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A TEACHING APPROACH TO READING SKILLS FOR STUDENTS WITH AUTISM SPECTRUM DISORDER AND COMORBID INTELLECTUAL DISABILITY IN SECONDARY EDUCATION

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Abstract:
The cultivation of reading skills is a fundamental priority in the teaching process, as their mastery facilitates the adaptation of students with special educational needs to school and community life. This study aims to highlight a differentiated teaching approach to support reading comprehension skills in students with Autism Spectrum Disorder (ASD) and comorbid Intellectual Disability (ID). Three case studies were conducted involving 13-year-old students attending a secondary special education school. The findings were derived through observation methodologies using checklists of basic skills and special intervention methodologies with recorded interactions on instructional activity forms. The results document the progress made by the students before and after the teaching interventions regarding their readiness for reading comprehension activities. The study's conclusions focus on the key features of differentiated pedagogical material that enhance the learning engagement of students with ASD and ID.

Keywords: autism spectrum disorder, intellectual disability, reading comprehension, differentiated pedagogical material

1. Introduction

Implementing an appropriate teaching approach for students with Autism Spectrum Disorder (ASD) and comorbid Intellectual Disability (ID) enables them to express themselves within the classroom setting. According to the United Nations Convention on the Rights of the Child, all children, with or without special educational needs, are capable of and entitled to freedom of expression (United Nations Commission on Human Rights, 1989). Specifically, they have the right to freely seek, receive, and impart written or verbal information. Consequently, this right should not be impeded by disabilities. On the contrary, students should be encouraged to develop such skills by being provided with appropriate conditions and opportunities.

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Students with developmental disabilities face challenges in reading and comprehension. These challenges may be more pronounced in students with both ASD and ID (Joseph *et al.*, 2023; Klefbeck, 2023). Text comprehension depends on two primary factors: the reader's skills and the characteristics of the text itself (Engel & Ehri, 2021; Joseph *et al.*, 2023;). Many students with developmental disabilities may lack a repertoire of strategies to understand text content and require adapted materials to support their reading comprehension (van Wingerden *et al.*, 2014).

Consequently, this study proposes a specialized teaching approach aimed at engaging students with ASD and ID in reading comprehension activities, evaluated through observational methodology. Observations in reading contribute both educationally and research-wise to assessing the current state within real-world educational contexts, such as a special education classroom (Drossinou - Korea, M, 2022; Solis & McKenna).

Furthermore, during the intervention methodology, certain pedagogical elements regarding the reading behavior of this specific student population—an area that remains under-researched—are revealed (Panopoulos & Drossinou-Korea, 2024; Tanet *et al.*, 2020).

2. Literature Review

Autism Spectrum Disorder (ASD) is characterized by difficulties in communication and social interaction, including deficits in socio-emotional reciprocity, nonverbal communicative behaviors, and the development, maintenance, and understanding of relationships. Additionally, individuals with ASD exhibit restricted, stereotyped, and repetitive patterns of behavior, interests, or activities (American Psychiatric Association, 2013).

Intellectual Disability (ID) is a disorder that emerges during the developmental period and is characterized by deficits in intellectual functions, such as reasoning, problem-solving, academic learning, and more. Additionally, deficits in adaptive functioning are observed, which may limit an individual's ability to perform daily life activities, such as communication and independent living, across various settings, including home, school, work, and community (American Psychiatric Association, 2013). According to Khachadourian *et al.* (2023), individuals with ASD, in addition to the core characteristics of the disorder, experience a significant burden from co-occurring disabilities. Their study describes the frequency and distribution of comorbid conditions among individuals with ASD. The sample consisted of 42,569 individuals with ASD and 11,389 siblings without ASD. Based on their findings, the majority (74%) of individuals with ASD had at least one comorbidity and exhibited a higher average number of comorbidities than their siblings without ASD. ASD with comorbid ID was reported in 21.7% of cases. Additionally, it was noted that some comorbidities could be partially attributed to perinatal factors. Maenner *et al.* (2020) reported that among 8-year-old children in the United States, the prevalence of ASD with ID was 33%. Moreover, 24%

had an IQ between 71 and 85. The highest prevalence of comorbidity was observed among girls. The authors emphasize the ongoing need for assessment and educational support for children with ASD and ID.

