

# AvatarSEN

PROJECT NO. 2023-1-CY01-KA220-SCH-000156226

## ***A Guide to Avatar-Based Reading Comprehension Interventions***



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## About AvatarSEN

**AvatarSEN - Enhancing Reading Comprehension in SEN Students with Partial Mental Disability**, Project No: 2023-1-CY01-KA220-SCH-000156226, is an innovative school project co-funded by the European Union, dedicated to revolutionizing education for students with special educational needs (SEN). This initiative harnesses the power of personalized avatars, interactive reading materials, and cutting-edge technology to transform the educational landscape for SEN students. With partners from Cyprus, Greece, Turkey, Spain, and Poland, **AvatarSEN** aims to reshape the learning experience to cater to individual needs and enhance educational outcomes.

This guide, is created under Work Package 2 (WP2), which aims to establish an evidence-based foundation for developing avatars and interactive reading materials tailored to the needs of SEN students with partial mental disabilities. The focus is on catering specifically to these students, ensuring that the materials developed are effective, engaging, and tailored to their unique learning needs. The goals include conducting a thorough review of existing literature on the use of avatars to enhance reading comprehension in SEN students with partial mental disabilities, determining best practices, recognizing challenges and barriers, and formulating practical recommendations and guidelines for educators, policymakers, and other stakeholders. By synthesizing the findings from the literature review and best practices analysis, **AvatarSEN** aims to provide actionable insights and guidelines. These resources are designed to help educators, policymakers, and other stakeholders implement effective and engaging avatar-based learning environments for SEN students, ultimately enhancing their educational experiences and outcomes.

## Project Partners

**AvatarSEN** is supported by a consortium of esteemed partners from various European countries, each contributing unique expertise and resources to ensure the success of the project. The partnership includes the University of Cyprus, Girift Egitim Teknolojileri Yazilim ve Danismanlik San. Tic. Ltd. Sti. from Turkey, Diefthinsi Prototbatmias Ekpaidefsis Ftiotidas and Mykonos International Initiative from Greece, Specjalny Osrodek Szkolno-Wychowawczy im. Henryka Sienkiewicza w Swidniku from Poland, and C.E.I.P. Federico García Lorca from Spain. This diverse collaboration reflects a comprehensive and inclusive approach to advancing education for SEN students across Europe.

This collaborative effort exemplifies the power of international cooperation in advancing educational practices and improving outcomes for SEN students. By leveraging the strengths of each partner, **AvatarSEN** is well-positioned to achieve its ambitious goals and set new standards in special education.





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## Chapter 1: Introduction to Avatar-Based Interventions

The 21st century is marked by significant transformations, not only social and economic but also technological and informational. These changes impact all aspects of human life, providing a new dimension to many activities, including education. New technologies have permeated schools, introducing innovative tools, methods, and didactic means based on modern technologies. The advent of these technologies necessitates a reorganisation of the education system, particularly in the way knowledge is transmitted. In this evolving landscape of educational technology, the use of digital avatars presents a novel approach to enhancing learning outcomes for Special Education Needs (SEN) students, particularly those with partial mental disabilities.

The introduction of the present guide aims to provide an overview of avatar-based interventions in special education as well as the significance of reading comprehension for SEN students with partial mental disabilities in Cyprus, Poland, Spain, Turkey, Greece and across Europe followed by a section describing the purpose and scope of the present guide.

### 1.1 Overview of Avatar-Based Interventions in Special Education

Avatar-based interventions in special education involve using virtual characters or digital personas to support and enhance learning for students with special needs. These innovative tools can significantly improve engagement, social interaction, and personalised learning experiences. In an attempt to define avatars, we could say that they are digital representations of individuals or characters used within educational software, virtual worlds, or simulations. They can represent teachers, students, or fictional characters, interacting in various educational contexts to facilitate learning. In special education, avatars are tailored to meet the unique needs of students with disabilities such as autism spectrum disorders (ASD), learning disabilities, and emotional and behavioural disorders. These interventions aim to address specific challenges and provide customised support to enhance learning outcomes.

Avatar-based interventions can engage students in virtual role-playing activities and simulated environments that make the learning experience more personalised for SEN students. More specifically, with the use of avatars students engage in role-playing scenarios to practise social skills, communication, and daily living skills in a controlled, safe environment. This method helps them prepare for real-life interactions and situations. Moreover, avatars give teachers the opportunity to create virtual classrooms or scenarios where students can practise academic tasks, social interactions, and adaptive behaviours. These environments mimic real-world settings, allowing students to learn and apply skills in a safe learning context. Another important characteristic of avatars is that they can be adapted to individual learning styles and needs and, thus, provide personalised feedback and support. These avatars can adjust the difficulty of tasks, offer hints, and reinforce positive behaviour, catering to each student's unique learning pace and preferences.





The advantages of avatar-based interventions are numerous:

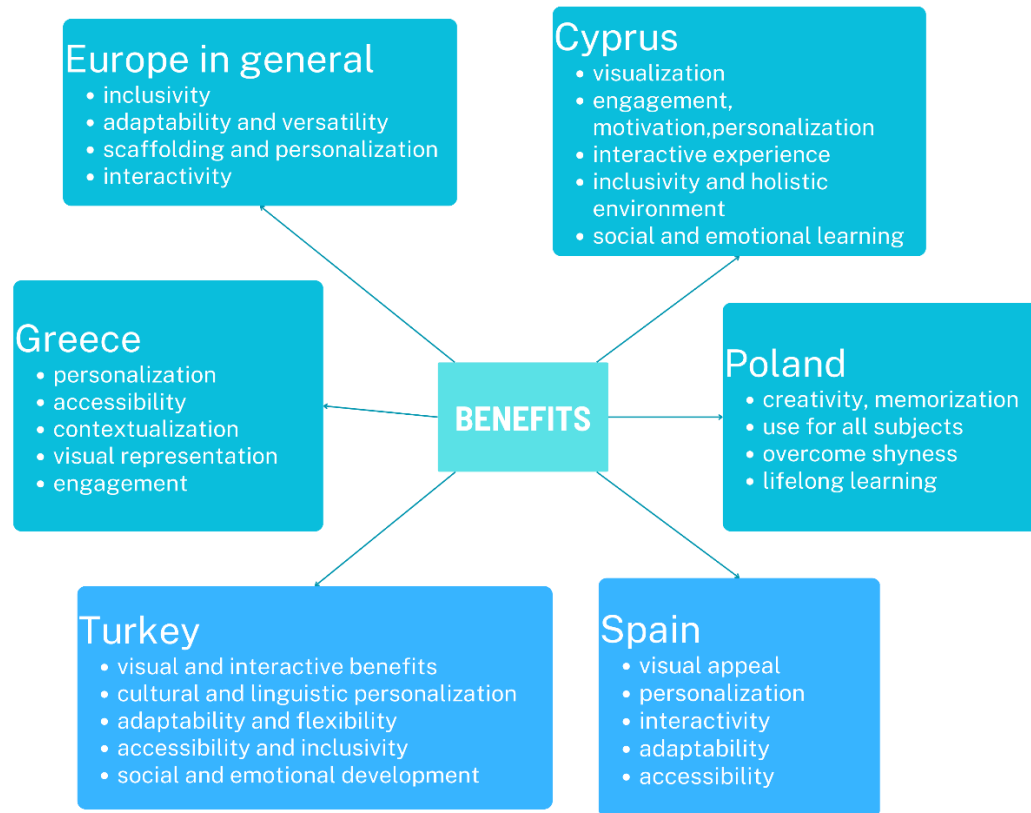
- **Visual representations:** Avatars cater to visual learners by providing visual accompaniments to text.
- **Customization:** Avatars can be adapted to reflect students' backgrounds and interests, making learning more engaging.
- **Interactive elements:** Interactive avatars can transform passive learning into active and immersive experiences.
- **Accessibility:** Avatars can provide alternative ways to engage with text, promoting inclusive education.
- **Social and emotional learning:** Avatars can encourage empathy and understanding of diverse perspectives.

Overall, avatars are emerging as a powerful tool for supporting SEN in partner countries due to their adaptability and interactive nature. In Cyprus, avatars cater to visual learners, foster engagement, and support inclusive education by providing alternative ways to engage with text. In Poland, avatars enhance creativity, motivation, and engagement, especially in language learning and speech therapy, offering a safe space for students to practice and overcome shyness. Spain sees avatars as beneficial for students with intellectual disabilities by providing personalised, interactive, and accessible learning experiences. In Turkey, avatars promote inclusivity and cultural connection, aiding in both academic and social development for SEN students. Greece emphasises the use of avatars in programs like Facesay to help SEN students recognize and express emotions, enhancing social skills. Across Europe, avatars are recognized for their ability to provide tailored support, fostering active participation and engagement for SEN students, particularly those with partial mental disabilities.





## Avatar-based interventions



To maximise the advantages of avatar-based interventions, a thoughtful implementation strategy is the key. Collaboration is paramount. Involving educators, specialists, parents, and even the students themselves in the planning and selection process allows for a comprehensive understanding of each student's needs. This collaborative approach ensures that chosen avatar-based tools are relevant, engaging, and directly address the student's specific challenges. Furthermore, customization is essential. By designing or choosing avatars and scenarios that reflect the students' cultural background and personal interests, educators can enhance engagement and relatability. The more students connect with the avatars, the more effective the learning experience becomes. Finally, integration with the curriculum is crucial. Avatar-based activities should not exist in isolation. Ensuring they align with established educational goals and standards fosters a cohesive learning experience where these interventions become a natural extension of the broader curriculum.





