Whole-Class Teaching. In N. Mercer, R. Wegerif & L. Major (Eds.), *The Routledge International Handbook of Research on Dialogic Education* (pp. 152–166). Routledge.

Harlen, W. (2007). *Assessment of Learning*. SAGE Publications.

Haskings-Winner, J. (2014). Teaching history teachers in the classroom. In R. Sandwell & A. von Heyking (Eds.), *Becoming a history teacher: Sustaining practices in historical thinking and knowing* (pp. 283–290). University of Toronto Press.

Hatzimichael, E. (2010). Reading difficulties and dyslexia. Construction of a psychometric tool for detecting Dyslexic Characteristics in Primary School students. (Dissertation Thesis). National and Kapodistrian University of Athens.

Heafner, T. L., Lipscomb, G. B. & Fitchett, P. G. (2014). Instructional Practices of Elementary Social Studies Teachers in North and South Carolina. *The Journal of Social Studies Research, 38*(1), 15-31. Doi:10.1016/j.jssr.2013.12.002

Helbig, H. B. & Ernst, M. O. (2007). Optimal integration of shape information from vision and touch. *Exp Brain Res, 179*, 595–606. Doi:10.1007/s00221-006-0814-y

Henry, M. K. (1998). Structured, sequential, multisensory teaching: The Orton legacy. *Bulletin of the Orton Society, 48,* 3–26. Doi.org/10.1007/s11881-998-0002-9

Hébert, C., Jenson, J. & Terzopoulos, T. (2021). Access to technology is the major challenge: Teacher perspectives on barriers to DGBL in K-12 classrooms. *E-Learning and Digital Media, 18*(3), 307-324. Doi:10.1177/2042753021995315

Herman, R. (1995). Effects of the Herman Method on the reading achievement of dyslexic students. *Clinical Studies of Multisensory Language Education*, 1-21. http://www.lexialearning.com

Hester, E. & Hodson, B.W. (2004). The role of phonological representation in decoding skills of young readers, *Child Language Teaching and Therapy, 20*(2), 115-133.

Hettiarachchi, S., Walisundara, D. C. & Ranaweera, M. (2022). The effectiveness of a multisensory traditional storytelling programme on target vocabulary development in children with disabilities accessing English as a second language: A preliminary study. *Journal of Intellectual Disabilities*, *26*(1), 90-108. Doi:10.1177/1744629520961605

Higbee, K. (1987). Process Mnemonics: Principles, Prospects, and Problems. In M. A. McDaniel & M. Pressley (Eds), *Imagery and Related Mnemonic Processes* (407-427). Doi:10.1007/978-1-4612-4676-3_19

Higbee, K. (1987). Process Mnemonics: Principles, Prospects, and Problems. In M. A. McDaniel & M. Pressley (Eds), *Imagery and Related Mnemonic Processes* (407-427). Doi:10.1007/978-1-4612-4676-3_19

Hilt, L. T. (2015). Included as excluded and excluded as included: minority language pupils in Norwegian inclusion policy. *International Journal of Inclusive Education, 19*(2), pp.165-182. doi: 10.1080/13603116.2014.908966

Hoeft, F., Ueno, T., Reiss, A. L., Meyler, A., Whitfield-Gabrieli, S., Glover, G. H., Keller, T. A., Kobayashi, N., Mazaika, P., Jo, B., Just, M. A. & Gabrieli, J. D. (2007). Prediction of children's reading skills using behavioral, functional, and structural neuroimaging measures. *Behavioral neuroscience*, *121*(3), 602–613. Doi:10.1037/0735-7044.121.3.602

Hofman, R. H. & Kilimo, J. S. (2014). Teachers' attitudes and self-efficacy towards inclusion of pupils with disabilities in Tanzanian schools. *Journal of Education and Training*, *1*(2), 177–198. Doi:10.5296/jet.v1i2.5760

Hogg J., Cavet J., Lambe L. & Smeddle M. (2001). The use of "Snoezelen" as multisensory stimulation with people with intellectual disabilities: A review of the research. *Research in Developmental Disabilities, 22*, 353–372. Doi:10.1016/S0891-4222(01)00077-4

Holmes, V. M. & Carruthers, J. (1998). The relation between reading and spelling is skilled adult readers. *Journal of Memory and Language, 39*(2), 264–289.

Holstein, K., McLaren, B. M. & Aleven, V. (2017, March). Intelligent tutors as teachers' aides: exploring teacher needs for real-time analytics in blended classrooms. In Proceedings of the seventh international learning analytics & knowledge conference (pp. 257–266). ACM.

Homeschooling with dyslexia (2023). Comparing Orton-Gillingham Home School Reading Programs. https://tinyurl.com/2wkfdw5f

Hood, M. & Conlon, E. (2004). Visual and auditory temporal processing and early reading development. *Dyslexia, 10*(3), 234–252. Doi:10.1002/dys.273

Hoogland, D., White, L. & Knight, S. (2023). Speech Rate and Turn-Transition Pause Duration in Dutch and English Spontaneous Question-Answer Sequences. *Languages*, *8*(2), 115. Doi: 10.3390/languages8020115

Hornsby, B. & Shear, F. (1980). *Alpha to Omega: The A-Z of Teaching Reading, Writing and Spelling.* Heinemann Educational.

Hosler, J. & Boomer, K. B. (2011). Are Comic Books an Effective Way to Engage Nonmajors in Learning and Appreciating Science? *CBE-Life Sciences Education, 10*(3), 309–317. Doi:10.1187/cbe.10-07-0090.

Howard E. (2013). Memory, Types of. In: Runehov A.L.C., Oviedo L. (Eds), *Encyclopedia of Sciences and Religions*. Doi:10.1007/978-1-4020-8265-8_201333

Howard, E. (2013). Memory, Types of. In: Runehov A.L.C., Oviedo L. (Eds), *Encyclopedia of Sciences and Religions*. Doi:10.1007/978-1-4020-8265-8_201333

Howes, D. (Ed.). (2004). *Empire of the Senses: The Sensual Culture Reader* (1st ed.). Routledge. Doi:10.4324/9781003230700

Huang, J., Liu, J., Tian, R., Liu, K., Zhuang, P., Sherman, H. T., Budjan, C., Fong, M., Jeong, M.-S. & Kong, X. -J. (2022). Correction: Huang et al. A Next Generation Sequencing-Based Protocol for Screening of Variants of Concern in Autism Spectrum Disorder. *Cells* 2022, *11*(20), *Cells*. Doi:10.3390/cells11203276

Hruby, G. G. (2019). Is my adolescent/adult struggling reader dyslexic? *Journal of Adolescent and Adult Literacy, 62*(6), 673–676. Doi:10.1002/jaal.953Hughes, J. E., Cheah, Y. H., Shi, Y. & Hsiao, K. (2020). Preservice and inservice teachers' pedagogical reasoning underlying their most-valued technology-supported instructional activities. *Journal of Computer Assisted Learning, 36*, 549–568. Doi:10.1111/jcal.12425

Hunter-Carsch, M. 2001. *Dyslexia; A Psychosocial Perspective*. Whurr.

Hyatt, K. J. (2007). Brain Gym®: Building stronger brains or wishful thinking? *Remedial and Special Education, 28*(2), 117–124.

International Dyslexia Association (IDA). (2023). About dyslexia. https://dyslexiaida.org/perspectives/

Irmsher, K. (1995). Inclusive Education in Practice: The Lessons of Pioneering School Districts. *OSSC Bulletin*, *38*(6), 1-63.

Jeffes, B. (2016). Raising the reading skills of secondary-age students with severe and persistent reading difficulties: evaluation of the efficacy and implementation of a phonics-based intervention program. *Educational Psychology in Practice*, 32(1), 73-84. Doi: 10.1080/02667363.2015.1111198

Jordan, N. C., Kaplan, D., Oláh, L. N. & Locuniak, M. N. (2006). Number Sense Growth in Kindergarten: A Longitudinal Investigation of Children at Risk for Mathematics Difficulties. *Child Development, 77*(1), 153-175. Doi:10.1111/j.1467-8624.2006.00862.

Jordan, N. C. & Levine, S. C. (2009). Socioeconomic variation, number competence, and mathematics learning difficulties in young children. *Dev Disabil Res Rev, 15*, 60–68. Doi:10.1002/ddrr.46

Joshi, M. R., Dahlgren, M. & Boulware-Gooden, R. (2002). Teaching reading in an inner city school through a multisensory teaching approach. *Annals of Dyslexia, 52*, 229–242.

Julianti, Husein, R. & Pulungan, A. H. (2020). The Use of Letterland Strategies in Teaching English Vocabulary to Young Learners. *Proceedings of the 5th Annual International Seminar on Transformative Education and Educational Leadership (AISTEEL 2020) 25/11/2020,* 302-305. Atlantis Press.

Kalyvioti, K. & Mikropoulos, T. A. (2014). Virtual environments and dyslexia: A literature review. *Procedia Computer Science, 27*, 138–147. Doi:10.1016/j.procs.2014.02.017.

Kandel, E. (2008). *Searching for memory*. University Publications of Crete.

Kandel, E., Dudai, Y. & Mayford, M. (2014). The Molecular and Systems Biology of Memory. *Cell, 157*(1), 163-186. Doi: 10.1016/j.cell.2014.03.001

Kapralos, B., Collins, K. & Uribe-Quevedo, A. (2017). The senses and virtual environments, *The Senses and Society, 12*(1), 69-75. Doi: 10.1080/17458927.2017.1268822

Kasturirangan, K. (2019). Draft of National Education Policy-2019. *Human Resource Development Government of India*. https://tinyurl.com/4u6wkmrj

Katai, Z. (2011). Multi-sensory method for teaching-learning recursion, *Computer Applications in Engineering Education, 19*(2), 234-243. Doi:10.1002/cae.20305

Katusic, S. K., Colligan, R. C., Barbaresi, W. J., Schaid, D. J. & Jacobsen, S. J. (2001). Incidence of reading disability in a population-based birth cohort, 1976–1982, Rochester, Minnesota. *Mayo Clinic Proceedings, 76*, 1081–1092.

Katusic, S. K., Colligan, R. C., Weaver, A. L. & Barbaresi, W. J. (2009). The forgotten learning disability—Epidemiology of written language disorder in a population-based birth cohort (1976–1982). *Pediatrics, 123*, 1306–1313.