When a student has both ID and ASD, the learning challenges they face are significantly greater (Klefbeck, 2023). For students with ID, the additional difficulties in social interaction, repetitive behaviors, and restricted interests associated with an autism diagnosis result in heightened challenges regarding their autonomy during the learning process (Kurzeja *et al.*, 2024).

As with the general student population, literacy skills are fundamental for societal integration. Similarly, for students with special educational needs (SEN), the ability to access and comprehend information is a priority for achieving meaningful independent living. However, according to Lindström and Lemons (2021), poor outcomes in reading comprehension are reported. In fact, compared to other disabilities, students with ASD and ID consistently perform lower in reading skills. This highlights the necessity to propose and understand the teaching approaches utilized by teachers in educational settings.

A similar observation is made by Paynter, O'Leary, and Westerveld (2024), who note that children on the autism spectrum exhibit significant vulnerability to reading comprehension disorders compared to their peers. A substantial variability in reading comprehension is evident, with skills ranging from very low to above average. The authors emphasize the importance of early instructional interventions for children with ASD who are at risk of developing difficulties in reading comprehension.

Bekken *et al.* (2021) report that students with neurodevelopmental disorders, such as those with ASD and ID, face significant challenges in developing reading skills, which are related to cognitive limitations (with an IQ of ≤ 69), phonological awareness and language abilities. Specifically, their reading difficulties include phonological processing, such as the inability to blend, segment, and manipulate sounds, as well as limited working memory, which impedes the processing and storage of sound-based information. These issues affect their ability to decode words. Additionally, difficulties in skills such as understanding word meanings, comprehending text structures, and drawing conclusions present significant barriers to text comprehension. The lack of high-quality instructional interventions and appropriate learning opportunities exacerbates these problems, while low expectations for the developmental trajectory of these students further compound the situation. Overall, these limitations make the development of fundamental skills, such as decoding and comprehension, particularly challenging for students with ID (Bakken *et al.*, 2021).

In an article by Kurzeja *et al.* (2024), it is stated that reading involves the skill of decoding, such as blending sounds, matching sounds with their written form, word recognition, and fluency. Furthermore, a significant skill in reading is language comprehension, which includes the ability to understand written words and sentences. Nelly *et al.* (2018), in their analysis of reading skills in children with ASD, emphasize that certain skills are required for reading, ranging from recognizing letters and syllables, to

recognizing whole words, and ultimately understanding the meaning of the text. In the early school years, children typically learn to decode unfamiliar words, recognize words, read with some fluency, and understand simple sentences. In the following years, reading becomes more demanding, focusing on expanding vocabulary and grammatical concepts. To comprehend a text, the reader needs support in certain prerequisite skills, such as oral language skills, a sufficient vocabulary, drawing conclusions from the text, and connecting the text to prior knowledge.

Teaching reading comprehension to students with autism presents a set of challenges that are interpreted through the theory of mind, weak central coherence, and difficulties in executive functioning (Chang, Menzies, & Osipova, 2020). According to Megat Khalid, Kussin, and Zulkepli (2024), students with ASD have a limited vocabulary and face difficulties connecting with prior knowledge and experiences. Additionally, they struggle with grammar and syntactic knowledge, which can affect their understanding of sentence structure and the overall meaning of a text. Furthermore, students with ASD may face challenges in understanding figurative languages, such as metaphors, irony, idioms, and humor. Finally, comprehending and interpreting the attitudes and motivations of authors and characters can present obstacles for students with ASD.

Globally, there is a lack of literature on specific interventions targeting children with ASD and ID. Therefore, it is crucial to focus research efforts on this under-studied population, which has traditionally been excluded from intervention trials, whether related to care or education (Tanet *et al.*, 2020).