Avatar-based interventions hold promise for education, but there are hurdles to overcome. First, ensuring equitable access is crucial. Not all students have equal access to the technology and internet needed for these programs, potentially widening the achievement gap. Technical difficulties like software glitches or hardware malfunctions can disrupt the learning process. Schools need to be prepared to address these issues quickly and efficiently to minimise disruptions. Additionally, personalising avatars to fully understand and respond to the unique needs of each student can be challenging. The effectiveness of the intervention may be hampered by limitations in personalization. Finally, educators need to be properly trained to integrate these interventions effectively. Professional development and ongoing support are essential for teachers to get the most out of avatar-based learning.

While challenges exist, research suggests avatar-based interventions can be a valuable asset for education. Studies have shown positive impacts on engagement, social skills, and academic performance, particularly for students with special needs. For instance, these interventions have been especially effective in improving social interactions and reducing anxiety in SEN students with partial mental disabilities. However, the field is still evolving. Ongoing research is necessary to assess the long-term effectiveness of these tools, optimise the underlying technologies, and explore their application to a wider range of disabilities. By continuing to refine these interventions through research, we can ensure they are well-equipped to meet the diverse needs of all students.

All in all, avatar-based interventions hold significant potential to support and enhance special education, offering personalised, engaging, and effective learning experiences for students with special needs. By addressing specific challenges, providing individualised support, and creating safe learning environments, these interventions can improve educational outcomes and foster greater independence and confidence in students with disabilities. Continuous research, collaboration, and technological advancements will further refine and expand the impact of avatar-based interventions in special education.





## 1.2 Importance of reading comprehension for SEN students with partial mental disability

While manual skills primarily determined social status in the early 20th century, modern society places greater emphasis on communication and information absorption skills, with reading and writing being crucial. These skills enable independent functioning, improve job market prospects, facilitate learning, and enhance leisure activities. As for the reading skill, it has been emphasized that it allows children to gain knowledge beyond their direct experiences, while it has also been pointed out that learning to read is a fundamental element of education in all civilized societies and is essential for further learning and knowledge expansion. Reading comprehension is the core of reading since it is a process where readers interpret text based on their personal meanings, expectations, attitudes, and interests. Reading involves extracting information from the text and forming an appropriate interpretation. Reading comprehension is divided into two levels: basic reading skills (letter and word recognition) and higher cognitive skills, which encompass the capacity to understand, interpret, and derive meaning from written text. Unfortunately, for a significant group of children, mastering these skills is not easy, including a considerable number of children with intellectual disabilities.

SEN students with partial mental disabilities face many challenges in acquiring reading skills. These children show significant differences in learning and using reading skills compared to their peers, often struggling throughout their school years and beyond. The difficulties stem from various factors affecting readiness for reading, such as overall physical maturity, intelligence, visual and auditory perception, motor coordination, speech development, conceptual thinking, motivation, home environment, emotional stability and the quality of education. Intellectual functioning disorders are identified as a primary cause of these difficulties.

Additional factors include decreased perceptual-motor functions, cognitive and emotional limitations, central nervous system dysfunctions, speech development delays, lack of family support and inadequately adapted educational systems. Visual and auditory perception disorders are particularly impactful, hindering symbol differentiation and word recognition. Furthermore, family environments often fail to support these children's development and pedagogical approaches frequently overlook individual needs and diverse speech development activities.

Let us now examine the importance of reading comprehension for SEN students in each of the countries mentioned above.

For SEN students with partial mental disabilities in Cyprus, who may encounter additional challenges in cognitive processing and retaining information, achieving proficiency in reading comprehension is exceptionally important for multiple reasons. Firstly, reading comprehension is essential for accessing and understanding educational content across a range of subjects, including language, arts, mathematics, and science.







Without the ability to grasp written instructions, textbooks, and classroom materials, SEN students may find it difficult to fully engage with the curriculum and succeed academically. Furthermore, reading comprehension is crucial for the development of critical thinking skills in SEN students. It allows them to analyze information, draw connections and make informed conclusions, thereby, enhancing their cognitive abilities and problem-solving skills. These skills are not only vital for academic tasks but also for navigating real-life situations and making sound decisions. Additionally, reading comprehension significantly improves effective communication and expression for SEN students. By understanding and interpreting written texts, they can enhance their vocabulary, language comprehension, and communication abilities, both verbally and in writing. This proficiency in communication is invaluable for social interactions, self-expression, and advocating for their needs and preferences. Moreover, strong reading comprehension skills open up numerous opportunities for SEN students in Cyprus, both academically and personally. It provides them with the necessary tools for further education, employment, and lifelong learning, empowering them to pursue their goals and aspirations with confidence.

In Poland, teachers take into consideration that in the journey of learning to read, children typically progress through similar stages, but those with intellectual disabilities often require significantly more time to reach each milestone. Their learning process can be up to three times longer compared to typically developing children. Reading difficulties in this population stem from a combination of factors, including general developmental challenges, decreased cognitive abilities, potentially non-stimulating environments, and inadequate educational approaches. The acquisition of reading skills varies greatly among students with mild and moderate intellectual disabilities due to the significant individual diversity within this group. Assessing their reading levels poses a challenge, but researchers believe that intensive educational interventions can lead to improvements throughout their learning journey, particularly when consistent and appropriate stimulation is provided. A critical milestone is the achievement of single-word reading ability. Children with intellectual disabilities often encounter challenges in letter acquisition, stemming from disorders in auditory perception and visual analysis and synthesis.

This affects their reading pace and comprehension, leading to the use of less effective reading techniques and potential regression in skills development. Factors such as insufficient emphasis on reading practice at home, lack of perceived usefulness of reading, decreased internal motivation, and inappropriate teaching methods contribute to these difficulties. In terms of text accuracy, children with disabilities commonly make errors during oral reading, including substitutions, omissions, distortions, additions, and rearrangements of letters, syllables, or words. These errors hinder their understanding of the text's semantic meaning and persist throughout their schooling.

Reading comprehension poses significant challenges for children with intellectual disabilities, as they struggle with inference, comparison, hypothesis-making, critical analysis, and memorization. While literal understanding may improve with age, it requires considerable teaching effort, and many children still struggle to match pictures to text or answer simple questions about the material.





Positive motivation is crucial in teaching reading skills to children with intellectual disabilities, highlighting the practical benefits of reading for exploring the world, expressing needs, and remembering information. Syllabic reading methods are commonly used in Polish education for children with mild intellectual disabilities, emphasizing word and text selection tied to their specific experiences. To support students with disabilities, the Polish Ministry of Education and Science has adapted textbooks for over a decade to meet their needs, providing summaries in Easy Text to Read and Understand, thematic boards with Picture Communication Symbols, and videos in Polish Sign Language. Additionally, educational applications and programs like SymWriter ([www.widgit.com](http://www.widgit.com)) are utilized to supplement traditional teaching methods and support reading learning, especially for children with complex communication needs.

The importance of reading comprehension for students with intellectual disabilities in Spain is both significant and multifaceted, impacting various aspects of their lives and development. Here are several key reasons highlighting the critical role of reading comprehension for these students. Firstly, access to inclusive education is fundamentally reliant on reading comprehension skills. For students with mild intellectual disabilities, understanding the material they read is essential for actively participating in the educational process. This participation allows them to benefit from inclusive education, where they can learn alongside their peers and receive the same opportunities for academic growth and social interaction. Moreover, improving reading comprehension aids in cognitive development and communication skills. It helps enhance executive functions such as attention, memory, and critical thinking. As students improve their ability to understand what they read, they also develop stronger communication skills, enabling them to express their ideas and thoughts more effectively. This, in turn, supports better interactions with teachers, classmates, and family members.

Additionally, the ability to understand written information is crucial for fostering independence and autonomy in daily life. Students with mild intellectual disabilities who can comprehend reading materials are better equipped to follow instructions, make informed decisions, and participate independently in everyday activities. This autonomy not only boosts their confidence but also enhances their quality of life by reducing their reliance on others for basic tasks. Furthermore, reading comprehension opens the door to social and cultural participation.

It provides access to a vast array of information, including stories, news, cultural events, and general knowledge. This access allows students with intellectual disabilities to engage more fully with society and their communities, facilitating their social and cultural integration. By understanding and discussing various topics, they can connect with others and participate in conversations that enrich their social experiences.

Lastly, preparation for the future is a critical aspect of why reading comprehension is so important. Equipping students with strong reading skills prepares them for future success in various domains, whether in continued education, employment, or personal life. These skills enable them to keep learning, adapt to new situations, and effectively face challenges.





As they transition into adulthood, the ability to comprehend reading materials becomes increasingly important for navigating the complexities of modern life and achieving their goals. All in all, Spanish teachers consider that reading comprehension is essential for the comprehensive development of students with mild intellectual disabilities. It provides them with the skills and knowledge necessary to actively participate in society, achieve greater independence, and reach their full potential. By prioritizing and enhancing reading comprehension, we can ensure that these students have the tools they need to succeed and thrive in all aspects of their lives.

In Turkey, the development of reading comprehension skills for SEN students is also considered significant. By collating and analyzing global best practices, and tailoring these insights to the Turkish context, they aim to develop comprehensive recommendations and guidelines. Moreover, by studying successful strategies from around the world, we can identify what works best in various contexts and adapt these methods to fit the specific requirements of Turkish schools and students. This process involves not only examining academic programs but also looking at how schools can better support the social and emotional well-being of SEN students. These practices serve educators, policymakers, and other stakeholders, guiding the creation of more inclusive, engaging, and effective learning environments for SEN students.

Their goal is to provide a holistic framework that addresses all aspects of education for SEN students. This includes developing tailored teaching methods, enhancing teacher training programs, and creating supportive school policies. By focusing on inclusivity, Turkish teachers aim to ensure that every student, regardless of their abilities, has access to a high-quality education that meets their individual needs. Furthermore, they emphasize on the importance of collaboration among educators, families, and communities. Effective communication and partnership are crucial for creating an environment where SEN students can thrive. By fostering a supportive network, they ensure that these students receive the encouragement and resources they need both inside and outside the classroom.