Kavale, K. A. & Mostert, M. P. (2010). River of ideology, islands of evidence. *Exceptionality, 11*(4), 191-208. Doi: 10.1207/S15327035EX1104_1

Kearns, D., Hancock, R., Hoeft, F., Pugh, K. & Frost, S. (2018). The Neurobiology of Dyslexia. *TEACHING Exceptional Children*, *51*(3), 175–188. Doi: 10.1177/0040059918820051

Kefallinou, A., Symeonidou, S. & Meijer, C. J. W. (2020). Understanding the value of inclusive education and its implementation: A review of the literature. *Prospects,* 49, 135–152. Doi:10.1007/s11125-020-09500-2

Kelly, K. & S. Phillips. (2016). *Teaching Literacy to Learners with Dyslexia A Multisensory Approach*. 2nd ed. Sage.

Kennedy, M. M. (2016). How does professional development improve teaching? *Review of Educational Research, 86*(4), 945–980. Doi:10.3102/0034654315626800

Khlaif, Z. (2018). Teachers' Perceptions of Factors Affecting Their Adoption and Acceptance of Mobile Technology in K-12 Settings, *Computers in the Schools, 35*(1), 49-67. Doi: 10.1080/07380569.2018.1428001

Ko, B. & Boswell, B. (2013). Teachers' Perceptions, Teaching Practices, and Learning Opportunities for Inclusion, *The Physical Educator, 70, 223-242.*

Koch, K. (2017). Stay in the box! Embedded assistive technology improves access for students with disabilities. *Education Sciences, 7*(4), 82.

Koegel, L., Matos-Freden, R., Lang, R. & Koegel, R. (2012). Interventions for children with autism spectrum disorder in inclusive school setting. *Cognitive and Behavioral Practice, 19*(3), 401-412.

Koliadis, E. (2007). *Learning Theories and Educational Practice: cognitive theories, (vol. 3)*. Self-publishing.

Koliadis, E. (2018). *Cognitive Psychology - Cognitive Neuroscience and Educational Practice (vol. 4).* Grigoris.

Koller D., McPherson A. C., Lockwood I., Blain-Moraes S. & Nolan J. (2018). The impact of Snoezelen in pediatric complex continuing care: A pilot study. Journal of *Pediatric Rehabilitation Medicine, 11*. Doi:31–41. 10.3233/PRM-150373

Konstantopoulos, S. (2011). How Consistent Are Class Size Effects? *Evaluation Review, 35*(1), 71-92. Doi:10.1177/0193841X11399847

Korkmaz, C. S. & Karatepe, C. (2018). The Impact of Multi-Sensory Language Teaching on Young English Learners' Achievement in Reading Skills. *Research on Youth and Language, 12*(2), 80-95.

Košak-Babuder, M., Kormos, J., Ratajczak, M. & Pižorn, K. (2019). The effect of read-aloud assistance on the text comprehension of dyslexic and non-dyslexic English language learners. *Language Testing, 36*(1), 51–75. Doi:10.1177/0265532218756946

Kouvelas, H. (1985). *Anatomy Physiology second issue*. Eugenides Foundation.

Krainer, K. (2011). Teachers as stakeholders in mathematics education research. In: B. Ubuz (Ed), *Proceedings of the 35th conference of the International Group for the Psychology of Mathematics Education vol 1* (pp. 47–62). PME.

Kroemer, E. K., Kroemer, H. B. & Kroemer Hoffman, A. D. (2018). Human Senses. In K. Kroemer Elbert, H. B. Kroemer & A. D. Kroemer Hoffman (Eds.), *Ergonomics: How to design For Ease And Efficiency, 3rd Edition* (171-252). Academic Press.

Krupa, D. (2003). Localization of memory traces. In J. Byrne (Ed.), *Learning and Memory* (332-334). Macmillan.

Kuder, S. J. (1990). Effectiveness of the DISTAR Reading Program for Children with Learning Disabilities. *Journal of Learning Disabilities, 23*(1), 69–71. Doi:10.1177/002221949002300114

Kuppen, S., Huss, M. & Goswami, U. (2014). A longitudinal study of basic auditory processing and phonological skills in children with low IQ. *Applied Psycholinguistics, 35*(6), pp.1109–1141. Doi:10.1017/S0142716412000719

LaBerge, D. & Samuels, S. J. (1974). Toward a Theory of Automatic Information Processing in Reading. *Cognitive Psychology, 6*, 293-323. Doi:10.1016/0010-0285(74)90015-2

Lai, C. Y. (2003). The use of multisensory environments on children with disabilities: a literature review. *International Journal of Therapy and Rehabilitation, 10*, 358–363.

Lam, B. H. (2015). Teacher professional development in Hong Kong compared to Anglosphere: The role of Confucian philosophy. Psychology, *Society and Education, 7*(3), 295–310.

Lancioni G. E., Cuvo A. J. & O'Reilly M. F. (2002). Snoezelen: An overview of research with people with developmental disabilities and dementia. *Disability and Rehabilitation, 24*, 175–184. Doi:10.1080/09638280110074911

Landahl, J. (2019). Learning to listen and look: the shift from the monitorial system of education to teacher-led lessons. *The Senses and Society, 14*(2), 194-206. Doi:10.1080/17458927.2019.1619314

Landerl, K. & Willburger, E. (2010). Temporal processing, attention, and learning disorders, *Learning and Individual Differences, 20*(5), 393–401.

Landerl, K. et al. (2013). Predictors of developmental dyslexia in European orthographies with varying complexity. *Journal of Child Psychology and Psychiatry*, *54*, 686–694. Doi:10.1111/jcpp.12029

Laney, J. (2011). Orton-Gillingham Reading Method. In: Goldstein S. & Naglieri J. A. (eds), *Encyclopedia of Child Behavior and Development*. Doi:10.1007/978-0-387-79061-9_2048

Larimore, J. (2017). 6:00 a.m. Time to Start the Day! How Our Senses Help Us Wake up! In J. Larimore (Ed.), *Neuroscience Basics*, (19-38). Academic Press.

Law 1566/1985 of Greek Government (GG 167/A/30-9-1985)

Law 2101 of Greek Government (GG 192A/1992)

Law 2289 of Greek Government (GG 2289/11-6-2019)

Law 3699 of Greek Government (GG 199/ 2-10-2008)

Law 3852/2010 of Greek Government (GG A 87/7.6.2010)

Law 3966/2011 of Greek Government (GG A 118/24.5.2011)

Law 4074/2012 of Greek Government (GG 88 A/2012)

Law 4415/2016 of Greek Government (GG A159/06.09.2016)

Law 4547/2018 of Greek Government (GG 102/A/12-6-2018)

Law 5009/2021 of Greek Government (GG 5009/τΒ΄/27-10-202)

Lenneberg, E.H. (1967). The Biological Foundations of Language, *Hospital Practice*, *2*(12), 59-67. Doi: 10.1080/21548331.1967.11707799

Lexcellent, C. (2019). *Human Memory and Material Memory*. Springer Nature.

Ling, L. M. & Mackenzie, N. M. (2015). An Australian perspective on teacher professional development in supercomplex times. Psychology, *Society and Education, 7*(3), 264–278.

Liu, X. & Pange, J. (2015). Early childhood teachers' perceived barriers to ICT integration in teaching: a survey study in Mainland China. *J. Comput. Educ,* 2, 61–75. Doi:10.1007/s40692-014-0025-7

Loizou, F. (2016). Changes in teaching in order to help students with learning difficulties improve in Cypriot primary classes, International Journal of Primary, *Elementary and Early Years Education, 44*(4), 371-390. Doi:10.1080/03004279.2014.948031

Loreman, T., Earle, C., Sharma, U. & Forlin, C. (2007). The development of an instrument for measuring pre-service teachers' sentiments, attitudes, and concerns about inclusive education, *International Journal of Special Education, 22*(2), 2007, 150-159.

Lorenzo, G., Lledó, A., Pomares, J., Roig, R. & Arnaiz, P. (2016). Bibliometric indicators in the study of Asperger syndrome between 1990 and 2014. *Scientometrics, 109*(1), 377–388. Doi:10.1007/s11192-016-1975-5.

Lorusso, M. L., Facoetti, A. & Bakker, D. J. (2011). Neuropsychological Treatment of Dyslexia: Does Type of Treatment Matter? *Journal of Disabilities, 44*(2), 136-149. Doi: 0.1177/0022219410391186

Lundborg, G. (2014). *The Hand and The Brain: From Lucy's Thumb to the Thought-Controlled Robotic Hand.* Doi: 10.1007/978-1-4471-5334-4

Lundetræ, K. & Thomson, J. (2018). Rhythm production at school entry as a predictor of poor reading and spelling at the end of first grade. *Reading and Writing, 31*, 215-237. Doi: 10.1007/s11145-017-9782-9

Luo, Y., Hitu, S., Lohrenz, T., Hula, A., Dayan, P., Ramey, S. L., Sonnier-Netto, L., Lisinski, J., LaConte, S., Montague, P. R. & Ramey, C. (2018). Early childhood investment impacts social decision-making four decades later. *Nature Communications, 9*(1), 1–10. Doi: 10.1038/s41467-018-07138-5

Lyon, G. R., Shaywitz, S. E. & Shaywitz, B. A. (2003). A definition of dyslexia. *Annals of Dyslexia*, 53(1), 1–14. Doi:10.1007/s11881-003-0001-9

Lyons, W., Thompson, S. A. & Timmons, V. (2016). 'We are Inclusive. We are a Team. Let's Just Do It': Commitment, Collective Efficacy, and Agency in Four Inclusive Schools. *International Journal of Inclusive Education, 20*(8), 889–907. Doi: 10.1080/13603116.2015.1122841

Lyytinen, H., Ahonen, T., Eklund, K., Guttorm, T. K., Kulju, P., Laakso, M.-L., Leiwo, M., Leppänen, P. H. T., Lyytinen, P., Poikkeus, A.-M., Richardson, U., Torppa, M. & Viholainen, H. (2004). Early development of children at familial risk for dyslexia—Follow-up from birth to school age. *Dyslexia*, *10*, 146–178.

Lyytinen, H., Aro, M., Eklund, K., Erskine, J., Guttorm, T., Laakso, M.-L., Leppänen, P. H.T., Lyytinen, P., Poikkeus, A.-M., Richardson, U. & Torppa, M. (2004). The development of children at familial risk for dyslexia: birth to early school age. *Annals of Dyslexia*, *54*, 184–220.

Lyytinen, P. & Lyytinen, H. (2004). Growth and predictive relations of vocabulary and inflectional morphology in children with and without familial risk for dyslexia. *Applied Psycholinguistics*, *25*, 397–411.

Mackay, N. (2012). *Removing Dyslexia as a Barrier to Achievement: The Dyslexia Friendly Toolkit (3rd Edition).* Wakefield: SEN Books.