This study aims to highlight a differentiated pedagogical material developed to serve educational purposes and examines its effectiveness in supporting reading skills in students with ASD and co-occurring ID. The material in question is a three-dimensional "cognitive machine" (utilizing simple materials, such as a shoe box or box) that introduces the student to an educational routine (Figure 1) (Drossinou-Korea, 2024). This specific pedagogical material, with its three dimensions, offers an interactive experience, as students use their hands to open, close, place, or remove materials from different sides of the "cognitive machine". By utilizing each side of the "cognitive machine", numerous learning advantages are provided (Drossinou-Korea, 2020) (Figure 1). Initially, the three-dimensional "cognitive machine" is a structured material. Children with ASD tend to respond well to materials that have clear boundaries and structure (Gargiulo, 2012). At the same time, it supports classification skills, as students can use it to store and organize educational materials, helping them understand the concept of organization (Drossinou-Korea, 2024). Furthermore, this pedagogical material is based on the principles of differentiated instruction and responds to various needs, considering the pedagogical principle of individuality, as it can be shaped and utilized in multiple educational ways depending on the goals of the intervention (Drossinou-Korea, 2020). Additionally, activities with the "cognitive machine" provide engaging and dynamic stimuli based on multisensory learning. In this context, the educator can incorporate activities that foster touch (placement of materials), hearing, sight (colors and images), and movement (e.g.,

use of cards)—stimuli that contribute to the development of reading skills (Panopoulos & Drossinou-Korea, 2024). Lastly, the cognitive machine-box is easy to use, cost-effective, and environmentally friendly, as it is made from recycled materials.

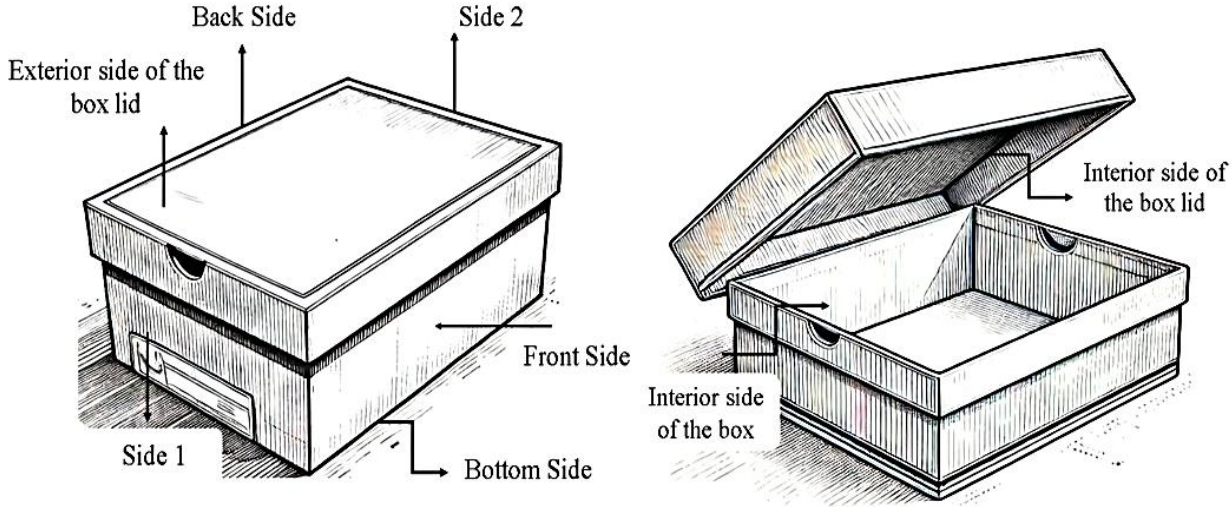


Figure 1: Differentiated Pedagogical Material - 3D "Cognitive Machine"

3. Methodology

This is a study examining three case studies of students diagnosed with Autism Spectrum Disorder (ASD) and co-occurring intellectual disability (ID). To assess the results, an observational methodology and teaching intervention were used.

3.1 Research Purpose

The purpose of this study is to highlight differentiated teaching approaches for students with ASD and co-occurring ID. More specifically, the following research questions are explored:

1) Can the teaching approach with specific differentiated pedagogical material support reading comprehension skills in this particular student population?
2) What characteristics of the differentiated pedagogical material are recorded as beneficial for the learning engagement of students with ASD and ID?