Ultimately, the Turkish participation in this project aims to make a significant impact on the lives of SEN students. By providing educators and policymakers with the tools and knowledge they need, it is intended to help create a more inclusive and effective education system. This will not only improve academic outcomes for SEN students but also enhance their overall well-being and future opportunities. In summary, the present project is dedicated to developing comprehensive, context-specific recommendations that will guide the creation of inclusive, engaging, and effective learning environments for SEN students in Turkey. Through collaboration, research, and advocacy, they wish to transform educational practices and policies, ensuring that all students have the opportunity to reach their full potential.

In Greece, as well, helping SEN students develop strong reading comprehension skills is of primary importance. The main aim is to empower SEN students to become independent learners, a crucial aspect of their overall development. When these students can understand written instructions and information on their own, they rely less on constant support from teachers, fostering a sense of autonomy and self-confidence.





This independence not only benefits their academic growth but also prepares them for real-world situations where they need to interpret and act upon written information without external assistance. The ability to comprehend written text is vital for accessing information in various aspects of daily life. For instance, understanding news articles keeps students informed about current events, enabling them to engage in conversations and make informed decisions. Following written directions is essential for tasks such as using public transportation, assembling products, or following recipes, all of which contribute to greater self-sufficiency. Additionally, interpreting signs and other written materials in public spaces allows students to navigate their environment safely and effectively. These skills collectively enhance their ability to function independently in society and reduce their dependency on others for basic information.

Moreover, strong reading comprehension supports social and emotional development, which is critical for the holistic growth of SEN students. Through reading, students can explore different perspectives and empathize with characters, gaining insights into human experiences and emotions. This exposure to diverse viewpoints helps them understand and relate to others, fostering improved social skills and emotional intelligence. By engaging with a variety of texts, students can learn about conflict resolution, empathy, and the complexities of human relationships, which are essential for building and maintaining meaningful social connections.

Reading comprehension also plays a significant role in academic success. It enables students to grasp complex concepts across subjects, follow along in class discussions, and complete assignments accurately. As their comprehension skills improve, so does their ability to critically analyze texts, form opinions, and articulate their thoughts both in writing and verbally. This academic competence boosts their confidence and encourages a lifelong love of learning. In summary, developing strong reading comprehension skills is essential for SEN students, as it is a priority for Greek teachers to include every student in the learning process and benefit from it.





## Reading comprehension for SEN students

### Cyprus

- Academic success
- Critical thinking development
- Enhanced communication
- Lifelong opportunities

### Poland

- Academic success
- Lifelong learning

### Spain

- Inclusive education
- Cognitive development & communication
- Independence & autonomy
- Social & cultural participation
- Future preparation

### Turkey

- Inclusive education
- Individual needs

### Greece

- Independence & self-confidence
- Daily life skills
- Social & emotional development
- Academic success

Generally, in Europe, where inclusive education practices are increasingly emphasized, there is a growing recognition of the importance of providing adequate support for SEN students with partial mental disabilities. However, traditional teaching methods may not always cater to their diverse learning needs effectively. Hence, exploring innovative tools and strategies becomes imperative to enhance their educational experiences and outcomes.

Taking into consideration all the partners' concerns and given the critical role of reading comprehension for SEN students with partial mental disabilities, it is essential to explore innovative and effective strategies to support their development in this area. To this end, the use of digital avatars presents a novel approach to enhancing learning outcomes for SEN students. The integration of avatars into educational settings offers a unique opportunity to create more engaging and tailored learning experiences, potentially revolutionizing the way reading comprehension skills are developed. What follows is the rationale for using avatars in learning contexts.

### 1.3 Purpose and scope of the guide

The primary purpose of this guide is to provide comprehensive insights into leveraging avatar technology to enhance reading comprehension for SEN students. It aims to equip educators, policymakers, and parents with the knowledge and practical strategies needed to effectively implement avatar-based interventions, overcome common challenges, and foster a supportive learning environment. Additionally, the guide seeks to inform future directions and emerging trends in this innovative educational approach.





This guide encompasses a broad range of topics essential for understanding and effectively utilizing avatar technology in education for SEN students. It covers the foundational aspects of reading comprehension challenges, explores the capabilities and benefits of avatar technology, and provides practical guidance on implementation. The guide is structured into the following chapters:

**Chapter 2** provides a deeper understanding of reading comprehension challenges for SEN students. Its main objective is to elucidate the specific difficulties SEN students face with reading comprehension and it is a detailed examination of cognitive, linguistic, emotional, and environmental factors affecting reading comprehension.

**Chapter 3** introduces avatar technology and its relevance in education. It describes the nature of avatars, how they work, and their potential benefits for SEN students.

**Chapter 4** analyzes the common challenges in implementing avatar-based interventions. It identifies the main obstacles that hinder the effective use of avatars in educational settings and discusses the technical, logistical, pedagogical, and attitudinal barriers.

**Chapter 5** is a presentation of best practices in avatar-based interventions. It provides actionable strategies for successful avatar-based interventions and contains evidence-based practices, case studies, and recommendations for integrating avatars into teaching methods based on the research of partner countries.

**Chapter 6** offers practical advice for teachers using avatar technology. It provides Tips on lesson planning, classroom management, and personalized learning approaches with avatars, while exploring the integration of avatars across various subjects and curriculum areas. It also includes a section on educator training and capacity building, providing educators with the necessary skills and knowledge to effectively use avatars in their teaching practices.

**Chapter 7** attempts to guide policymakers in supporting the adoption of avatar technology in special education by prioritizing accessibility and universal design to ensure all students can benefit, fostering collaboration among stakeholders, addressing ethical considerations and promoting digital citizenship, and, thus, ensuring this technology is used responsibly and empowers students to navigate the digital world effectively.

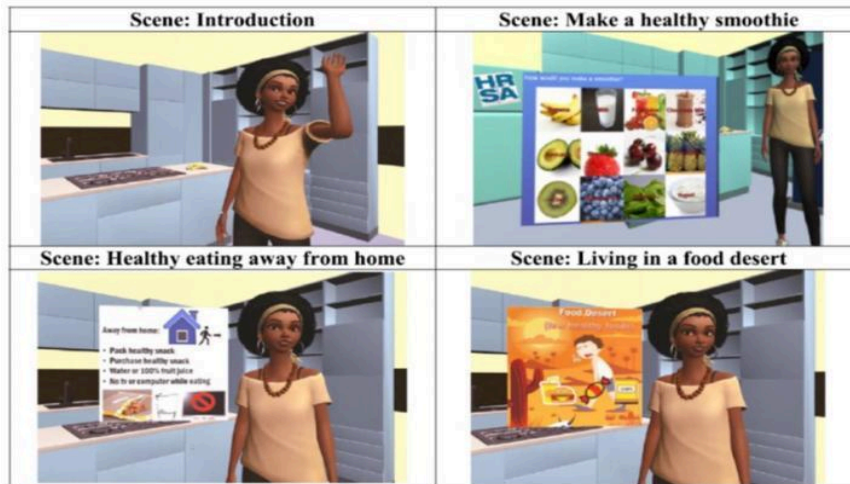
**Chapter 8** emphasizes the role of parents in supporting avatar-based learning. It contains strategies for parents to engage with and support their children's learning using avatars, and how to collaborate with educators.

**Chapter 9** seeks to explore the future landscape of avatar technology in education. It provides insights into emerging trends, innovative applications, and potential developments in avatar-based learning tools.





To sum up, the guide aims to be a valuable resource for stakeholders involved in the education of SEN students. By offering in-depth knowledge and practical solutions, it aspires to enhance reading comprehension and overall educational outcomes through the strategic use of avatar technology.



## Chapter 2: Understanding Reading Comprehension Challenges

### 2.1 Multifaceted nature of reading comprehension

Reading and writing are fundamental skills acquired during school education. These skills are developed and refined from early school years through all stages of education. The beginning of building these skills is the so-called readiness to learn reading and writing. A. Brzezińska defines the concept of readiness as sensitivity to signs, their essence, and their significance in the process of communicating with the environment (M. Bogdanowicz 2010). She believes that readiness to learn reading and writing comprises psychomotor, cognitive, and emotional-motivational processes:

- Psychomotor processes related to perceptual-motor functions in the areas of visual, auditory-linguistic, and motor analyzers,
- Cognitive processes encompassing conceptual-verbal thinking and thinking based on linguistic and non-linguistic material,
- Emotional-motivational processes forming the foundation for the two earlier spheres.

A child ready to read appreciates the value of this activity and masters it much faster and more effectively. Driven by curiosity, the child is more eager to explore the unknown, which is discovered upon encountering a book. An open attitude towards books fosters creative, critical, and analytical reading (M. Bogdanowicz 2010). The act of reading and writing engages many brain mechanisms and involves multiple systems that connect various anatomical structures (L. Utrat-Milecka 2008). It has been proven that reading and writing activate perceptual, cognitive, linguistic, memory, and motor processes.





Quick and efficient execution of reading and writing tasks is also influenced by attention, an appropriate level of arousal in the body, and the aforementioned engagement of motivational and emotional processes. During reading, cognitive processes such as visual, auditory, tactile, and kinesthetic functions, as well as memory and motor functions, are activated. Reading always involves decoding text and interpreting content, while writing involves formulating content and encoding it using conventional signs.

Reading and writing as school skills are developed in children using appropriately selected methods and means, adequate to the child's age and level of development. L. Utrat-Milecka writes that reading with comprehension involves conceptual-verbal thinking, flexibility, productivity, and critical thinking. Brzezińska identifies three levels in the act of reading:

- Technical (related to decoding),
- Semantic (identical to reading comprehension),
- Critical-creative.