Mag, A. G., Sinfield, S. & Burns, T. (2017). The benefits of inclusive education: new challenges for university teachers. *MATEC Web Conferences, 121*(12011). Doi: 10.1051/matecconf/201712112011

Manson, J. & Wendon, M. (2003). *Early Years Handbook.* Letterland.

Marcus, J. (2019). The Senses, Chemosensory Changes and Aging. In J. Marcus (Ed.), *Aging, Nutrition and Taste,* (65-104). Academic Press.

Margari, L., Buttiglione, M., Craig, F., Cristella, A., de Giambattista, C., Matera, E., Operto, F. & Simone, M. (2013). Neuropsychopathological comorbidities in learning disorders. *BMC neurology*, *13*, 198. Doi:10.1186/1471-2377-13-198

Maridaki-Kassotaki, K. (2002). The relation between phonological memory skills and reading ability in Greek-speaking children: Can training of phonological memory contribute to reading development? *European Journal of Psychology of Education, 17*(1), 63-75. Doi:10.1007/BF03173205

Marshall, A. (2014). Sensemaking in Second Life. *Procedia Technology, 13*, 107–111. Doi:10.1016/j.protcy.2014.02.014

Marshall, J. C. (1984). Toward a rational taxonomy of the developmental dyslexias. In R. N. Malatesha & H. A. Whitaker (Eds.), *Dyslexia: A global issue*. The Hague: Martinus Nijhoff.

Marshall, J. C. & Newcombe, F. (1973). Patterns of paralexia: A psycholinguistic approach. *Journal of Psycholinguistic Research, 2*, 175–199.

Martín, E. (2015). Pathways that converge in teacher professional development: Are they present in Spain? Psychology, *Society and Education, 7*(3), 327–342.

Mathes, P. G. & Denton. C. A. (2002). The Prevention and Identification of Reading Disability. *Seminars in Pediatric Neurology, 9*(3), 185–191. Doi:10.1053/spen.2002.35498

Mathias, B., Andrä, C., Schwager, A., Macedonia, M. & von Kriegstein, K. (2022). Twelve- and Fourteen-Year-Old School Children Differentially Benefit from Sensorimotor- and Multisensory-Enriched Vocabulary Training. *Educ Psychol Rev, 34*, 1739–1770. Doi:10.1007/s10648-021-09648-z

Matta, B. N., Guzman, J. M., Stockly, S. K. & Widner, B. (2015). Class Size Effects on Student Performance in a Hispanic-Serving Institution. *The Review of Black Political Economy, 42*(4), 443-457. Doi:10.1007/s12114-015-9214-5

Mavropalias, T. (2019). Research Highlights in Education and Science 2018 (Annual Book). The Greek Co-Teaching Model. Chapter one, p. 5-18, International Society for Research in Education and Science.

McAnally, K.I., Castles, A. & Stuart, G.W. (2000). Visual and Auditory Processing Impairments in Subtypes of Developmental Dyslexia: A Discussion. *Journal of Developmental and Physical Disabilities, 12*, 145–156. Doi:10.1023/A:1009459622805

McCabe, R. (2003). The efficacy of Lexia skills-based software for improving reading comprehension. http://www.lexialearning.com

McCarty, K. A. (2006). *Full Inclusion: The Benefits and Disadvantages of Inclusive Schooling An Overview*. https://tinyurl.com/nzb2urn3

Mccaskill, M. (2001). Grammar, Punctuation, and Capitalization - A Handbook for Technical Writers and Editors. *Research gate*. https://tinyurl.com/mumyme4e

McCroskey, R. L. & Kidder, H. C. (1980). Auditory fusion among learning disabled, reading disabled, and normal children. *J. Learn. Disabil*, *13*, 18–25.

McDonough, E., Flanagan, D., Sy, M. & Alfonso, V. (2017). Specific Learning Disorder. In S. Goldstein & M. DeVries (Eds), *Handbook of DSM-5 Disorders in Children and Adolescents* (pp.77-104). Doi:10.1007/978-3-319-57196-6

McDowell, M. (2018). Specific Learning Disability. *Journal of Paediatrics and Child Health, 54,* 1077-1083. Doi:10.1111/jpc.14168

McGinnis, M. A. (1939). *The association method for diagnosis and treat-ment of congenital aphasia.* (Published Doctoral Thesis). (Independent Studies and Capstones), Program in Audiology and Communication Sciences, Washington University School of Medicine.

McLeskey, J. & Hoppey, D. (2014). What are Qualities of Effective Inclusive Schools?" In J. McLeskey, L.N. Waldron, F. Spooner & B. Algozzine (Eds.), *Handbook of Effective Schools: Research and Practice* (17–29). Routledge. Doi: 10.4324/9780203102930

Melhuish, E. C. (2014). *The Impact of Early Childhood Education and Care on Improved Wellbeing in "If you Could do one Thing…" Nine Local Actions to Reduce Health Inequalities*. The British Academy.

Menon, V. (2011). Developmental cognitive neuroscience of arithmetic: implications for learning and education. *ZDM Mathematics Education*, *42*, 515–525. Doi:10.1007/s11858-010-0242-0.Developmental

Mercer, N. (2013). The Social Brain, Language, and Goal-Directed Collective Thinking: A Social Conception of Cognition and Its Implications for Understanding How We Think, Teach, and Learn. *Educational Psychologist, 48*(3), 148–168. Doi: 10.1080/00461520.2013.804394

Merchant, Z., Goetz, E. T., Cifuentes, L., Keeney-Kennicutt, W. & Davis, T. J. (2014). Effectiveness of virtual reality-based instruction on students' learning outcomes in K-12 and higher education: A meta-analysis. *Computers & Education, 70*, 29–40. Doi:10.1016/j.compedu.2013.07.033

Merleau-Ponty, M. (1962). *Phenomenology of Perception*. Routledge.

Meyer, L. A., Gersten, R. M. & Gutkin, J. (1983). Direct instruction: A project follow through success story in an inner-city school. *Elementary School Journal, 84*, 241-252.

Miciak, J. & Fletcher J. M. (2020). The critical role of instructional response for identifying dyslexia and other learning disabilities. *Journal of Learning Disabilities*, 53(5), 343–353. Doi:10.1177/002221942090680

Milesi, C. & Gamoran, A. (2006). Effects of Class Size and Instruction on Kindergarten Achievement. *Educational Evaluation and Policy Analysis, 28*(4), 287-313. Doi:10.3102/01623737028004287

Mihandoost, Z. & Elias, H. (2010). The Effectiveness of the Barton's Intervention Program on Reading Comprehension and Reading Attitude of Students with Dyslexia, *Iranian Journal of Psychiatry and Behavioral Sciences,5*(2),43-52.

Mihandoost, Z., Habibah, E., Sharifah, M. N. & Rosnaini, M. (2012). The effectiveness of the Barton intervention programme on reading skills of dyslexic students. *Pertanika Journal of Social Sciences & Humanities, 20*(2), 475–492.

Miles, E. (1992). *The Bangor Dyslexia Teaching System.* Whurr Publishers Limited.

Mills, J. R. (2018). Effective Multi-Sensory Strategies for Students With Dyslexia. *Kappa Delta Pi Record, 54*(1), 36-40. doi: 10.1080/00228958.2018.1407181

Ministerial Decision of Greek Government (GG 211076/ΓΔ4/13-12/2018)

Ministerial Decision of Greek Government no. 27922/Γ6 (GG 449/08-03-2007)

Ministerial Decision of Greek Government no. 27922/Γ6/2007

Ministerial Decision of Greek Government no. 48275/D3/2019 (GG 1088/B/2-4-2019)

Ministerial Decision of Greek Government no. T.353.1/324/105657/Δ1

Minogue, J. & Jones, M. G. (2006). Haptics in education: Exploring an untapped sensory modality. *Review of Educational Research, 76*(3), 317–348. Doi:10.3102/00346543076003317

Minskoff, E. (2005). *Teaching Reading to Struggling Learners*. Brookes Publishing Co.

Mitchell, K. J. (2018). *Innate: How the wiring of our brains shapes who we are*. Princeton University Press.

Moats, L. C. & Farrell, M. L. (2005). Multisensory Structured Language Education. In *Multisensory Teaching of Basic Language Skills*. In J. R. Birsh (Ed), 23–31. Paul H Brookes.

Mody, M., Studdert-Kennedy, M. & Brady, S. (1997). Speech perception deficits in poor readers: Auditory processing or phonological coding? *The Journal of Experimental Child Psychology, 64*(2), 199–231. Doi:10.1006/jecp.1996.2343

Moll, K., Landerl, K., Snowling, M. J. & Schulte-Körne, G. (2019). Understanding comorbidity of learning disorders: Task-dependent estimates of prevalence. *Journal of Child Psychology and Psychiatry, 60*(3), 286–294. Doi:10.1111/jcpp.12965

Moores, E., Nicolson, R. & Fawcett, A. (2003). Attention deficits in dyslexia: Evidence for an automatisation deficit? *European Journal of Cognitive Psychology, 15*(3), 321 – 34.

Morgan, K. (2019). Multisensory teaching: Crossing Into a New Discipline. *Palaestra, 33*(1), 46-51.

Morgan, K. N. (2019). Using Pictures and Written Descriptions for Learning, *Strategies, 32*(6), 36-39. Doi:10.1080/08924562.2019.1658431

Mostert, M. P. (1999–2000). A partial etiology of discriminative disability: Bandwagons and beliefs. *Exceptionality, 8*, 117–132. Doi:10.1207/S15327035EX0802_3

Mostert, M. P. & Crockett, J. B. (1999–2000). Reclaiming the history of special education for more effective practice. *Exceptionality, 8*(2), 133–143. Doi:10.1207/S15327035EX0802_4

Mourao, S. (2012). Children as meaning makers: Interpretation and Knowledge transfer prompted by the visual. In H. Barbosa & J. Quental (Eds.), *2nd International Conference: Art, Illustration and Visual Culture in Infant and Primary Education. Creative processes and childhood-oriented cultural resources, December 2012* (pp.56-61). Universidade de Aveiro.

Mpastea, A. (2014). *An intervention for Specific Learning Disorder-Dyslexia through the development of Multisensory Teaching Method.* (Doctoral thesis). Aristotle University, Thessaloniki.

Muijs, D. & Reynolds, D. (2018). *Effective Teaching: Evidence and Practice*. SAGE Publications Ltd.

Myhill, D. (2006). Talk, Talk, Talk: Teaching and Learning in Whole Class Discourse. *Research Papers in Education, 21*(1), 19–41. Doi:10.1080/02671520500445425.