3.2 Sample

The sample for this study consists of three students who attend a special secondary education school. Specifically:

A. Student (1)

This is a 15-year-old student who is in the first grade of the special middle school. According to his individual history, he has been diagnosed by a competent evaluation and diagnostic service with severe intellectual disability and autism spectrum disorder. In his free time, he goes to the neighborhood playground to swing. He is the fourth member of his family. His parents seem to take care of his appearance, but they do not

show interest in his learning progress. They were absent from the school on the day designated as the "parent information day." According to his school history, Student (1) has verbal speech, responding mostly with one-word answers. He reads high-frequency words, understands simple and short sentences, and writes mainly two-syllable or three-syllable words in the consonant-vowel (C-V) structure with illegible handwriting.

B. Student (2)

This is a 14-year-old student who is in the first grade of the special middle school. According to her individual history, she has been diagnosed by a competent evaluation and diagnostic service with autism spectrum disorder, mild intellectual disability, and low functionality. In her free time, she dances. Her favorite show is Mickey Mouse. She has an obsession with writing the names of various supermarkets. She comes from a single-parent family. Her mother seems to take care of her appearance, is interested in her academic progress, and mainly focuses on her emotional well-being. According to her school history, Student (2) has verbal speech, responding mostly with one-word answers, and frequently echolalia occurs. She reads with a monotonous rhythm and understands simple and short sentences. She writes mainly two-syllable or three-syllable words with consonant-vowel (C-V) or consonant-consonant-vowel (C-C-V) syllables, stressing them.

C. Student (3)

This is a 13-year-old student who is in the first grade of the special middle school. According to her individual history, she has been diagnosed by a competent evaluation and diagnostic service with autism spectrum disorder and intellectual immaturity. In her free time, she swims. She hates princesses and loves sleeping. She comes from a family of four. Her parents are interested in her academic progress, particularly in the Greek language subject. According to her school history, Student (3) has verbal speech, responding with adequate clarity. She reads and understands simple and short sentences while adhering to punctuation marks. She writes mainly two-syllable or three-syllable words with consonant-vowel (C-V) or consonant-consonant-vowel (C-C-V) syllables, replacing or omitting certain letters. Finally, it was observed that she has low learning motivation.

3.3 Research Tools

For the conduct of the research, the observation methodology was utilized. The completion of the Basic Skills Checklist for learning readiness recorded qualitative data on the students' reading behaviors before and after the instructional interventions (Drossinou Korea, 2024; Ministry of Education-Pedagogical Institute, 2009). Additionally, through the methodology of instructional intervention, printed materials for didactic interaction were used, in which the researcher-educator's notes were recorded (Drossinou-Korea 2020). These notes were derived from hetero-observation, self-observation, and pedagogical reflection.

3.4 Research Process

The case studies of the students were conducted in a special secondary education school. Initially, the teacher-researcher carried out a systematic empirical observation both inside and outside the classroom in order to gather information on the individual, historical, and family background of the students. Then, an informal pedagogical assessment was conducted by completing the Basic Skills Checklist for learning readiness, specifically focusing on oral language skills, psychomotor abilities, cognitive skills, and emotional organization. After recording and defining the students' capabilities and needs, the teacher-researcher designed the teaching plan with the instructional objective: for the students to understand up to 5 sentences with specific visual conceptual facilitators, showing interest in the learning process. Additionally, the teaching steps and pedagogical materials (such as the "cognitive machine" – box, movable cards, etc.) were defined.

Subsequently, the teaching interventions took place. During each intervention, the students performed the following activities (Figure 2,3): They placed cards with personal information (such as name, subject, class, and favorite object/activity) on the outer surface of the box lid. On the front side, they formed a sentence-calendar with movable cards that displayed the day, month, and year of the teaching intervention. On sides 1 and 2, the students practiced recognizing and recording the start and end times of the intervention and engaged in self-assessment activities. On the bottom side of the box, the students placed a card with the subject from their weekly schedule and indicated their position by placing a card with their name on the classroom seating plan. On the inside of the lid, the students read differentiated sentences with visual conceptual facilitators. On the inside of the box, the students were tasked with learning readiness activities aimed at enhancing their understanding of the sentences/text.

At the end of the intervention, the teacher-researcher carried out the final informal pedagogical assessment by completing the learning readiness basic skills checklists and recording hetero-observations and self-observations in the teaching interaction forms.