The author links the latter with the ability to reflect and take a stance on the read content and its hidden meanings.

Children with special educational needs exhibit specific difficulties in reading and writing from the beginning of their school education. These difficulties are classified by various scientific disciplines. Speech therapy recognizes them as a syndrome of communication disorders via written language, encompassing both reception (reading) and production (writing) aspects (Kaczmarek 1975; 1995; Krasowicz 1997). Psychology and neuropsychology classify specific difficulties in reading and writing as disorders of higher mental functions. A. Luria (1976) points to their systemic and dynamic localization in the brain. H. Spionek (1965) identified these difficulties in the broadly understood psychomotor development. M. Bogdanowicz describes these issues as learning difficulties/disorders, referring to partial developmental disorders of higher mental functions in the realm of linguistic communication. She uses both descriptive terminology and the term "developmental dyslexia" to denote the syndrome of difficulties in reading and writing, including dyslexia, dysorthography, and dysgraphia (Bogdanowicz 1969).

Children with special educational needs (SEN) require specific conditions in the learning process that are tailored to their individual abilities and limitations. Selecting the appropriate program, methods, and forms of teaching plays a crucial role in this context. It is also important for the teacher to have adequate preparation for working with SEN children.

School problems related to learning to read and write for children with special educational needs are influenced by factors such as intellectual disabilities, neurological disorders, sensory and motor impairments, as well as emotional disorders. Difficulties in learning to read and write also occur in children who are within the intellectual norm and whose mental development is proceeding normally. In such cases, we speak of dyslexia, which refers to specific difficulties in reading and writing in children with typical intellectual development.







Dyslexia (from Greek: dys- meaning "difficult" or "impaired," and lexis meaning "word" or "speech") is defined by the World Federation of Neurologists (USA, 1968) as a disorder characterized by an inability to master the skills of reading and writing despite adequate intelligence and environmental conditions. This incapacity is conditioned by disruptions in basic cognitive functions. Another definition is provided by Marta Bogdanowicz, who describes dyslexia as "difficulties in mastering the skill of reading."

The term dysgraphia (from Greek: dys- meaning "difficult" or "impaired," and graphein meaning "to write") is defined by B. Sawa as "difficulties in handwriting technique, low graphical level of writing." The author also associates these terms with a third term—dysortography. According to Marta Bogdanowicz, "dysortography is difficulties in mastering correct spelling (referring to any deviations from correct writing, not just orthographic errors)."

In literature discussing dyslexia, dysgraphia, and dysortography, various positions exist regarding whether these three specific difficulties can be grouped under one term. For example, Teresa Gąsowska and Zofia Pietrzak-Stępkowska believe it is appropriate to "apply the term dyslexia to cases of decreased ability to read and write."

It's quite common for reading difficulties to occur in gifted children. In every class, there are students with developmental dyslexia, which refers to specific difficulties in learning to read and write. The term "specific" emphasizes the narrow and limited nature of these difficulties. Specific learning difficulties refer to severe difficulties in mastering reading comprehension and correct writing.

The cause of specific learning difficulties lies in the disharmonious psychomotor development, manifested by delayed development of specific functions: motor, visual-spatial, and auditory-linguistic.

Labeling dyslexia as developmental indicates that becoming a student with SEN in reading and writing doesn't happen suddenly; these difficulties persist throughout the child's development because they are conditioned by abnormal functioning of the nervous system.

The term "developmental dyslexia" sometimes includes the adjective "developmental." This means that the described difficulties occur from the beginning of schooling, unlike "acquired dyslexia," which refers to the loss of previously acquired reading and writing skills in adults following brain injury. Since learning to read and write is a multifaceted problem, difficulties associated with it will manifest in the areas of visual perception, auditory perception, motor skills, and lateralization. Because difficulties in learning to read and write can be noticed quite early, even in infancy and preschool age, it's important to remember not to overlook symptoms in children that may indicate future difficulties in reading and writing.





M. Bogdanowicz writes that among the early signs, known as risk factors for dyslexia, include: delayed speech development, faulty pronunciation, ambidexterity, confusion of body sides, low proficiency and coordination of movements during self-care, play, drawing, etc., difficulties in differentiating similar-sounding phonemes, phonemic awareness, syllabification, confusion of letters, omission of letters, spelling errors despite knowledge of rules. A child with impaired cognitive and motor functions often experiences academic failures, hence requiring support from both parents and teachers.

## 2.2 Challenges faced by SEN students with partial mental disabilities

As a child with special educational needs (SEN) begins their schooling journey, they encounter new challenges. They must adapt to the conditions and requirements of a new educational environment, engage in various interactions with teachers and peers in school and class, and also with themselves as learners. They must also undertake typical school tasks related to acquiring knowledge and acquiring school skills (Brzezińska et al. 2012: 8). They are capable of meeting these challenges, provided that they are adequately prepared and receive the necessary support in both their family and educational environments. Students with SEN may experience difficulties in mastering school skills due to developmental deficits, making it imperative for them to receive support from teachers, therapists, and parents.

K. Kuligowska (1984: 29–30) suggests that academic achievement encompasses "favorable changes both in the instrumental sphere of the student (in information resources, intellectual skills, abilities to use this information in action), and in the directional sphere (in motivation to act, aspirations, feelings, and attitudes)." Such a definitional approach to academic achievement allows for distinguishing the following types:

- Motivational achievements, characterized as acquired willingness to perform specific activities, manifested, for example, in mathematical interests.
- Cognitive (didactic) achievements, interpreted as the acquired ability to perform specific tasks, such as reading, writing, or solving particular types of problems.
- Psychomotor achievements (Niemierko 1993: 499).

Challenges faced by students with special educational needs, as well as the ways of coping with them, have an impact on their school start and further development. Learning difficulties constitute a broad group of problems encountered by students during their schooling. They manifest in various forms of school activities, such as speech (both expression and perception), reading, writing, reasoning (logical thinking skills), mathematics, and others. These difficulties can be caused by environmental or educational neglect, below-average intelligence, or intellectual impairment, as well as sensory impairments (e.g., children with hearing or visual impairments).

The level of school functioning of a student with specific learning difficulties may vary depending on the severity of the difficulties and the compensatory abilities determined by their intelligence level, personality traits, effectiveness of the support provided, etc.





Considering that when we struggle with a task that requires more effort, we tend to avoid it and prefer other activities, it's not surprising that suspicion of laziness arises (Sochacka, 2008). With greater intensity of difficulties and/or lesser ability to compensate for them, academic failures often accumulate, becoming a source of serious socio-emotional problems.

The most common learning difficulties are often associated with reading, writing, and speaking, which are various ways of using language. All language-related activities are complex processes and, as mentioned earlier, depend on many cognitive abilities, including visual, auditory, memory, and intellectual development. However, language skills are considered the most significant. In the process of learning to read with comprehension, factors that exacerbate or diminish difficulties in reading and writing should also be taken into account. These are exogenous factors, referred to as secondary or ancillary. They include:

Educational methods, atmosphere, and the intellectual-cultural level of the family.

- Parental reactions to the child's difficulties and methods of overcoming them.
- Teacher's attitude towards the child, their approach to addressing dyslexia.
- Method and organization of reading and writing instruction.
- Child's physical condition (frequent observation at school).

These factors can facilitate or expedite the process, but they can also hinder, reduce, or even prevent the dyslexia process.

There is no doubt that the ability to read with comprehension is crucial because it facilitates the independent functioning of individuals in the world. For children with special educational needs, mastering reading and writing techniques is often a huge challenge. Why does this happen? First and foremost, these children lack the readiness to learn to read and write. A. Brzezińska defines readiness for reading and writing as a state in a child's development that results from maturation and previous educational training, primarily within the family environment, making them sensitive to signs, their essence, and their significance in the process of human communication, while also being ready to benefit from environmental cues regarding the acquisition of reading and writing skills." According to the author, readiness can be understood in three aspects:

- Psychomotor readiness, the existence of which is a prerequisite for mastering the techniques of reading and writing.
- Conceptual-linguistic readiness, which is associated with the reservoir of psychological and linguistic experience.
- Emotional-motivational readiness, the essence of which is discovering the existence of written language, the principles governing it, and understanding its significance in the process of human communication and the transmission of cultural experience.

The mentioned aspects are interdependent and together determine the mastery of reading and writing skills. However, according to the author, the emotional-motivational aspect determines the child's attitude towards overcoming difficulties.





Achieving a state of full school readiness not only allows for the start of learning in school but also fosters a creative approach to the new role of being a student. Children with special educational needs often do not achieve such readiness due to their deficits and impaired functions. In the case of children with SEN, the greatest impact on the level of reading skills is exerted by disorders of visual and auditory perception, which manifest in difficulties in differentiating symbols, physical characteristics of letters, sounds, and word features.

However, it should be remembered that the lack of readiness for learning to read is influenced by the overall life experiences of the child: knowledge, skills, and patterns of behavior shaped over the years preceding the start of schooling. According to the assumptions of theories explaining the learning and reading process from a sociocultural perspective (Vygotsky, 1978), socio-cognitive (Ruddel and Unrau, 1994; Schaffer, 1994), and socio-pragmatic (Tomasello, 2000), it is argued that early interactions of the child with printed words, occurring in relation to others, especially with more experienced readers such as parents, play an important role in developing language and reading skills. Early literacy, occurring during what is known as the "reading situation" in the family home, can provide an opportunity for children to develop both the psychomotor, conceptual-linguistic, and emotional-motivational aspects of readiness for reading and writing. These are the areas that significantly contribute to a child's achievements in later stages of education.