Nagy, W. E., Herman, P. A. & Anderson, R. C. (1985). Learning words from context. *Reading Research Quarterly, 20*(2), 233–253. Doi:10.2307/747758

Nation, K., Adams, J. W., Bowyer-Crane, C. A. & Snowling, M. J. (1999). Working memory deficits in poor comprehenders reflect underlying language impairments. *Journal of Experimental Child Psychology, 73*, 139–158. Doi:10.1006/jecp.1999.2498

National Center for Learning Disabilities (2014). *The state of learning disabilities* (3rd ed.). Author.

National Institute of Child Health and Human Development (2000). *Report of the national reading panel: Teaching children to read.* Retrieved July 6, 2021 from http://www.nichd.nih.gov/publications/pubs/nrp/Pages/smallbook.aspx

National Research Center on Learning Disabilities (NRCLD) (2010). *The Learning Disabilities Resource Kit: Specific Learning Disabilities Determination Procedures and Responsiveness to Intervention*, NRCLD (National Research Center on Learning Disabilities). (Available online at http://www.nrcld.org/resource_kit/)

Neil, A. P. (2017). Dyslexia? In A.P. Neil (Ed), *The Successful Dyslexic* (pp. 1-14). Sense Publisher.

Nicolson, R. & Fawcett, A. (2001). Dyslexia, learning and the cerebellum. In M. Wolf (Ed), *Dyslexia, Fluency, and the Brain*. Timonium, 159–188. York Press.

Nicolson, R. & Fawcett, A. (2008). Dyslexia, Learning, *MIT Press Scholarship Online*, 1-20. Doi: 10.7551/mitpress/9780262140997.001.0001

Nicolson, R. & Fawcett, A. (1990). Automaticity: A New Framework for Dyslexia Research? *Cognition, 35,* 159- 182. Doi:10.1016/0010-0277(90)90013-A

Nicolson, R., Fawcett, A. & Dean, P. (1995). Time estimation deficits in developmental dyslexia: Evidence of Cerebellar Involvement. *Proceedings of Royal Society of London in Biological Sciences, 259,* 43-47. Doi: 10.1098/rspb.1995.0007.

Nicolson, R., Fawcett, A. & Dean, P. (2001). Developmental dyslexia: the cerebral deficit hypothesis, *Trends in Neurosciences, 24*, pp. 506-509.

Niemi, H. (2015). Teacher professional development in Finland: Towards a more holistic approach. Psychology, *Society and Education, 7*(3), 278–294.

Nijakowska, J. (2008). An experiment with direct multisensory instruction in teaching word reading and spelling to Polish dyslexic learners of English. *Language learners with special needs: An international perspective*, 130-157.

Nirmala, S. D., Ong, E. T., Thoe, N. K. & Anggoro, S. (2022). Reading and Writing Ability of Dyslexic Students Through Simultaneous Multisensory Teaching (SMT) Method. *Dinamika Jurnal Ilmiah Pendidikan Dasar, 14*(2). Doi: 10.30595/dinamika.v14i2.14352

Norwich, B. (2000). Inclusion in education: from concepts, values and critique to practice. In H. Daniels (Ed.), *Special education reformed: beyond rhetoric?* Falmer.

Norwich, B. (2003). Education, Inclusion and Individual Differences: Recognizing and Resolving Dilemmas. *British Journal of Educational Studies, 50*(4), 482-502. Doi: 10.1111/1467-8527.t01-1-00215

Novita, S. (2016). Secondary symptoms of dyslexia: a comparison of self-esteem and anxiety profiles of children with and without dyslexia, *European Journal of Special Needs Education, 31*(2), 279-288. Doi: 10.1080/08856257.2015.1125694

O'Donnell, P. S. & Miller, D. N. (2011). Identifying students with specific learning disabilities: School psychologists' acceptability of the discrepancy model versus response to intervention. *Journal of Disability Policy Studies*, *22*(2), 83–94. Doi:10.1177/1044207310395724

Oakhill, J. V. & Cain, K. (2012). The precursors of reading ability in young readers: Evidence from a four-year longitudinal study. *Scientific Studies of Reading*, *16*, pp. 91–121. Doi:10.1080/10888438.2010.529219

Oakland, T., Black, J. L., Stanford, G., Nussbaum, N. & Balise, R. R. (1998). An evaluation of the dyslexia training program: A multisensory method for promoting reading in students with reading disabilities. *Journal of Learning Disabilities, 31*, 140–147.

O'Brien, J., Ottoboni, G., Tessari, A. & Setti, A. (2021). Multisensory Perception, Verbal, Visuo-spatial and Motor Working Memory Modulation After a Single Open- or Closed-Skill Exercise Session in Children. *J Cogn Enhanc,* 5, 141–154. Doi:10.1007/s41465-020-00189-x

O'Connor, C., Michaels, S. Chapin, S. & Harbaugh, A. G. (2017). The Silent and the Vocal: Participation and Learning in Whole-Class Discussion. *Learning and Instruction, 48*, 5–13. Doi:10.1016/j.learninstruc.2016.11.003

OECD. (2019). PISA 2018 results (vol I): What students know and can do. *PISA and OECD Publishing*. Doi:10.1787/5f07c754-en

O'Muircheartaigh, C., Krosnick, J. & Helic, A. (1999). *Middle Alternatives, Acquiescence, and the Quality of Questionnaire Data, Working Papers 0103*, Harris School of Public Policy Studies, University of Chicago.

Olulade, O., Napoliello, E. & Eden, G. (2013). Abnormal visual motion processing is not a cause of dyslexia. *Neuron, 79*(1), 180–190. Doi:10.1016/j.neuron.2013.05.002

Opfer, V. & Pedder, D. (2011a). Conceptualizing teacher professional learning. *Review of Educational Research, 81*(3), 376–407. Doi:10.3102/0034654311413609

Orr, A. C. & Hammig, S. B. (2009). Inclusive postsecondary strategies for teaching students with learning disabilities: A review of the literature. *Learning Disability Quarterly, 32*(3), 181–196. Doi.org/10.2307/27740367

Orton, S. T. (1937). *Reading, writing and speech problems in children.* W W Norton & Co.

Orton, S. T. (1963). Specific reading disability: Strephosymbolia. *Annals of Dyslexia, 13*(1), 9–17.

Ouellette, G., Martin-Chang, S. & Rossi, M. (2017). Learning from our mistakes: Improvements in spelling lead to gains in reading speed. *Scientific Studies of Reading, 21*(4), 350–357. Doi: 10.1080/10888438.2017.1306064

Overy, K. (2000). Dyslexia, Temporal Processing and Music: The Potential of Music as an Early Learning Aid for Dyslexic Children. *Psychology of Music, 28*(2), 218–229. Doi:10.1177/0305735600282010

Pagliano, P. (1999). *Multisensory environments*. David Fulton.

Padhy, S. K., Goel, S., Das, S. S., Sarkar, S., Sharma, V. & Panigrahi, M. (2016). Prevalence and Patterns of Learning Disabilities in School Children. *Indian journal of pediatrics*, *83*(4), 300–306. Doi:10.1007/s12098-015-1862-8

Paeplow, C. (2015). Letterland Evaluation: 2013-14, *D&A Report, 14.18*. https://files.eric.ed.gov/fulltext/ED565243.pdf

Paivio, A. (1991). Dual coding theory: Retrospect and current status. *Canadian Journal of Psychology, 45*, 255–287.

Pallasmaa, J. (2005). *The Eyes of the Skin: Architecture and the Senses* (2nd Edition). John Wiley and Sons Ltd.

Pallasmaa, J. (2006). Hapticity Vision. *Architectural Design*, *75*(4), 137-138. Doi: 10.1002/ad.119

Papadatos, G. (2010). *Mental disorders and learning disabilities of children and adolescents*. Gutenberg.

Papadatos, G. (2011). Learning disabilities and dyslexia. In G. Papadatos & A. Bastea (Eds.), Issues in Learning Difficulties and Dyslexia (pp. 245-256). Smyrniotakis.

Papadatos, G. (2011). *Psychophysiology*. Parisianou.

Pappas, T. (2002). *The Methodology of Scientific Research in the Humanities*. Kardamitsa Publications.

Parekh, G. (2018). *Exploring inclusion in Ontario*. National Inclusive Education Month Commentary #24. https://tinyurl.com/76pfu5tf

Parkinson, E. (1993). Book reviews: Tackling dyslexia: the Bangor way Anne Cooke. *Child Language Teaching and Therapy*, *9*(3), 266–268. Doi:10.1177/026565909300900313

Passe, A. (2006). How Dyslexic Teenagers Cope: An Investigation of Self-esteem, Coping and Depression. *Dyslexia, 12*, 256–275. https://tinyurl.com/v8ydq4r

Pasiardis, P. & Pasiardis, G. (2000). Effective schools: Reality or Utopia. Typothito.

Paterson, M. (2009). Introduction. Remediating Touch. *Senses and Society, 4*(2), 129-140.

Patsidou, M. (2010). *Co-education of children with and without educational needs: attitudes of teachers and students in secondary education*. (Doctoral thesis). Aristotle University, Thessaloniki.

Paulesu, E., Démonet, J. F., Fazio, F., McCrory, E., Chanoine, V., Brunswick, N., Cappa, S. F., Cossu, G., Habib, M., Frith, C. D. & Frith, U. (2001). Dyslexia: Cultural diversity and biological unity. *Science, 291*, 2165–2167. Doi: 10.1126/science.1057179

Perfetti, C. A. & Hart, L. (2002). The lexical quality hypothesis. In L. T. H. Verhoeven, C. Elbro, & P. Reitsma (Eds.), *Precursors of functional literacy* (Vol. 11, pp. 67–86). John Benjamins.

Peters, L. & De Smedt, B. (2018). Arithmetic in the developing brain: a review of brain imaging studies. *Dev Cogn Neurosci*, *30*, 265–279. Doi:10.1016/j.dcn.2017.05.002

Pinker, S. (1994). *The Language Instinct: How the Mind Creates Language*. William Morrow and Company Banse, R., & Scherer, K. R. (1996).

Pinna, B. & Deiana, K. (2018). On the Role of Color in Reading and Comprehension Tasks in Dyslexic Children and Adults. *I-Perception*. Doi:10.1177/2041669518779098

Pinna, B. (2006). Introduction to a Special Issue on spatio-chromatic interactions. *Spatial Vision, 19*, 2–24.

Pokorni, J., Worthington, C. & Jamison, P. (2004). Phonological awareness intervention: Comparison of Fast ForWord, Earobics, and LiPS. *Journal of Education, 97*, 147–157.

Polk, T. A. (2018). *The learning brain*. The Great Courses.