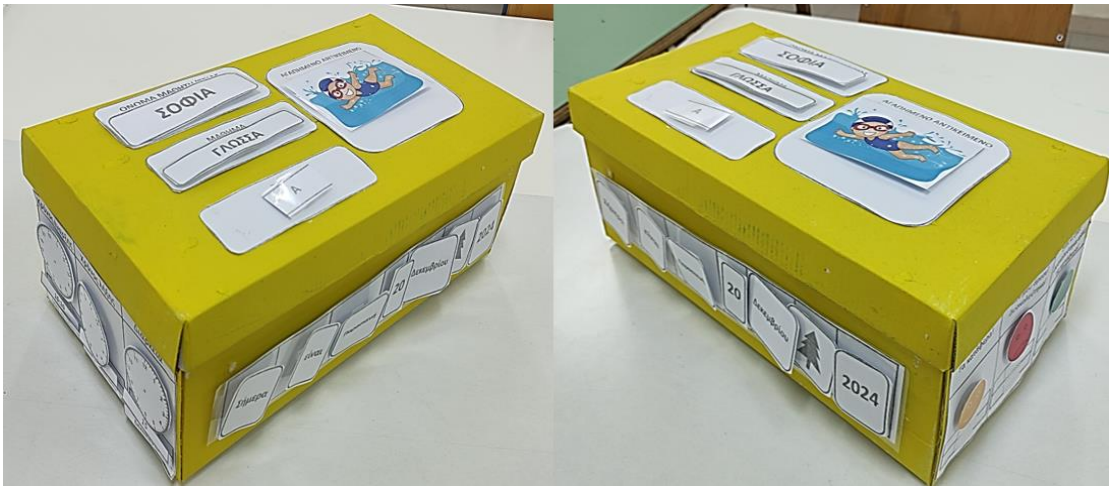


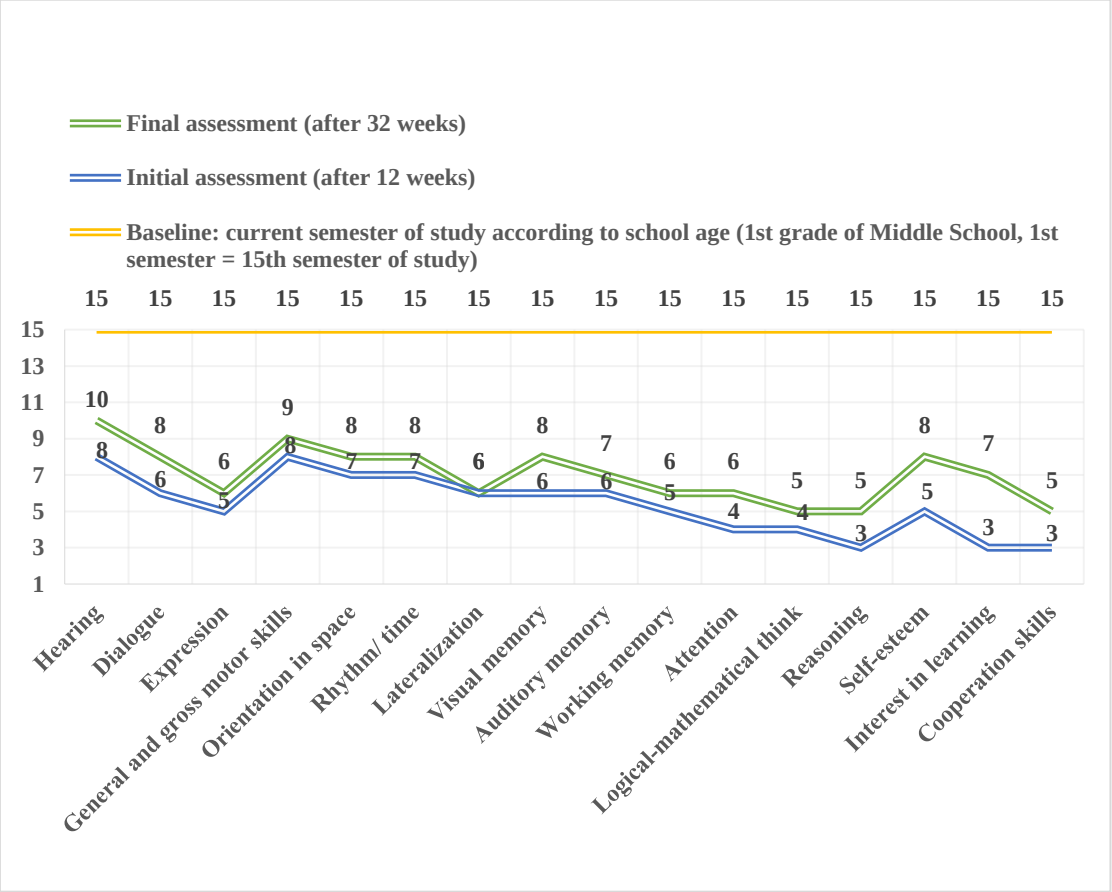
Figure 2: External side of the lid: Student's name (Sofia), Subject, Class.