The role of parents in fostering language and reading skills in children is extremely important. Whether parents read to their children, instill a love for books in them, and set an example of reading themselves plays a crucial role in the acquisition of language and reading competencies. Although reading to children is strongly promoted in today's society, and the benefits are widely acknowledged, not all parents engage in this practice. It is valuable for children to participate in various activities, primarily playful in nature, with their parents, utilizing reading materials in traditional or alternative text formats. Research has shown that such early reading experiences have a significant impact on later positive educational achievements, both for children with disabilities and typically developing children.

Currently, we have a wide range of options available to expose children to written and spoken words. There are many resources adapted for children with special educational needs, including interactive books, books with moving pictures, inclusive reading books, books with Picture Communication Symbols (PCS), audiobooks, multimedia games, and avatars designed specifically for teaching reading to children with special needs. It's also worth mentioning shared reading, also known as dialogic reading, which involves adults reading aloud to children while encouraging interaction through asking questions about the text and engaging in conversation about the book. This activity is considered highly beneficial for the academic achievement of preschool children, as it is based on mutual interactive communication tailored to the needs and abilities of children with developmental disabilities.

Additionally, for some children, such as those with autism spectrum disorders who have difficulties in social communication, participating in shared reading may require the use of alternative and augmentative communication methods and prompts to facilitate information exchange.





Engaging in storytelling activities with parents also has a significant impact on children's reading and writing achievements. Through storytelling, children have the opportunity to develop language skills, including phonological awareness, word recognition, comprehension, accuracy, and fluency in reading.

Fascinating data on the impact of reading with children and introducing them to books is provided by studies such as those conducted by Meghan Davidson and Susan Ellis Weismer (2014). These studies confirm the significant importance of early-acquired language skills, particularly in the home environment, especially in the areas of nonverbal communication and language expression, for predicting later reading achievements in children with autism spectrum disorders. This underscores the significant role of early interactions with printed words in the home environment for developing children's cognitive and language skills, and thus shaping their readiness for reading and writing.

Students with intellectual disabilities often face much greater challenges and longer learning processes when it comes to reading and writing. Sometimes, achieving proficiency in these skills seems nearly impossible. This is due to their overall developmental disorders, accompanying disabilities and deficits, as well as a lack of motivation and perceived usefulness of reading and writing techniques. For children with special educational needs, mastering these skills is a tremendous challenge, which is why both parents and teachers should support this process.

It's important to use innovative teaching methods, attractive visual aids, and information and communication technology, such as educational games, avatars, interactive whiteboards, tablets, communicators, and specialized programs that support learning to read and write.

"Development does not begin with material goods; it begins with people, their education, organization, and discipline. Without these three components, all resources remain hidden, unused, and potential" (Schumacher, 1999, p. 139). We won't support children in the educational process, we won't change the education system, if we don't start with ourselves, with openness to self-improvement, to using innovative solutions, and above all, to igniting passion in children. Let's teach them to find joy in learning, show them how learning can be fun, motivate them to work, and praise even the smallest progress. Such approach and support from parents and teachers given to children with special educational needs can make them more eager to take on the challenge of learning, approach new challenges with curiosity, and make progress more easily. The challenge for education is to create conditions for such learning that "[...] reaches to the heart of what it means to be human. Through learning, we transform ourselves. Through learning, we are able to do something we wouldn't otherwise be able to do. Through learning, we perceive the world and our relationships with it. Through learning, we develop our creative potential and become part of the creative processes of life. In each of us lies a hunger for this kind of learning" (Senge, 2000, p. 26).





The need for innovative learning began to be clearly recognized in the early 1970s. It seems that the paradigms and new categories of learning in the late modernity period can be expressed as follows:

- Learn to know, that is, to acquire tools for understanding oneself and the world, seeking knowledge and wisdom, and learning tools to continue learning throughout life.
- Learn to act, to apply knowledge in everyday life, to be able to influence one's environment, and to act creatively and responsibly within it.
- Learn to live together, to use knowledge, values, and skills to understand others, participate and collaborate with others in all areas of human activity, and build citizenship in an interdependent world.
- Learn to be, to use knowledge, values, and skills for personal development, striving to seek values and self-improvement. School as a space for building the future, developing aesthetic dimensions of life, immersing oneself in culture, and learning for oneself.
- Learn to be innovative, to transform oneself, local communities, and global society.
- Learn to live sustainably, develop a reflective approach to life, shape one's living environment and relationships with it, and live a balanced lifestyle.

Let's teach our children these principles, let's teach them to find joy and progress, let them see the purpose of reading skills, and let's ignite their curiosity for books and good educational games. Let's accompany them constantly in this challenging process.

### 2.3 Impact of cognitive, linguistic, and sensory impairments on reading comprehension

Reading with comprehension is a gateway that opens up enormous possibilities for learning, developing one's personality, and keeping pace with growing knowledge. Teaching a child to read is to open the door to intellectual development. Mastering reading comprehension conditions a child's academic success, as it facilitates learning in the early grades and prepares them for systematic learning in subsequent grades. Effective learning provides additional satisfaction, with the joy of mastering material quickly and easily, which fosters further interests and motivations associated with improving reading skills. Understanding a text is a complex process that occurs in several successive phases. The process of understanding a text consists of perceptual, memory, cognitive, imaginative, and emotional elements.

A student who struggles to understand what they read cannot rely on internal rewards that reinforce their efforts. This may lead to the formation of a negative attitude towards tasks and oneself, thereby causing a dislike for text as a source of knowledge. Such a student will not expand and consolidate school knowledge through available printed sources, thus weakening their reading interests.





Recognizing the role of silent reading with comprehension and its impact on intellectual development, it is important to equip students with this skill as early as possible. T. Gałkowski writes that reading and writing are fundamental means of social communication. They facilitate the process of communication between people not only in everyday life but also as a means of transmitting experiences between past, present, and future generations. Therefore, reading and writing are essential skills for modern humans, and mastering them is given tremendous importance today. It is crucial not only to acquire these skills but also to consider the time it takes to acquire them.

Developing reading comprehension skills is facilitated by games that require matching shapes, distinguishing them, and connecting similarities. According to M. Cadwerska, reading and writing involve many interconnected activities, and children should be prepared for them in advance. Most researchers dealing with the issue of learning to read and write consider it an extremely complex process - one that engages in various activities of the child: sensory (visual, auditory), motor (articulatory, manual), cognitive (memory, perceptual), and above all, complex mental activities. Sometimes, however, a child may not be able to perform all of these activities, and this is where problems with learning to read and write arise. To answer the question of what causes this, we must be aware of what the reading and writing processes entail. According to H. Mystkowska, reading is a sensory-motor, intellectual, emotional, and educational process. Reading is a unique, complex mental operation that requires the simultaneous execution of several tasks. M. Baczyńska distinguishes tasks such as:

- Holistic perception of the graphic shape of the word and associating it with its phonetic counterpart,
- Constructing coherent content from individual words of the text, that is, recognizing and becoming aware of the logical connections between words and expressions.

"The essence of reading and writing skills lies in a child's ability to translate or decipher the signs of written language, and the basic elements of reading include: understanding the text being read and the reading technique associated with it" (R. Więckowski, 1978).

Research conducted by H. Spionek has shown that the majority of children experiencing difficulties in reading and writing, despite normal mental development, exhibit various types of delays in psychomotor development. These delays are minor but still hinder the child's ability to properly perform tasks related to mastering reading and writing skills. Due to the fact that delays in psychomotor development concern a relatively narrow range and pertain to elementary functions, they have been termed as fragmentary developmental deficits. These include:

- Delays and disturbances in auditory perception development,
- Delays and disturbances in visual perception development,
- Delays and disturbances in kinetic-motor perception development,
- Disturbances in the lateralization process.





These deficits result in specific categories of errors in reading and writing.

Another cause of difficulties in mastering reading and writing are speech development disorders resulting from various reasons, including: global psychomotor development disorders (below-average intelligence, intellectual disability), perceptual-motor integration disorders, lateralization disorders, visual and auditory perception disorders, sensory and motor organ damage, neurological disorders, environmental neglect, educational errors, emotional-social development disorders, memory disorders, psychomotor hyperactivity (G. Krasowicz-Kupis, 2003).

Difficulties in reading and writing may coexist or result from speech development disorders, including dyslalia. Delay in acquiring specific language skills may indicate future problems with lexicon and spelling. Language abilities are the foundation for the development of reading and writing skills. Proper articulation is extremely important for the correct association between sounds and letters, while other language skills are crucial for recognizing the meaning of individual words or sentences and combining them into a textual whole.

In Polish literature on the subject, statements appear suggesting that few children with difficulties in reading and writing have mastered language and communication skills to a good extent. There are indicators that can predict future reading and writing difficulties in children diagnosed with language disorders in early childhood. These include:

- Low scores in terms of mean length of utterance (MLU),
- Phonological awareness disorders,
- Difficulties with rapid automatic naming, and word retrieval (RAN).

Special attention should therefore be paid to children who experience various delays in vocabulary acquisition, building utterances of appropriate length, as well as atypical disturbances in word structure.

## 2.4 Understanding the challenges associated with reading comprehension.

From the foregoing considerations, it follows that the causes of difficulties in learning to read and write include disruptions in auditory, visual, and manual skills. When these symptoms manifest in school-age children as dyslexia, the child requires systematic re-educational work to improve the functions of the disrupted analyzers. This is precisely the focus of educational therapy. "Educational therapy involves using educational (pedagogical and didactic) means to address the causes and manifestations of children's learning difficulties, aiming to eliminate school failures and their negative consequences" (I. Czajkowska, 1989). Educational therapy represents a specific educational intervention aimed at bringing about certain positive changes in the cognitive and socio-emotional spheres, as well as in the structure of the child's school knowledge and skills.







The overarching goal of educational therapy is:

- To create opportunities for comprehensive intellectual, psychological, and social development,
- To develop the child according to their own potential.