Polychroni, F., Koukoura, K. & Anagnostou, I. (2006). Academic self-concept, reading attitudes and approaches to learning of children with dyslexia: Do they differ from their peers? *European Journal of Special Needs Education, 21*(4), 415–430. Doi: 10.1080/08856250600956311

Ponticorvo M., Di Fuccio R., Ferrara F., Rega A. & Miglino O. (2019). Multisensory Educational Materials: Five Senses to Learn. In: T. Di Mascio et al. (Eds), Methodologies and Intelligent Systems for Technology Enhanced Learning, 8th International Conference. MIS4TEL 2018. Advances in Intelligent Systems and Computing, vol 804. Doi:10.1007/978-3-319-98872-6_6

Porpodas, K. D. (1993). *Dyslexia: The Specific Disorder in the Learning of Written Language: A Psychological Perspective*. Self-Publishing.

Porpodas, K. D. (2002). *The reading*. Hellenika Grammata.

Poskiparta, E., Niemi, P., Lepola, J., Ahtola, A. & Laine, P. (2003). Motivational-emotional vulnerability and difficulties in learning to read and spell. *British Journal of Educational Psychology*, *73*, 187–206.

Post, Y. & Carreker, S. (2002). Orthographic similarity and phonological transparency in spelling. *Reading and Writing: An Interdisciplinary Journal, 15*, 317–340.

Prashnig, B. (2008). *The Power of Diversity: New Ways of Learning and Teaching Through Learning Styles*. 3rd ed. Network Continuum Education.

Prelock, P. A. (2013). What is a learning disability? In F. R. Volkmar (Ed.), *Encyclopedia for autism spectrum disorders* (1st ed.). Springer.

Prelock, P. A. & Hutchins, T. L. (2018). Children with Learning Disabilities or Specific Learning Disorders. In: Clinical Guide to Assessment and Treatment of Communication Disorders (Eds.), *Best Practices in Child and Adolescent Behavioral Health Care*. Doi:10.1007/978-3-319-93203-3_7

Price C. J. & Humphreys G. W. (1992). Letter-by-letter reading: Functional deficits and compensatory strategies. *Cognitive Neuropsychology*, 9, 427–457.

P-Scales. 2005. *QCA*. https://tinyurl.com/8xh4nt58

Puspitaloka, N. & Syarif, H. E. (2021). Teacher's Perception on How Multisensory Approach in Teaching Reading for EYL with Dyslexia, *Advances in Social Science, Education and Humanities Research, 539, Proceedings of the Ninth International Conference on Language and Arts (ICLA 2020).* Atlantis Press.

Puustinen, M., Santti, J., Koski, A. & Tammi, T. (2018). Teaching: A Practical or Research-Based Profession? Teacher Candidates' Approaches to Research-Based Teacher Education. *Teaching and Teacher Education, 74*, 170–179. Doi: 10.1016/j.tate.2018.05.004

Ramey, C. T. & Haskins, R. (1981). The modification of intelligence through early experience. *Intelligence, 5*, 5–19. Doi: 10.1016/0160-2896(81)90013-1

Ramey, C. T., Collier, A. M., Sparling, J. J., Loda, F. A., Campbell, F. A., Ingram, M. D. & Finkelstein, N.W. (1976). The Carolina Abecedarian project: A longitudinal and multidisciplinary approach to the prevention of developmental retardation. In T. D. Tjossem (Ed.), *Intervention strategies for high-risk infants and young children* (pp. 629–665). University Park Press.

Ramus, F., Rosen, S., Dakin, S., Day, B., Castellote, J., White, S. & Frith, U. (2003). Theories of developmental dyslexia: insights from a multiple case study of dyslexic adults, *Brain*, *126*(4), 841–865. Doi:10.1093/brain/awg076

Rao, A. R. (2018). An oscillatory neural network model that demonstrates the benefits of multisensory learning. *Cognitive Neurodynamics, 12*(5), 481–499. Doi:10.1007/s11571-018-9489-x

Reading Horizons (2023). ESSA tier 4, Reading Horizons Evidence Brief. https://tinyurl.com/yc8s46r5

Reid, G. (2003). *Dyslexia. A practitioner's handbook*. Editing of the Greek edition: Parisianou.

Reid, J. M. (1998). *Understanding Learning Styles in the Second Language Classroom*. Prentice Hall Regents.

Rice, M. & Gilson, C. B. (2023). Dyslexia Identification: Tackling Current Issues in Schools. *Intervention in School and Clinic, 58*(3), 205–209. Doi:10.1177/10534512221081278

Ricketts, J. (2011). Research review: Reading comprehension in developmental disorders of language and communication. *Journal of Child Psychology and Psychiatry, 52*, 1111–1123. Doi:10.1111/j.1469-7610.2011.02438.x.

Riddick, B. (2000). An examination of the relationship between labelling and stigmatisation with special reference to dyslexia. *Disability & Society, 15*(4), 653–667. Doi:10.1080/09687590050058233

Rimm-Kaufman, S. E. & Pianta, R. C. (2000). An ecological perspective on the transition to kindergarten: A theoretical framework to guide empirical research. *Journal of Applied Developmental Psychology, 21*(5), 491–511.

Riddall-Leech, S. (2012). *Heuristic Play*. London: Andrews UK.

Ring, J. J., Avrit, K. J. & Black, J. L. (2017). Take Flight: the evolution of an Orton Gillingham-based curriculum. *Annals of dyslexia*, *67*(3), 383–400. Doi:10.1007/s11881-017-0151-9

Ritchey, K. D. & Goeke, J. L. (2006). Orton-Gillingham and Orton-Gillingham-Based Reading Instruction: A Review of the Literature. *The Journal of Special Education, 40*(3), 171–183. Doi:10.1177/00224669060400030501

Robson, C. (2007). *Real World Research*. Gutenberg.

Rose, T. E. & Zirkel, P. (2007). Orton-Gillingham Methodology for Students with Reading Disabilities: Thirty years of case law. *The Journal of Special Education, 41*, 171–185.

Rosenshine, B. (1976). Classroom instruction. In L. Gage (Ed), The psychology of teaching methods: The 75th yearbook of the national society for the study of education, 335-371. The University of Chicago Press.

Roulstone, S., Wren, Y., Bakopoulou, I. & Lindsay. G. (2012). Interventions for Children with Speech, Language and Communication Needs: An Exploration of Current Practice. *Child Language Teaching and Therapy, 28*(3), 325–341.

Rudel, R., Denckla, M. & Spalten, E. (1976). Paired Associate Learning of Morse Code and Braille Letter Names by Dyslexic and Normal Children. *Science Direct, 12*(1), pp.61-70. Doi:10.1016/S0010-9452(76)80030-5

Ruppar A. L., Neeper L. S. & Dalsen J. (2016). Special education teachers' perceptions of preparedness to teach students with severe disabilities. *Research and Practice for Persons With Severe Disabilities*, *41*(4), 273–286. Doi:10.1177/1540796916672843

Russak, S. & Kahn-Horwitz, J. (2015). English as a foreign language spelling: Comparisons between good and poor spellers. *Journal of Research in Reading, 38*(3), 307–330. Doi: 10.1111/jrir.12009

Sabeti, S. (2012). Reading Graphic Novels in School: Texts, Contexts and the Interpretive Work of Critical Reading. *Pedagogy, Culture, and Society, 20*(2), 191–210. Doi:10.1080/14681366.2012.672336

Sacks, A. (2011). Mnemonic Techniques. In: Kreutzer J.S., DeLuca J., Caplan B. (Eds), *Encyclopedia of Clinical Neuropsychology* (1641-1644). Springer. Doi:10.1007/978-0-387-79948-3_1095

Sadoski, M. & Paivio, A. (2001). *Imagery and text*. Lawrence Erlbaum Associates.

Sadoski, M. & Paivio, A. (2013). A dual coding theoretical model of reading. In D. Alvermann, N. Unrau, & R. Ruddell (Eds.), *Theoretical models and processes of reading* (sixth ed., pp. 886–922). International Reading Association.

Sancak Sert, Z. & Panieri, G. (2023). Functions of senses in learning. In G. Panieri & M. Stiller-Reeve (Eds.), *The Ocean Senses Activity Book* (pp. 11-13). Septentrio Educational, (1). Doi:10.7557/8.7047

Sand, L. A. & Bolger, D. J. (2019). The neurobiological strands of developmental dyslexia: What we know and what we don't know. In D. A. Kilpatrick, R. M. Joshi & R. K. Wagner (Eds.), *Reading development and difficulties: Bridging the gap between research and practice* (pp. 233–270). Springer.

Sandravelis, A. (2015). The detection of dyslexia in the Greek language in bilingual compulsory education students (Doctoral Dissertation). University of Western Macedonia, Florina.

Saris, W. E. & Gallhofer, I. N. (2007). *Design, evaluation, and analysis of questionnaires for survey research.* Wiley-Interscience. Doi:10.1002/9780470165195

Sarudin, N. A., Hashim, H. & Yunus, M. M. (2019). Multi-sensory approach: How it helps in improving word recognition? *Creative Education, 10*(12), 3186-3194. Doi:10.4236/ce.2019.1012242

Sayeski, K. L. (2011). Effective spelling instruction for students with learning disabilities. *Intervention in School and Clinic, 47*, 75–81. Doi:10.1177/1053451211414191

Sayeski, K. L. (2019). Dyslexia. *Teaching Exceptional Children, 51*(3), 170–171. Doi:10.1177/0040059918820436

Scammacca, N. K., Roberts, G., Vaughn, S. & Stuebing, K. K. (2015). A meta-analysis of interventions for struggling readers in Grades 4–12 1980–2011. *Journal of Learning Disabilities, 48*, 369–390. Doi:10.1177/0022219413504995

Scanlan, J. N. & Novak, T. (2015). Sensory approaches in mental health: A scoping review. *Australian occupational therapy journal*, *62*(5), 277–285. Doi:10.1111/1440-1630.12224

Scerri, T. S. & Schulte-Korne, G. (2010). Genetics of developmental dyslexia. *European Journal of Child Adolescent Psychiatry, 19,* 179–197.

Scherer, K. R., Banse, R., Wallbott, H. G. & Goldbeck, T. (1991). Vocal cues in emotion encoding and decoding. *Motivation and emotion*, *15*, 123-148.