Front side of the box: Calendar record of the intervention with cards (Today is Wednesday, December 4, 2024).
Side 1: Three clocks showing the start time, end time, and duration of the intervention.
Side 2: Three emoticons (happy, sad, indifferent) for self-assessment.

Figure 3: Internal side of the box: Structured space with activities for oral language (listening, dialogue, clear expression) to support text comprehension. Internal side of the lid: Differentiated text on the topic of television.

4. Results

The qualitative data from the Basic Skills Checklists for learning readiness and the teaching interaction forms were collected and represented in Graph 1 (Drossinou Korea, 2024). In this graph 1, the horizontal axis records the skills of each area of learning readiness, evaluated based on the reading behavior of the students. The vertical axis records the academic semesters according to the typical and mandatory education system, in an ascending scale from number 1, corresponding to the first semester of kindergarten, to number 15, which corresponds to the first semester of the first year of middle school. At semester 15, a solid horizontal line (yellow color) spans all the areas of learning readiness, representing the baseline corresponding to the current semester of the students' schooling based on their school age. A jagged green line shows the average performance (in academic semester) of the students during the initial evaluation. Finally, a jagged blue line reflects the average performance (in academic semester) of the students during the final informal pedagogical evaluation.



Graph 1: Average Performance of Learning Readiness during Reading Skills Instruction

In Graph 1, the current semester of the students' enrollment is depicted according to their school age (baseline line in yellow color: 15th semester of enrollment, i.e., the first semester of the first grade of middle school). The blue fluctuating line represents the average skills of the students in learning readiness during the initial observation, which lasted for 12 weeks. The green fluctuating line shows the average skills of the students in learning readiness after the completion of the instructional interventions (after 32 weeks).

Based on the observations and the data recorded in the teaching interaction forms during the intervention, students' performance improved. Specifically: In the area of listening, students improved by two semesters of schooling (10th semester: 4th grade of elementary school, second semester). For example, students participated in listening activities where they listened to and repeated words and sentences from texts. Regarding oral language, through differentiated activities, students engaged in dialogues about the content of the texts (8th semester: 3rd grade of elementary school, second semester) and answered comprehension questions with accuracy and clarity (using sentences such as Subject, Verb, Object). In the area of psychomotor skills, students showed improvement by one semester in three areas. Specifically, their fine motor skills (10th semester: 4th grade of elementary school, second semester) were enhanced through activities that required placing mobile cards with Velcro. Furthermore, in the 8th semester (3rd grade of elementary school, second semester), students demonstrated spatial orientation skills (e.g., identifying their position in the classroom using differentiated materials), time

management skills (e.g., narrating events from the texts in chronological order), and rhythm skills (e.g., reading sentences at a slow or fast pace). In cognitive skills development, students made progress by two semesters in visual memory (e.g., understanding text content with the use of visual conceptual facilitators), attention concentration (e.g., using their favorite object during the interventions), and reasoning (e.g., using graphic organizer tables to comprehend and draw conclusions from the content of the texts). Regarding emotional regulation, the most significant deviations from the initial observation were recorded. Specifically, in terms of self-awareness, students recognized success and accepted their failures in reading comprehension through self-assessment activities (8th semester of enrollment), showed interest in reading texts due to the unique pedagogical material (8th semester: 3rd grade of elementary school, first semester), and collaborated with their classmates to answer comprehension questions.