The effectiveness of therapeutic actions depends on the child's activity. The therapist's task is not only to enable children to learn but also to encourage them to want to learn. To achieve this, it is necessary to incorporate elements of psychotherapeutic interventions into the process of educational therapy. Psychotherapeutic actions should focus on eliminating stressful situations and preventing them; creating an atmosphere of friendliness and trust in which the child feels comfortable; stimulating activity and the need for cooperation in resolving their own problems. The child must be convinced that the therapist will help them with their issues. It is crucial to satisfy the need for success by creating situations that provide opportunities for satisfaction and experiencing joy in the work accomplished.

This is achieved by setting tasks within the child's capabilities and utilizing their interests. The child gains a sense of self-worth, which motivates them for further actions, fosters cognitive needs, and motivates them to learn. Maintaining the student's interest in activities and keeping them engaged can be achieved through varied forms of exercises, using games and play, as well as various relaxation exercises, taking into account the child's preferences. A child experiencing difficulties in reading and writing requires understanding and wise psychotherapeutic treatment at home and at school. It is essential that every achievement, no matter how small, is recognized and appreciated, and that the child's work is not compared with that of other classmates if such comparison is detrimental to them.

Pedagogical therapy typically proceeds in three stages of work.

- Initial (preparatory) stage: This involves exercises stimulating and correcting disturbed perceptual-motor functions and their coordination through play and games using concrete verbal material, as well as intensive psychotherapeutic interventions.
- Rehabilitation stage (actual therapy): At this stage, one moves on to working with didactic, letter, and word material in various exercises aimed at improving reading and writing skills.
- Stage of refining reading and writing skills: This stage involves further corrective and compensatory exercises aimed at improving auditory and visual functions, kinesthetic-motor skills, and their coordination during reading and writing. The goal of these exercises is to master the skill of correct reading and writing by eliminating dysorthography, i.e., characteristic spelling errors related to the specifics of Polish orthography.

In the case of children with special educational needs, implementing appropriate ways of adapting requirements and providing authentic support during ongoing work with the child is extremely important because abnormalities resulting from below-average intellectual development affect many diverse spheres of the student's functioning. These difficulties are distressing and burdensome for both the child and their parents. They also present significant didactic and organizational challenges for teachers.





These are students with special educational needs, thus requiring special assistance and comprehensive support (cf. Krauze-Sikorska et al., 2020).

Symptoms arising from the specificity of their difficulties are often interpreted by the environment in an inadequate and hurtful way—as laziness, lack of respect, or dismissive attitude towards intellectual effort. However, the cost of reduced intellectual abilities is very high and much broader than just educational lag. Therefore, the child should be surrounded by special psychological and pedagogical care and support. By implementing appropriate methods of work and organizing the learning process, the possibility of providing the child with ongoing assistance and an authentic sense of security gradually increases. In turn, the sense of security, control, and responsibility for one's own actions is the foundation of effective acquisition and structuring of knowledge and skills (cf. Kossowska, Schouwenburg, 2003; Kostańska, 1995; Spionek, 1973; Kostrzewski, 1981; Kwaśniewska, Wojnarska, 2001).

During the organization of the didactic and educational process, it is worth paying attention to several circumstances and methods of work. Firstly, due to the concrete thinking (low level of abstract reasoning) and impaired functioning of memory processes in this group of children, it is necessary to embed the discussed material in the context of situations known to the child from everyday life. It is also beneficial to use examples and visualizations (photos, videos, recordings); such organization ultimately facilitates not only understanding but also effective memorization of the discussed content.

Because of noticeable difficulties in maintaining proper attention and focusing on the proposed cognitive task for an extended period, it is necessary to alternate tasks of a static nature with dynamic tasks (using movement, physical activity); variability of tasks is key. In order to achieve and direct effective communication with the child, it is advisable to use short, clear verbal communications. This applies to both formulated instructions, questions, and repetitions. This communication specificity makes it easier for the child to encode, memorize, and retrieve presented content from long-term memory if needed; it is also important to divide longer instructions into shorter segments.

Systematic monitoring of the child's level of understanding and encoding of presented tasks and instructions is necessary. It is also valuable to continuously verify whether the student understands the tasks being performed, such as whether they heard and encoded the instruction correctly.

Extremely important is the ongoing prevention regarding potential irregularities in socio-emotional development, including, for example, ensuring the use of positive reinforcements, praise, and creating a conducive environment for the student to achieve success. Often, such an environment is difficult to find in the sphere of learning and academic achievements (due to frequent co-occurrence of so-called generalized educational difficulties), so it is necessary to monitor all areas of development, interests, and preferences of the child, such as artistic, sports, or prosocial.





The basis for individualizing work and selecting support methods for students with lower-than-average intellectual development and accompanying difficulties should be a thorough and proper diagnosis of the observed irregularities. The underlying causes of these difficulties can be very diverse, and the proper and thorough recognition of them is crucial for identifying the source of the problem and implementing appropriate forms of assistance. Individualization of work and adjustment of requirements according to needs are essential conditions for the further, proper development of this group of students and achieving satisfactory educational outcomes.

It is also extremely important to offer support to both the child and parents. In case of noticing the difficulties, it is tactful to suggest the possibility of seeking specialized help and undergoing a psychological-pedagogical diagnosis. It is worth emphasizing that accessing all forms of assistance and support in public psychological-pedagogical counseling centers, including specialized diagnosis, is free of charge and requires parents/legal guardians to submit the appropriate formal application. Strengthening children with special educational needs in their development should be the primary goal of all educational and support activities. Listening to individual needs and focusing on both deficits and strengths is an important foundation for teaching, stimulating development, and providing ongoing support to the child. It is worth remembering that from a broad and long-term perspective, caring for the multidimensional well-being of individuals contributes to optimizing the development of the entire society.





## Chapter 3: Overview of Avatar Technology

Avatar technology, a rapidly evolving field, involves creating digital representations of individuals for use in various domains, including virtual reality (VR), augmented reality (AR), gaming, social media, telecommunication, and professional environments. These avatars range from simple 2D images to complex 3D models that can mimic human appearance, behavior, and emotions, significantly enhancing our interaction with digital environments.

The concept of avatars originated in Hindu mythology, where it referred to deities' incarnations on Earth. In the digital realm, the term gained popularity through Neal Stephenson's 1992 science fiction novel "Snow Crash." With the advent of the internet and online gaming in the late 20th century, avatars first appeared as simplistic 2D images in chat rooms and multiplayer games, evolving into the sophisticated 3D models we see today.

Creating and animating avatars involves several key technologies. 3D modeling software like Blender, Maya, or 3ds Max is used to create a three-dimensional representation of a character. This model is then equipped with a skeleton in a process known as rigging, and the model is attached to this skeleton in skinning to enable movement. Animation techniques, including motion capture data, bring these avatars to life by simulating realistic movements and interactions.

Artificial Intelligence (AI) plays a crucial role in enhancing avatar functionality. Behavioral AI allows avatars to perform actions autonomously based on programmed behaviors or AI algorithms, while conversational AI leverages natural language processing (NLP) to enable avatars to engage in realistic conversations with users.

Rendering technologies are vital for the visual quality and performance of avatars. Graphics engines such as Unity and Unreal Engine render avatars in real-time, ensuring high-quality visuals. Techniques like shading and texturing add depth, color, and texture to the avatars, enhancing their realism.

Motion capture (MoCap) and facial recognition technologies are essential for capturing and translating human movements and expressions onto avatars. MoCap uses sensors to record body movements, while facial recognition and tracking technologies, such as Apple's Face ID and Intel's RealSense, map facial expressions onto avatars.

Avatars are extensively used in various fields. In gaming, they serve as primary representations of players in virtual worlds, providing personalized experiences and interactive storytelling. Games like "World of Warcraft" and "The Sims" offer customizable characters that enhance player immersion.

In social media and communication, platforms like Snapchat and Facebook allow users to create and use avatars for personal expression and interaction. Virtual meeting spaces such as VRChat and AltspaceVR enable social interactions in digital environments through avatars. In virtual reality (VR) and augmented reality (AR), avatars enhance the sense of presence and embodiment.





In VR, avatars are crucial for immersive experiences in training simulations, virtual tours, and social VR applications. In AR, avatars interact with the real world, offering new ways of engagement and information overlay.

Professional and educational uses of avatars include remote work platforms and virtual classrooms, where avatars facilitate meetings, presentations, and collaborative work. Examples include Microsoft's Mesh for Teams and educational simulations like Engage, which enhance communication and engagement.

The widespread use of avatar technology raises several ethical and social concerns. Privacy and security are paramount, as the use of personal data for creating and animating avatars poses risks related to data privacy and potential misuse for impersonation or fraud.

Identity and representation are also significant issues. While avatars offer opportunities for self-expression, they also raise questions about authenticity and identity, as users can choose any appearance, impacting social interactions and self-perception. The digital divide is another concern, as access to advanced avatar technology depends on resources and digital literacy, potentially exacerbating socio-economic disparities.

The future of avatar technology is promising, with advancements in AI, machine learning, and immersive technologies paving the way for more lifelike and responsive avatars capable of nuanced interactions and emotional expressions. The integration of avatars into the metaverse will create interconnected virtual worlds where they play a central role, and efforts to enhance accessibility and inclusivity will make avatar technology available to a broader audience.

Avatar technology, blending artistic creativity and advanced computing, is transforming how we interact with digital environments and each other. As the technology continues to evolve, it promises to unlock new dimensions of virtual presence, identity, and communication, shaping the future of digital interaction.

### 3.1 Explanation of Avatars and their Role in Educational Settings

Avatars, digital representations of individuals, are increasingly being utilized in educational settings. These virtual characters can represent students, teachers, or even fictional personas within digital learning environments. The integration of avatars in education leverages technology to enhance engagement, personalize learning experiences, and facilitate innovative teaching methods. This document explores the role of avatars in education, including their technological foundation, applications, benefits, challenges, and future directions.