Schirmer, A. (2010). Mark my words: tone of voice changes affective word representations in memory. *PloS one*, *5*(2), e9080. Doi: 10.1371/journal.pone.0009080

Schlesinger, N. W. & Gray, S. (2017). The impact of multisensory instruction on learning letter names and sounds, word reading, and spelling. *Ann. of Dyslexia* 67, 219–258. Doi:10.1007/s11881-017-0140-z

Schroeder, C. E. & Foxe, J. J. (2002). The timing and laminar profile of converging inputs to multisensory areas of the macaque neocortex. *Brain research. Cognitive brain research*, *14*(1), 187–198. Doi.org/10.1016/s0926-6410(02)00073-3

Schulte-Korne, G., Grimm, T., Nothen, M. M., Muller-Myhsok, B., Cichon, S., Vogt, I. R., et al. (1998). Evidence for linkage of spelling disability to chromosome 15. *American Journal of Human Genetics, 63*, 279–282.

Seitz, A. R., Kim, R., van Wassenhove, V. & Shams, L. (2007). Simultaneous and independent acquisition of multisensory and unisensory associations. *Perception*, *36*, 1445–1453. Doi:10.1068/p5843

Selwyn, N. (2011). *Education and Technology: Key Issues and Debates*. Continuum International Publishing Group.

Serafini, M. (2018). The professional development of VET teachers in Italy: participation, needs and barriers. Statistical quantifications and benchmarking in an international perspective. *Empirical Res Voc Ed Train, 10*(3). Doi:10.1186/s40461-018-0064-9

Sexton, C. W. (1989). Effectiveness of the DISTAR Reading I Program in Developing First Graders' Language Skills. *The Journal of Educational Research*, *82*(5), 289–293.

Seymour, P. H. K. (1999). Cognitive Architecture of Early Reading. In: Lundberg, I., Tønnessen, F.E., Austad, I. (Eds.), *Dyslexia: Advances in Theory and Practice*. Neuropsychology and Cognition, 16. Springer. Doi:10.1007/978-94-011-4667-8_5

Shaffner, C. B. & Buswell, B. E. (2004). What do we really know about inclusive schools? A systematic review of the research evidence. In Mitchell, D. (Ed.)

*Special educational needs and inclusive education: Major themes in education*, 2. Routledge.

Shalev, R. S. (2004). Developmental Dyscalculia. *Journal of Child Neurology*, *19*(10), 765-771. Doi:10.1177/08830738040190100601

Shallice T. & Saffran E. (1986). Lexical processing in the absence of explicit word identification: Evidence from a letter-by-letter reader. *Cognitive Neuropsychology*, 3, 429–458.

Shams, L. & Seitz, A. R. (2008). Benefits of multisensory learning. *Trends in cognitive sciences*, *12*(11), 411–417. Doi.org/10.1016/j.tics.2008.07.006

Share, D. L. (1995). Phonological recoding and self-teaching: Sine qua non of Reading acquisition. *Cognition*, *55*(2), 151–218. Doi:10.1016/0010-0277(94)00645-2

Share, D. L. (1999). Phonological recoding and orthographic learning: A direct test of the self teaching hypothesis. *Journal of Experimental Child Psychology*, *72*(2), 95–129. Doi:10.1006/jecp.1998.2481

Shayesteh, S., Pishghadam, R. & Moghimi, S. (2019). Extending the boundaries of multisensory teaching: an introduction to the dual-continuum model of sensorial education. *Int. Journal of Innovation, Creativity and Change*, *4*, 64–82.

Shaywitz, B. A. & Shaywitz, S. E. (2020). The American experience: towards a 21st century definition of dyslexia. *Oxford Review of Education, 46*(4). Doi:10.1080/03054985.2020.1793545

Shaywitz, B. A., Shaywitz, S. E., Blachman, B. A., Pugh, K. R., Fulbright, R. K., Skudlarski, P., Mencl, W. E., Constable, R. T., Holahan, J. M., Marchione, K. E., Fletcher, J. M., Lyon, G. R. & Gore, J. C. (2004). Development of left occipitotemporal systems for skilled reading in children after a phonologically-based intervention. *Biological psychiatry*, *55*(9), 926–933. Doi:10.1016/j.biopsych.2003.12.019

Shaywitz, S. E. & Shaywitz, B. A. (2004). Neurobiologic Basis for Reading and Reading Disability. In P. McCardle & V. Chhabra (Eds.), *The voice of evidence in reading research* (pp. 417–442). Paul H. Brookes Publishing Co.

Shaywitz, S. E., Gruen, J. R. & Shaywitz, B. A. (2007). Management of dyslexia, its rationale, and underlying neurobiology. *Pediatric clinics of North America*, *54*(3), 609–viii. Doi:10.1016/j.pcl.2007.02.013

Shaywitz, S. E. & Shaywitz, B. A. (2003). The science of reading and dyslexia. Leonard Apt lecture. *Journal of American Association for Pediatric Ophthalmology and Strabismus, 7(3),* 158-166.

Sheffield, B. B. (1991). The structured flexibility of Orton-Gillingham. *Annals of Dyslexia 41,* 41–54. Doi:10.1007/BF02648077

Shimojo, S. & Shams, L. (2001). Sensory modalities are not separate modalities: plasticity and interactions. *Curr. Opin. Neurobiol. 11*, 505–509.

Shute, V. J. & Rahimi, S. (2017). Review of computer-based assessment for learning in elementary and secondary education. *Journal of Computer Assisted Learning*, 33(1), 1–19.

Sileo, J. M. & Van Garderen, D. (2010). Creating optimal opportunities to learn mathematics: Blanding co-teaching structures with research-based practices. *Teaching Exceptional Children, 42*(3), 14-21.

Singleton, C. (2009). *Intervention for Dyslexia A review of published evidence on the impact of specialist dyslexia teaching*. University of Hull, 2009

Sjoblom, A., Eaton, E. & Stagg, S. (2016). The effects of letter spacing and coloured overlays on reading speed and accuracy in adult dyslexia. *British Journal of Educational Psychology, 86,* 630–639. Doi:10.1111/bjep.12127

Slater, Z. & Chambers, G. (2022). Primary teachers' perceptions of whole-class teaching and learning in English primary schools: an exploratory study of perceived benefits, challenges and effective practice, *Education 3*(13). Doi: 10.1080/03004279.2022.2110603

Smith, C. R. (1994). *Learning disabilities, the interaction of learner, task, and setting (3rd edition)*. Allyn and Bacon.

Smith, P., Goodmon, L., Howard, J., Hancock, R., Hartzell, K. & Hilbert, S. (2019). Graphic novelisation effects on recognition abilities in students with dyslexia, *Journal of Graphic Novels and Comics*. Doi:10.1080/21504857.2019.1635175

Smith, T., Mruzek, D. W. & Mozingo, D. (2015). Sensory Integration Therapy. In R.M. Fox & J.A. Mulick (Eds.), *Controversial Therapies for Autism and Intellectual Disabilities. Fad, Fashion, and Science in Professional Practice* (247-269). Routledge.

Snider, P. (2005). The Effects Of Lexia Phonics Based Reading Software On First Graders' Lexia Comprehensive Reading Scores. *The Corinthian, 7*(8). https://kb.gcsu.edu/thecorinthian/vol7/iss1/8

Snowling, M. (1998). Dyslexia as a phonological Deficit: Evidence and Implications. *Child Psychology & Psychiatry Review, 3*(1), 4.

Snowling, M. (2000). *Dyslexia. 2nd ed.* Blackwell: Oxford.

Snowling, M., Bishop, D. V. & Stothard, S. E. (2000). Is preschool language impairment a risk factor for dyslexia in adolescence?. *Journal of child psychology and psychiatry, and allied disciplines*, *41*(5), 587–600. Doi:10.1111/1469-7610.00651

Snowling, M., Gallagher, A. & Frith, U. (2003). Family risk of dyslexia is continuous: individual differences in the precursors of reading skill. *Child development*, *74*(2), 358–373. Doi:10.1111/1467-8624.7402003

Snowling, M., Hulme, C. & Nation, K. (2020). Defining and understanding dyslexia: past, present and future. *Oxford Review of Education, 46*(4), 501-513. Doi: 10.1080/03054985.2020.1765756

Solvang, P. (2007). Developing an ambivalence perspective on medical labelling in education: Case dyslexia. *International Studies in Sociology of Education, 17*(1–2), 79–94. Doi:10.1080/09620210701433779

Sparling, J. & Meunier, K. (2019). Abecedarian: An Early Childhood Education Approach that has a Rich History and a Vibrant Present. *International Journal of Early Childhood* (51), 207–216. Doi: 10.1007/s13158-019-00247-2

Spaulding, L., Mostert, M. & Beam, A. (2010). Is Brain Gym® an Effective Educational Intervention? *Exceptionality, 18*(1), 18-30. Doi:10.1080/09362830903462508

Specht, J., McGhie-Richmond, D., Loreman, T., Mirenda, P., Bennett, S., Gallagher, T., Young, G., Metsala, J., Aylward, L., Katz, J., Lyons, W., Thompson, S. & Cloutier, S. (2016). Teaching in inclusive classrooms: efficacy and beliefs of Canadian preservice teachers. *International Journal of Inclusive Education*, *20*(1), 1–15. Doi:10.1080/13603116.2015.1059501

Special Education. Ministry of Education, Sports and Youth of Greece. https://tinyurl.com/r9wvoha

Spiteri, M., Chang Rundgren, S.-N. (2020). Literature Review on the Factors Affecting Primary Teachers' Use of Digital Technology. *Tech Know Learn,* 25, 115–128. Doi:10.1007/s10758-018-9376-x

Spooner, W. (2011). *The SEN Handbook for Trainee Teachers, NQTs and Teaching Assistants*. 2nd ed. Routledge.

Spyropoulou, D., Kontaris, X., Antonakaki, T. & Chala, X. (2007). Financial Resources in Education. Education and Quality in the Greek School (Two-day workshop, Athens 20-21 March & Thessaloniki 17-18 April 2008). 102-106.

Stahelski, A., Anderson, A., Browitt, N. & Radeke M. (2021). Facial Expressions and Emotion Labels Are Separate Initiators of Trait Inferences From the Face. *Frontiers in Psychology*, *12*, 1-9. Doi:10.3389/fpsyg.2021.749933

Stallings, J. & Stipek, D. (1986). Research on early childhood and elementary school teaching program. In M. C., Whitrock (Ed), Third handbook of research on teaching, 727-753. Macmillan.

Stampoltzis, A. & Polychronopoulou, S. (2009). Greek university students with dyslexia: An interview study. *European Journal of Special Needs Education, 24*(3), 307–321. Doi: 10.1080/08856250903020195

Standen, P. J., Brown, D. J. & Cromby, J. J. 2001. The effective use of virtual environments in the education and rehabilitation of students with intellectual disabilities. *British Journal of Educational Technology*, *32*(3), 289–299.