4. Discussion

Students with ASD face challenges in communication, processing sensory stimuli, understanding abstract concepts, and using and understanding the structure of language, all of which impede text comprehension. These deficits can be further amplified when intellectual disabilities coexist with ASD. However, despite these challenges, there are practices that educators can implement to improve reading comprehension. Specifically, according to Megat Khalid, Kussin, & Zulkepli (2024), practices such as the use of visual conceptual facilitators, a structured learning environment, individualization of reading materials, text differentiation, providing clear instructions, offering opportunities for repeated practice, incorporating multisensory stimuli, and fostering self-encouragement, all provide an inclusive learning environment for students with ASD and intellectual disabilities, ensuring that they receive equal educational opportunities and outcomes as their peers.

Similarly, this research highlights that individualized, structured, and differentiated educational materials support reading comprehension skills for specific student populations. The teaching approach used here initially provides students with an educational routine. Through activities that identify personal information (such as name, favorite object), the student practices recognizing and connecting information about themselves, boosting their self-confidence as they recognize words (name, class, subject) and match them with the correct positions. Additionally, the student makes a diary entry of the interventions, understanding and forming sentences (e.g., "Today is Monday…"). They also understand the duration of the intervention and practice recognizing and recording time by connecting numbers to the words that represent time. With the self-assessment activity, students recognize their feelings about the learning process (e.g., satisfaction, frustration, indifference), promoting self-awareness and the ability to express their emotions. Through self-assessment, students learn to recognize their needs and communicate how they feel about their progress. By determining their

position in the classroom on the spatial diagram, students enhance organizational skills and spatial understanding while promoting autonomy and social integration. Additionally, the weekly schedule chart is an essential tool for organization, predictability, and enhancing the student's autonomy. It serves as a bridge between the current activity and the broader framework of daily and weekly planning, supporting the learning process.

These activities provide opportunities for students to become familiar with literacy tasks. Regarding the inner side of the box, the differentiation of the text and activities related to the neurodevelopmental areas of readiness for understanding meanings provide multisensory stimuli that support skills connected to reading. For example, through oral language activities, students can enrich their vocabulary for text comprehension. Through psychomotor activities, they can develop fluidity skills. Through cognitive activities, they can understand meanings with visual facilitators and graphic organizers. Additionally, through emotional organization activities, students' interest in reading increases, especially when the content of the texts connects to their personal interests.

Students with intellectual disabilities can succeed in reading comprehension interventions when teaching approaches combine various skills. The current pedagogical material can be structured with activities to support comprehension, decoding, vocabulary, and fluency skills (Kurzeja *et al.*, 2024). It can also include activities to activate prior knowledge, understand text structure, identify main ideas, understand word meanings, and draw conclusions, which are fundamental skills for extracting meaning from text (Joseph *et al.*, 2023). Teaching approaches need to include educational routines aligned with students' needs, especially when attempting to differentiate instruction (Solis & McKenna, 2023).

5. Conclusions

Based on the case studies, the present pedagogical material for supporting reading comprehension fulfills certain pedagogical characteristics, such as:

- Structured and Organized: The material is structured, making it predictable and organized, which helps reduce anxiety and uncertainty. It facilitates students with ASD and ID in their understanding and autonomy.
- Individualization: The differentiated material is tailored to the needs, abilities, and interests of each student. It focuses on enhancing the student's strengths to compensate for challenges.
- Multisensory Learning: It is based on the principle of multisensory learning, allowing for activities with challenging and dynamic stimuli, fostering neurodevelopmental areas of learning readiness such as oral language, psychomotor skills, cognitive abilities, and emotional organization.

5.1 Limitations

The confirmation of the beneficial outcomes of the current instructional approach using differentiated pedagogical material (cognitive engine) for the development of reading skills in students with ASD and ID needs to be verified through further case studies, utilizing observational methodology in school settings.

Conflict of Interest Statement

The authors declare no conflicts of interest.

About the Author(s)

Dr. Nikolaos Panopoulos is a special education and training teacher in a secondary education school. His PhD concerned the special teaching methodology of reading skills for students with intellectual disabilities.

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