Avatars in educational settings are often created using 3D modeling software like Blender, Maya, or 3Ds Max. These tools allow for the creation of detailed and customizable characters. The avatars are then animated through processes such as rigging and skinning, where a digital skeleton is constructed and the 3D model is attached to it to enable movement. This technology ensures that avatars can perform a wide range of actions, from simple gestures to complex interactions.





AI plays a crucial role in enhancing the functionality of avatars. Behavioral AI allows avatars to perform tasks autonomously, responding to student inputs and adapting to different educational scenarios. Conversational AI, leveraging natural language processing (NLP), enables avatars to engage in meaningful dialogues with students, answering questions, providing feedback, and facilitating discussions.

Motion capture (MoCap) technology captures real human movements and maps them onto avatars, making their actions appear more natural and lifelike. Facial recognition and tracking technologies, such as those developed by Apple and Intel, allow avatars to mimic human facial expressions accurately. This is particularly useful in virtual classrooms where visual communication enhances the learning experience.

Avatars are integral to virtual reality (VR) and augmented reality (AR) educational applications. In VR, avatars provide a sense of presence and embodiment, crucial for immersive learning experiences. In AR, avatars can interact with real-world elements, offering an interactive and engaging way to present educational content.

In virtual classrooms, avatars represent both teachers and students, creating an interactive and immersive learning environment. Platforms like Engage and AltspaceVR enable educators to conduct classes in virtual spaces, where avatars can participate in discussions, present projects, and collaborate on group activities. This setup is particularly beneficial for distance learning, providing a sense of presence and community despite physical separation.

Avatars can be tailored to match individual student profiles, providing personalized learning experiences. Adaptive learning systems use avatars to deliver customized content based on a student's learning pace, style, and preferences. These avatars can guide students through lessons, offer encouragement, and provide real-time feedback, enhancing the overall learning experience.

Simulation-based learning, which includes medical training, engineering practice, and emergency response drills, benefits significantly from avatars. These simulations create realistic scenarios where students can practice skills and make decisions in a safe environment. For instance, medical students can interact with patient avatars to practice diagnosis and treatment, while engineering students can use avatars to simulate the operation of complex machinery.

Avatars facilitate language learning by providing interactive conversation partners. Language learning platforms can use avatars to simulate real-life conversations, helping students practice speaking and listening skills in a controlled environment. The avatars can adjust their speech and responses based on the learner's proficiency level, offering a personalized and engaging language learning experience.

Avatars make learning more interactive and engaging. Their ability to perform actions, express emotions, and respond to student inputs creates a dynamic learning environment. This level of interactivity helps maintain student interest and motivation, which are crucial for effective learning.





Avatars can make education more accessible and inclusive. For students with disabilities, avatars can provide alternative ways to participate in classroom activities. For example, speech-to-text technology combined with avatars can help hearing-impaired students follow along in real-time. Additionally, avatars can be customized to represent diverse cultures and identities, promoting inclusivity and representation.

In fields requiring practical training, such as medicine or engineering, avatars allow students to practice skills in a risk-free virtual environment. This reduces the potential for harm and provides opportunities for repeated practice, which is essential for mastery. The safe environment also encourages students to experiment and learn from their mistakes without real-world consequences.

The use of avatars in educational technology generates valuable data on student interactions and performance. This data can be analyzed to gain insights into learning patterns, identify areas where students struggle, and tailor educational strategies accordingly. Educators can use these insights to improve curriculum design and teaching methods.

Despite their potential, avatars in education face technical limitations. High-quality 3D modeling and animation require significant computational resources, which may not be available in all educational settings. Additionally, the implementation of AI and motion capture technologies can be complex and costly.

The use of avatars involves the collection and processing of personal data, raising concerns about privacy and security. It is essential to ensure that data is handled responsibly and that student's privacy is protected. Schools and developers must implement robust security measures to prevent data breaches and misuse.

Access to the technology required for avatar-based learning is not universal. Students from underprivileged backgrounds or in regions with limited technological infrastructure may face barriers to accessing these advanced educational tools. Efforts must be made to bridge the digital divide and ensure equitable access to technology-enhanced learning.

Integrating avatars into education requires thoughtful pedagogical planning. Educators need to be trained in using these technologies effectively and must design lessons that leverage avatars to enhance learning outcomes. There is also a need to balance technological integration with traditional teaching methods to ensure a holistic educational experience.

Future developments in AI and machine learning will further enhance the capabilities of avatars in education. More sophisticated AI algorithms will enable avatars to understand and respond to complex student behaviors and emotions, providing more personalized and effective learning experiences.

The concept of the metaverse, an interconnected virtual world, offers exciting possibilities for educational avatars. In the metaverse, students and teachers can interact with each other and with educational content in entirely new ways, creating a seamless blend of virtual and real-world learning experiences.





Advancements in graphics technology and motion capture will make avatars even more realistic and interactive. This will improve the sense of presence and immersion in virtual learning environments, making educational experiences more engaging and effective.

Ongoing efforts to enhance the accessibility and inclusivity of educational technology will ensure that avatars are available to a broader range of students. This includes developing cost-effective solutions and improving digital infrastructure in under-resourced areas.

Avatars are transforming the educational landscape by offering innovative ways to engage students, personalize learning, and create immersive and interactive learning environments. While there are challenges to overcome, the potential benefits of avatar technology in education are immense. As technology continues to evolve, avatars will play an increasingly central role in shaping the future of education, making learning more accessible, inclusive, and effective for all students.

## 3.2 Types of Avatars Used in Special Education

Avatars, digital representations of individuals, are proving to be transformative in special education by providing tailored support to students with diverse learning needs. These virtual characters can serve various roles, from instructional aids to therapeutic companions, significantly enhancing the educational experience for students with disabilities. This document explores the various types of avatars used in special education, detailing their applications, benefits, and the underlying technologies that enable their use.

Instructional avatars are designed to deliver educational content in an engaging and accessible manner. These avatars, which can appear as virtual teachers, tutors, or guides, interact with students to provide personalized instruction.

Instructional avatars are integral in personalized learning, adapting the pace and style of teaching to match individual student needs. They can provide immediate feedback and reinforcement, helping students understand concepts and correct mistakes in real-time. Furthermore, these avatars can present lessons in an interactive format, utilizing multimedia elements like videos, animations, and simulations to enhance comprehension.

The interactive nature of instructional avatars keeps students engaged and motivated. They offer consistent instruction, which is crucial for students requiring repetitive reinforcement. Moreover, they can use various communication methods, including sign language and text-to-speech, making learning accessible to students with different needs.

Technologies like AI and machine learning enable instructional avatars to adapt to the student's learning style and provide personalized instruction. Speech recognition and synthesis allow these avatars to understand and respond to verbal communication, making interactions more natural.

Social skills training avatars help students with social and communication difficulties, such as those with autism spectrum disorder (ASD), to practice and develop essential social skills in a safe and controlled environment.







These avatars are used in role-playing scenarios to simulate various social situations, allowing students to practice appropriate responses and behaviors. They can demonstrate nonverbal cues, such as facial expressions and body language, helping students recognize and interpret them. Additionally, social skills training avatars can act as peers, providing a platform for students to practice interactions without the pressure of real-world consequences.

Social skills training avatars provide a safe learning environment where students can practice social interactions without fear of judgment or failure. They support incremental learning by breaking down social skills into manageable steps, allowing students to build confidence gradually. These avatars also offer immediate feedback on social interactions, helping students learn from their experiences.

Facial recognition and emotion AI technologies enable these avatars to express and recognize emotions, making interactions more realistic. Natural language processing (NLP) allows avatars to engage in meaningful conversations, understanding and responding to student inputs appropriately.

Assistive communication avatars support students with speech and language impairments by providing alternative means of communication.

These avatars are integrated with augmentative and alternative communication (AAC) devices to help students communicate their needs and thoughts effectively. They assist in speech therapy sessions by providing exercises and feedback to improve speech and language skills. Moreover, interactive communication tools, such as avatars using visual aids and symbols, facilitate conversations for students with speech and language challenges.

Assistive communication avatars enhance students' ability to express themselves, improving their communication with others. They offer consistent and personalized support during speech therapy sessions, helping students improve their speech and language skills. By providing a reliable means of communication, these avatars help students gain confidence in their interactions.

Speech generation and text-to-speech technologies enable these avatars to vocalize text inputs, providing a voice for students who are nonverbal. Gesture recognition allows avatars to interpret and use sign language, facilitating communication for students who rely on it.

Behavioral intervention avatars teach and reinforce positive behaviors, helping students develop self-regulation and coping skills. These avatars demonstrate appropriate behaviors and responses in various situations, serving as role models for students. They provide praise and rewards for positive behaviors, encouraging students to repeat them. Behavioral intervention avatars also help track and monitor student behaviors, providing valuable data for behavioral interventions.

Avatars provide consistent reinforcement of positive behaviors, which is crucial for behavior modification. They can be programmed to address specific behavioral challenges, tailoring interventions to individual needs. The use of avatars in behavioral interventions allows for the collection of data on student progress, informing future strategies.





Behavioral AI algorithms enable these avatars to adapt their interactions based on the student's behavior, providing personalized support. Data analytics tools help in tracking and analyzing student behaviors, identifying patterns and areas for improvement.

Therapeutic avatars support mental health and emotional well-being, offering therapeutic interventions in a virtual format. These avatars facilitate virtual counseling sessions, providing a comfortable and non-judgmental environment for students to express their feelings. They guide students through mindfulness exercises and relaxation techniques to manage stress and anxiety. Therapeutic avatars also provide a safe outlet for students to express their emotions, helping them process and understand their feelings.