Stanovich, K. E. (1986). Matthew effects in reading: Some consequences of individual differences in the acquisition of literacy. *Reading Research Quarterly, 21*(4), 360–407. Doi:10.1598/RRQ.21.4.1

Stasinos, D. (2016). *Special education 2020 Plus (2nd ed).* Papazisi.

Stathis, F. (2006). Learning disabilities and Dyslexia. Practical ways to deal with it. Argyropoulos EPE.

Stebbins, M. S., Stormont, M., Lembke, E.S., Wilson, D. J. & Clippard, D. (2012). Monitoring the Effectiveness of the Wilson Reading System for Students with Disabilities: One District's Example. *Exceptionality, 20*(1), 58-70. Doi: 10.1080/09362835.2012.640908

Stein, B. E. & Meredith, M. A. (1993). *The Merging of the Senses*. MIT Press.

Stein, C. L. & Goldman, J. (1980). Beginning reading instruction for children with minimal brain dysfunction. *Journal of Learning Disabilities, 13*(4), 219-222.

Stein, J. (1993). Dyslexia? Impaired temporal information processing? *Annals of the New York Academy of Sciences, 682,*83–86.

Stein, J. (2001). The Sensory Basis of Reading Problems. *Developmental Neuropsychology, 20*(2), 509-534. Doi:10.1207/S15326942DN2002_4

Stein, J. (2018). Does dyslexia exist? *Language, Cognition and Neuroscience, 33*(3), pp. 313-320. Doi:10.1080/23273798.2017.1325509

Stein, J. F. & Walsh, V. (1997). To see but not to read, the magnocellular theory of dyslexia. *Trends of Neuroscience, 20,* 147-152.

Stein, J. F., Talcott, J. & Witton, C. (2001). The sensorimotor basis of developmental.

Steinbrink, C., Zimmer, K., Lachmann, T., Dirichs, M. & Kammer, T. (2013). Development of rapid temporal processing and its impact on literacy skills in primary school children. *Child Development, 85*(4), 1711-1726. Doi: 10.1111/cdev.12208

Stephens, V. (2018). National Library of New Zealand. Feel the rhythm: developing language through rhythm and rhyme. https://tinyurl.com/38vfzjdb

Stephenson, J. & Carter, M. (2011). The Use of Multisensory Environments in Schools for Students with Severe Disabilities: Perceptions from Teachers. *Journal of*

*Developmental and Physical Disabilities*, *23*(4), 339-357. Doi: 10.1007/s10882-011-9232-6

Stevens, E. A., Vaughn, S., Swanson, E. & Scammacca, N. (2020). Examining the effects of a Tier 2 reading comprehension intervention aligned to Tier 1 instruction for fourth-grade struggling readers. *Exceptional Children*, *86*(4), 430–448. Doi:10.1177/0014402919893710

Stevens, D. (2000). Leveraging technology to improve test scores: A case study of low-income Hispanic students. http://www.lexialearning.com.

Stevens, E. A. & Vaughn, S. (2021). Using Paraphrasing and Text Structure Instruction to Support Main Idea Generation. *TEACHING Exceptional Children*, *53*(4), 300–308. Doi:10.1177/0040059920958738

Stoeckel, R. E., Colligan, R. C., Barbaresi, W. J., Weaver, A. L., Killian, J. M. & Katusic, S. K. (2013). Early speech-language impairment and risk for written language disorder: A population-based study. *Journal Developmental Behavior Pediatrics, 34*, 38–44.

Stoner, J. B., Parette, H. P., Watts, E. H., Wojcik, B. W. & Fogal, T. (2008). Preschool teacher perceptions of assistive technology and professional development responses. *Education and Training in Developmental Disabilities, 43,* 77–91.

Storch, S. A. & Whitehurst, G. J. (2002). Oral language and code-related precursors to reading: Evidence from a longitudinal structural model. *Developmental Psychology*, *38*, 934–947. Doi:10.1037/0012-1649.38.6.934

Stough, L. M. & Palmer, D. J. (2003). Special thinking in special settings: A qualitative study of expert special educators. *The Journal of Special Education, 36*(4), 206–222. Doi:10.1177/002246690303600402

Stuebing, K. K., Barth, A. E., Trahan, L. H., Reddy, R. R., Miciak, J. & Fletcher, J. M. (2015). Are child cognitive characteristics strong predictors of responses to intervention? A meta-analysis. *Review of Educational Research*, *85*(3), 395–429. Doi:10.3102/0034654314555996

Stylianou, A. (2017). Inclusive and exclusive knowledge practices in interdisciplinary, international education, *International Journal of Inclusive Education, 20*(10), 1097-1108.

Sucuoğlu, B., Bakkaloğlu, H., İşcen, F., Akalin, S. & Demir, S. (2013). Inclusive Preschool teachers: Their attitudes and knowledge about inclusion. *International Journal of Early Childhood Special Education, 5*(2), 107-128.

Sun, M., Penuel, W. R., Frank, K. A., Gallagher, H. A. & Youngs, P. (2013). Shaping professional development to promote the diffusion of instructional expertise among teachers. *Educational Evaluation and Policy Analysis, 35*(3), 344–369. Doi:10.3102/01623737134822763

Suryaratri, R. D., Prayitno, E. H. & Wuryani, W. (2019). The Implementation of Multi-sensory Learning at Elementary Schools in Jakarta. *Jurnal Pendidikan Usia Dini*, *13*(1), 100 - 113. Doi:10.21009/10.21009/JPUD.131.08

Syahputri, D. (2019). The Effect of Multisensory Teaching Method on The Students' Reading Achievement, *Budapest International Research and Critics in Linguistics and Education (BirLE) Journal, 2*(1), 124-131, Doi:10.33258/birle.v2i1.192

Taanila, A., Ebeling, H., Tiihala, M., Kaakinen, M., Moilanen, I., Hurtig, T. & Yliherva, A. (2014). Association Between Childhood Specific Learning Difficulties and School Performance in Adolescents With And Without ADHD Symptoms: A 16-Year Follow-Up. *Journal of Attention Disorders, 18*(1), 61–72. Doi:10.1177/1087054712446813

Taljaard, J. (2016). A Review of Multi-Sensory Technologies in a Science, Technology, Engineering, Arts and Mathematics (STEAM) Classroom, *Journal of Learning Design*, *9*(2), 46-55.

Tallal, P. (1980). Auditory temporal perception, phonics and reading disabilities in children, *Brain and language, 9*(2), 182-198. Doi:10.1016/0093-934X(80)90139-X

Tallal, P., Miller, S. & Fitch, R. H. (1996a). Neurobiological basics of speech: A case for the preeminence of temporal processing. In C. H., Chase, G. D., Rosen, & G. F. Sherman, (Eds.), *Developmental Dyslexia: Neural, Cognitive and Genetic Mechanisms*, York.

Tamboer, P., Vorst, H. & Oort, F. (2016). Five Describing Factors of Dyslexia. *Journal of Learning Disabilities, 49*(5), 466-483. Doi: 10.1177/0022219414558123

Tang, Y. Y. (2017). *Brain-based learning and education: Principles and practice*. Academic Press.

Tate, M. L. (2011). Engaging the Brain. In D. A. Sousa *(Ed.), The Best of Corwin: Educational Neuroscience*, (143–148). Corwin.

Temple, E., Deutsch, G. K., Poldrack, R. A., Miller, S. L., Tallal, P., Merzenich, M. M. & Gabrieli, J. D. (2003). Neural deficits in children with dyslexia ameliorated by behavioral remediation: evidence from functional MRI. *Proceedings of the National Academy of Science of the U. S. A. 100*(5), 2860-2865. Doi: 10.1073/pnas.0030098100

Thanopoulos, T. (2005). *Educational programs for children with special learning difficulties and educational needs*. Atrapos.

The chemical senses - Smell and taste (1970). *Indian Journal of Otolaryngology, 22*, 127–128. Doi:10.1007/BF03047549

Thompson, N. (2019). Ontario school board projects $28.7M shortfall due to provincial cuts', *CTV news*. https://tinyurl.com/e42z7ey7

Thornton, S. J. (2005). *Teaching social studies that matters: Curriculum for active learning*. Teachers College Press.

Tilanus, E. A., Segers, E. & Verhoeven, L. (2013). Diagnostic profiles of children with developmental dyslexia in a transparent orthography. *Research in Developmental Disabilities*, *34*, 4194–4202. Doi:10.1016/j.ridd.2013.08.039

Tilanus, E. A., Segers, E. & Verhoeven, L. (2020). Responsiveness to Intervention after Second versus ThirdGrade Diagnosis of Dyslexia. *Reading & writing quarterly, 36*(6), 521-541. Doi:10.1080/10573569.2019.1667929

Tilanus, E., Segers, E. & Verhoeven, L. (2019). Predicting responsiveness to a sustained reading and spelling intervention in children with dyslexia, *Dyslexia: an international journal of research and practice, 25*(2), 190-206. Doi:10.1002/dys.1614

Todd, S., Hoveid, M. H. & Langmann, E. (2021). Educating the Senses: Explorations in Aesthetics, Embodiment and Sensory Pedagogy. *Stud Philos Educ, 40*, 243–248. Doi:10.1007/s11217-021-09776-7

Toste, J. R., Didion, L., Peng, P., Filderman, M. J. & McClelland, A. M. (2020). A meta-analytic review of the relations between motivation and reading achievement for K–12 students. *Review of Educational Research, 90*(3), 420–456. Doi:10.3102/0034654320919352

Treiman, R. & Kessler, B. (2022). Statistical learning in word reading and spelling across languages and writing systems. *Scientific Studies of Reading, 26*(2), 139–149. Doi: 10.1080/10888438.2021.1920951

Tsakiridou, H. & K. Polyzopoulou (2014). Greek Teachers' Attitudes toward the Inclusion of Students with Special Educational Needs. *American Journal of Educational Research, 2*(4), 208-218. Doi:10.12691/education-2-4-6

Turunen, P. (2003). Production of word structures: A constraint-based study of 2; 6-year-old Finnish children at-risk for dyslexia and their controls. Doctoral Dissertation, Jyväskylä; Jyväskylä studies in Language 54.

Tyk, I. (2014). Whole Class Teaching: A Paper for the Campaign for Real Education. Halland: The Campaign for Real Education. https://www.cre.org.uk/docs/CRE-Whole-Class-Teaching.pdf.

Uhry, J. & Clark, D. B. (2005). *Dyslexia: Theory and Practice of Instruction - (3rd Edition).* Pro-Ed.

Uhry, J. & Shepherd, M. (1993). Segmentation/spelling instruction as part of a first-grade reading program: Effects on several measures of reading. *Reading Research Quarterly, 28*, 218–233.

UNESCO. (1994). The Salamanka Statement and framework for action on special needs education. In D. Mitchell (Ed), *Special educational needs and inclusive education: Major themes in education, Vol 1*, pp. 382-385. Routledge.

UNICEF. (2013). *Educating Teachers for Children with Disabilities. Mapping, Scoping and Best Practices Exercise in the Context of Developing Inclusive Education. Rights, Education and Protection* (REAP project). Australian government and UNICEF partnership. https://tinyurl.com/4yy7x87u

Unwin, K. L., Powell, G. & Jones, C. R. (2022). The use of Multi-Sensory Environments with autistic children: Exploring the effect of having control of sensory changes. *Autism, 26*(6), 1379–1394. Doi:10.1177/13623613211050176

Vamvoukas, M. (2010). *Introduction to psychopedagogical research and methodology*. Grigoris.

Van der Laan, A. R. (2009). *The effects of the Lindamood Phoneme Sequencing Program on reading fluency and comprehension of at-risk first-graders*. Thesis dissertation. Michigan: University of Eastern Michigan.

Vander, A., Sherman, J., Luciano, D. & Tsakopoulos, M. (2011). *Human Physiology (8th edition)*. BC Paschalidis.

van Hover, S. D. (2006). Teaching history in the Old Dominion: The impact of Virginia's accountability reform on seven beginning secondary history teachers. In S.G. *Grant's Measuring History* (pp. 195-220). Information Age Publishing.

van Hover, S. D. & Hicks, D. (2018). History Teacher Preparation and Professional Development. In S.A. Metzger & L.M. Harris (Eds.), *The Wiley International Handbook of History Teaching and Learning*. Doi:10.1002/9781119100812.ch15

Vellutino, F. R. (1979). *Dyslexia: Theory and Research*. MIT Press.

Vellutino, F. R., Fletcher, J. M., Snowling, M. J. & Scanlon, D. M. (2004). Specific Reading Disability (Dyslexia): What Have we Learned in the Past Four Decades? *Journal of Child Psychology and Psychiatry, 45*(1). 2–40. Doi:10.1177/00221940603900204O1

Viesel-Nordmeyer, N. & Prado, J. (2023, preprint). Arithmetic skills are associated with grey matter volume in the left inferior frontal gyrus: A brain-wide association study with 536 children and adolescents. *npj Science of Learning*. Doi:10.21203/rs.3.rs-2302095/v1

Volpe, G. & Gori, M. (2019). Multisensory interactive technologies for primary education: from science to technology. *Front Psychol*, *10*, 1076.

Vosniadou, S. (2004). *Cognitive Science - the New Science of the Mind*. Gutenberg.

Vygostky, L. S. (1978). *Mind in Society: The Development of Higher Psychological Processes*. Harvard University Press.

Wagner R. K. & Torgesen J. K. (1987). The nature of phonological processing and its causal role in the acquisition of reading skills. *Psychological Bulletin*, *101*(2), 192–212. Doi:10.1037/0033-2909.101.2.192

Wagner R. K., Zirps F. A., Edwards A. A., Wood S. G., Joyner R. E., Becker B. J., Liu G. & Beal B. (2020). The prevalence of dyslexia: A new approach to its estimation. *Journal of Learning Disabilities*, 53(5), 354–365. Doi:10.1177/0022219420920377

Waite, S. J., Carrington, V. & Passy, R. (2005). Evaluation of Excellence and Enjoyment: Learning and Teaching in the Primary Years. Final report. University of Plymouth: unpublished report for Primary National Strategy.

Walker, J. 2000. Teaching Basic Reading and Spelling. In J. Townend & M. Turner (Eds), *Dyslexia in Praxis: A Guide for Teachers*, (93–130). Kluwer Academic/Plenum Publishers.

Wanzek, J., Vaughn, S., Scammacca, N., Metz, K., Murray, C. & Roberts, G. (2013). Extensive reading interventions for students with reading difficulties after grade 3. *Review of Educational Research*, *83*(2), 163–195. Doi:10.3102/0034654313477212

Watson, A. & Kelso, G. L. (2014). The effect of Brain Gym® on academic engagement for children with developmental disabilities. *International Journal of Special Education, 29*(2), 75–83. https://files.eric.ed.gov/fulltext/EJ1029010

Wendon, L. (1986). *First steps in Letterland*. Letterland.

Wendon, L. (1997). *Letterland Programme One Teacher's Guide.* Collins Educational.

Werner, J. S., Pinna, B. & Spillmann, L. (2007). Illusory color & the brain. *Scientific American, 296*, 90–95.

White, S., Milne, E., Rosen, S., Hansen, P., Swettenham, J., Frith, U. & Ramus, F. (2006). The role of sensorimotor impairments in dyslexia: A multiple case study of dyslexic children. *Developmental Science*, *9*(3), 237–255. Doi:10.1111/j.1467-7687.2006.00483.x

Whitehurst, G. J. & Lonigan, C. J. (1998). Child Development and Emergent Literacy. *Child Development, 69*(3), 848-872. Doi:10.1111/j.1467-8624.1998.tb06247.x

Willcutt, E. G., McGrath, L. M., Pennington, B. F., Keenan, J. M., DeFries, J. C., Olson, R. K. & Wadsworth, S. J. (2019). Understanding comorbidity between specific learning disabilities. *New Directions for Child and Adolescent Development, 2019*(165), 91–109. Doi.org/10.1002/cad.20291

Willemsen, A., Gosen, M. N., Koole, T. & Glopper. K. (2020). Teachers' Pass-on Practices in Whole-Class Discussions: How Teachers Return the Floor to Their Students. *Classroom Discourse, 11*(4), 297–315. Doi: 10.1080/19463014.2019.1585890

Willis, J. (2006). *Research Based Strategies to Ignite Student Learning: Insight from a Neurologist and Classroom Teacher*. ASCD.

Willis, J. (2007). Improving Instruction for Students with Learning Needs, *Educational Leadership, 64*(5), 68-73.

Wilson, B. A. (1995). *Effectiveness of the Wilson Reading System used in Public School Training*.

Wise, M. L. (2011). Effectiveness of the Barton Reading and Spelling System: A Qualitative Case Study Investigation. Theses and Dissertations. Mississippi State University.

Wolf, M. & Bowers, P. G. (1999). The double-deficit hypothesis for developmental dyslexias. *Journal of Educational Psychology, 91,* 415–438.

Wolf, M., Barzillai, M., Gottwald, S., Miller, L., Spencer, K., Norton, E., Lovett, M. & Morris, R. (2009). The RAVE-O Intervention: Connecting Neuroscience to the Classroom. *Mind Brain and Education 3*(2), 84–93. Doi: 10.1111/j.1751-228X.2009.01058.x

Wong, A. M., Ho, C. S., Au, T. K., McBride, C., Ng, A. K., Yip, L. P. & Lam, C. C. (2017). Reading comprehension, working memory and higher-level language skills in children with SLI and/or dyslexia. *Reading and Writing, 30,* 337–361. Doi:10.1007/s11145-016-9678-0

Wood, E. (2010). Cross Curricular Teaching to Support Child-Initiated Learning in EYFS and KS1. In T. Kerry (Ed), *Cross Curricular Teaching in the Primary School* (pp. 34–58). Routledge.

Woods, A. T., Poliakoff, E. Lloyd, D. M., Kuenzel, J., Hodson, R., Gonda, H., Batchelor, J., Dijksterhuis, G. B. & Thomas, A. (2011). Effect of Background Noise on Food Perception, *Food Quality and Preference, 22*(1), 42–47.

Woolfson, L. & Brady, K. (2009): An investigation of factors impacting on mainstream teachers' beliefs about teaching students with learning difficulties. *Educ. Psychol*. *29*(2), 221–238. Doi:10.1080/01443410802708895

Wright, M. C., Bergom, I. & Bartholomew, T. (2019). Decreased class size, increased active learning? Intended and enacted teaching strategies in smaller classes. *Active Learning in Higher Education, 20*(1), 51-62. Doi:10.1177/1469787417735607

Wu, H. K., Hsu, Y. S. & Hwang, F. K. (2008). Factors Affecting Teachers' Adoption of Technology in Classrooms: Does School Size Matter?. *Int J of Sci and Math Educ 6*, 63–85. Doi:10.1007/s10763-006-9061-8

WWC, Intervention Report. (2008). What work clearinghouse. Ies: US Department of Education.

Yang, D. C., Sianturi, I. A. J., Chen, C. H., Su, Y. W. & Trakulphadetkrai, V. N. (2022). Taiwanese primary school teachers' perceived enablers for and barriers to the integration of children's literature in mathematics teaching and learning. *Educ Stud Math,* 110, 125–148. Doi:10.1007/s10649-021-10115-3

Yaverbaum, O. (2003). Letterland Pictogram Concept in EFL Teaching of Young Children, *The InternetTESL Journal*, *4*(3), 2003, No. 3.

Yeager, E. A. & Hover, S. V. (2006). Virginia vs. Florida: Two Beginning History Teachers' Perceptions of the Influence of High-Stakes Tests on Their Instructional Decision-Making, *Social Studies Research and Practice*, *1*(3), 340-358. Doi:10.1108/SSRP-03-2006-B0005

Yin, H., Han, J. & Lu. G. (2017). Chinese Tertiary Teachers' Goal Orientations for Teaching and Teaching Approaches: the Mediation of Teacher Engagement. *Teaching in Higher Education, 22*(7), 766–784. Doi: 10.1080/13562517.2017.1301905.

Yoshimasu, K., Barbaresi, W. J., Colligan, R. C., Killian, J. M., Voigt, R. G., Weaver, A. L., et al. (2012). Gender, ADHD, and reading disability in a population-based birth cohort. *Pediatrics, 126*, e788–e795.

Youman, M. & Mather, N. (2018). Dyslexia laws in the USA: A 2018 update. *Perspectives on Language and Literacy, 44*(2), 37–41 https://tinyurl.com/v6g32wk

Zafeiropoulos, K. (2015). *How Is A Scientific Work Done? Scientific Research And Paper Writing.* Kritiki.

Ziegler, J. C. & Goswami, U. (2005). Reading acquisition, developmental dyslexia, and skilled reading across languages. *Psychological Bulletin*, *131*, 3–29. Doi:10.1037/0033-2909.131.1.3

Ziegler, J. C., Bertrand, D., Tóth, D., Csépe, V., Reis, A., Faisca, L., Saine, N., Lyytinen, H., Vaessen, A. & Blomert, L. (2010). Orthographic depth and its impact on universal predictors of reading: A cross-language investigation. *Psychological Science*, *21*, 551–559. Doi:10.1177/0956797610363406