Therapeutic avatars make mental health support more accessible, especially for students who may be reluctant to seek help in person. They offer consistent therapeutic interventions, which is crucial for effective mental health support. Avatars provide a safe and supportive space for students to explore and express their emotions.

Emotion AI allows these avatars to recognize and respond to student emotions, providing appropriate therapeutic support. Virtual reality (VR) environments enhance the therapeutic experience, making it more immersive and engaging.

Avatars can be customized to meet the unique needs of each student, providing personalized instruction and support. This tailored approach helps address the diverse challenges faced by students with disabilities, enhancing their learning outcomes.

The interactive and engaging nature of avatars keeps students motivated and involved in the learning process. Increased engagement is particularly beneficial for students who may struggle with traditional educational methods.

Avatars provide a safe and controlled environment for students to practice new skills and behaviors. This risk-free setting allows students to learn from their mistakes and build confidence without the fear of real-world consequences.

For students with communication and social difficulties, avatars offer alternative ways to interact and practice social skills. This support is crucial in helping these students develop the ability to communicate effectively and build meaningful relationships.

Implementing avatars in special education requires advanced technology and computational resources, which may not be readily available in all educational settings. Ensuring that the technology is reliable and accessible is a significant challenge.

The use of avatars involves the collection of sensitive student data, raising concerns about privacy and security. Schools and developers must implement robust measures to protect student information and prevent misuse.

Educators need to be trained in using avatar technology effectively. Integrating avatars into the curriculum requires careful planning to ensure they complement and enhance traditional teaching methods.





Access to avatar technology is not universal, and students from underprivileged backgrounds or in regions with limited technological infrastructure may face barriers. Efforts must be made to bridge this digital divide and ensure equitable access to technology-enhanced learning.

Future developments in AI and machine learning will further enhance the capabilities of avatars in special education. More sophisticated AI algorithms will enable avatars to provide even more personalized and effective support.

The integration of avatars with emerging technologies such as augmented reality (AR) and virtual reality (VR) will create more immersive and engaging learning experiences. These advancements will open new possibilities for interactive and experiential learning.

Advancements in graphics technology and motion capture will make avatars even more realistic and interactive. This will improve the sense of presence and engagement in virtual learning environments.

Ongoing efforts to enhance the accessibility and inclusivity of educational technology will ensure that avatars are available to a broader range of students. This includes developing cost-effective solutions and improving digital infrastructure in under-resourced areas.

Avatars are revolutionizing special education by providing innovative ways to support students with diverse learning needs. Through personalized instruction, enhanced engagement, and safe learning environments, avatars make education more accessible and effective. While there are challenges to overcome, the potential benefits of avatar technology in special education are immense. As technology continues to evolve, avatars will play an increasingly central role in shaping the future of special education, ensuring that all students have the opportunity to succeed.

### 3.3 Benefits of avatar-based interventions for SEN students

Avatar technology, which involves digital representations of individuals, has made significant strides in various fields, including education. For students with special educational needs (SEN), avatars offer a range of benefits that traditional educational methods might not be able to provide. This document delves into the benefits of avatar-based interventions for SEN students, examining how these digital tools enhance learning experiences, provide personalized support, and create inclusive educational environments.

Avatars transform passive learning into an interactive experience. They engage students through simulations, games, and interactive lessons, making learning more enjoyable and stimulating. For SEN students, who may have difficulties maintaining focus, the dynamic nature of avatars helps in sustaining their interest and motivation.

By incorporating elements of gamification, avatars make learning fun. Reward systems, achievements, and progress tracking motivate students to participate and achieve their learning goals. This approach is particularly effective for students with attention deficits or those who find traditional learning methods unappealing.





Avatars can be programmed to adapt their teaching methods to suit individual learning styles and needs. For instance, they can adjust the complexity of the content, provide step-by-step instructions, or repeat lessons as needed. This level of customization ensures that each student receives instruction tailored to their unique requirements.

Immediate feedback from avatars helps students understand their mistakes and learn from them. This instant reinforcement is crucial for SEN students, who may need more frequent feedback to grasp new concepts fully.

Avatars allow students to learn at their own pace. This flexibility is essential for SEN students, who may need more time to process information and complete tasks. It reduces the pressure and anxiety associated with keeping up with peers in a traditional classroom setting.

Avatars provide a safe, non-judgmental environment where students can practice new skills without fear of embarrassment or failure. This is particularly beneficial for students with anxiety disorders or social phobias, as it encourages them to engage in learning activities more freely.

Avatars can create realistic simulations that allow students to practice real-world skills in a controlled environment. For example, students with social communication difficulties can practice conversational skills, while those with mobility issues can explore virtual environments to build spatial awareness.

For students with autism spectrum disorder (ASD) or other social communication challenges, avatars offer a platform to practice social interactions. They can simulate peer interactions, role-play different social scenarios, and provide feedback on social cues, helping students improve their social competence.

Avatars can be used to teach and reinforce nonverbal communication skills, such as recognizing facial expressions and body language. This is particularly useful for students who struggle with interpreting nonverbal cues, enhancing their ability to understand and respond to social signals.

Avatars can use various forms of communication, including text, speech, and sign language, making them accessible to students with different communication needs. This multimodal approach ensures that all students, regardless of their abilities, can participate in learning activities.

Avatars can be customized to reflect the diversity of students, promoting a sense of inclusion and belonging. Students can see themselves represented in their learning tools, which can boost their self-esteem and engagement.

Avatars can model appropriate behaviors and coping strategies, providing students with clear examples to follow. This is beneficial for students with behavioral challenges, as it helps them understand and adopt positive behaviors.





The consistency of avatar-based interventions ensures that positive behaviors are consistently reinforced. This helps students with behavioral issues to internalize and maintain new behaviors over time.

Avatars can assist in developing executive functioning skills, such as planning, organization, and time management. Through interactive tasks and prompts, students learn to manage their activities more effectively.

Avatars can provide targeted support in academic areas where students may struggle. For example, they can offer additional practice in math, reading, or writing, using methods tailored to each student's learning style.

Avatars can track student interactions and performance, providing valuable data for educators. This data helps in monitoring progress, identifying areas of difficulty, and adjusting interventions accordingly.

Detailed reports generated by avatar-based systems offer insights into a student's learning journey. These reports can be shared with parents, therapists, and other stakeholders to ensure a coordinated approach to the student's education.

Avatars can provide emotional support and companionship, which is particularly beneficial for students with emotional or behavioral disorders. They can offer words of encouragement, guide mindfulness exercises, and help students manage their emotions.

Interactive activities with avatars can serve as stress relievers, offering a break from traditional learning methods. This is important for students who may experience stress or frustration in a conventional classroom setting.

As artificial intelligence continues to evolve, avatars will become even more sophisticated, offering more personalized and responsive interventions. AI-driven avatars will be able to understand and adapt to student behaviors more effectively, providing even greater support.

The integration of avatars with emerging technologies such as augmented reality (AR) and virtual reality (VR) will enhance the learning experience. These technologies will provide more immersive and engaging environments, further benefiting SEN students.

Ongoing efforts to improve digital infrastructure and develop cost-effective solutions will ensure that avatar-based interventions become accessible to a wider range of students. This will help bridge the digital divide and promote equity in education.

Avatar-based interventions offer numerous benefits for students with special educational needs. By providing personalized, engaging, and safe learning experiences, avatars help SEN students overcome challenges and achieve their full potential. The flexibility and adaptability of avatar technology make it an invaluable tool in special education, supporting not only academic and cognitive development but also social, emotional, and behavioral growth. As technology continues to advance, the potential for avatar-based interventions to transform special education is immense, promising a future where every student can succeed.





## Chapter 4: Common Challenges in Implementing Avatar-Based Interventions

### Overview

Implementing avatar-based interventions in Special Educational Needs (SEN) education presents numerous challenges that can impede their effectiveness and accessibility. These challenges are rooted in diverse and complex factors that vary across different countries and regions. This chapter provides an in-depth exploration of the common obstacles faced in Cyprus, Greece, Turkey, Poland, and Spain, and includes broader insights from Europe based on the research findings of the AvatarSEN project. The challenges are categorized into four main areas: technological infrastructure disparities, educator training and professional development, cost and resource constraints, and cultural and linguistic adaptation challenges including some other key challenges. By analyzing these challenges, we aim to provide a comprehensive understanding that will assist SEN educators, policymakers, and stakeholders in overcoming these barriers to successfully integrate avatar-based interventions in SEN education.

### 4.1 Technological Infrastructure Disparities

Technological infrastructure is the backbone of any digital intervention in education, making it a critical factor in the successful implementation of avatar-based learning tools, particularly in SEN education. Without reliable access to the necessary hardware, software, and internet connectivity, schools cannot effectively deploy these advanced educational technologies. Disparities in technological infrastructure create significant inequities in educational opportunities, particularly for students in rural or economically disadvantaged areas. Ensuring that all schools have access to the required technological resources is essential for providing an equitable learning experience for all students.

Technological infrastructure disparities significantly hinder the effective implementation of avatar-based interventions in SEN education across different regions as trended in the research. In Cyprus, the primary issues include variances in access to necessary technological devices such as computers and tablets, inadequate internet connectivity, and insufficient technical support within schools.

Many schools in rural or economically disadvantaged areas lack the resources to provide consistent and reliable access to these technologies, which impedes the seamless use of online avatar-based platforms. The lack of standardized technology infrastructure across schools creates an uneven playing field, where students in under-resourced areas are at a distinct disadvantage.





Poland experiences similar challenges, with a pronounced gap in technological access between urban and rural areas. Schools in remote regions often struggle with reliable internet access, which is essential for using avatar-based learning tools effectively. This lack of foundational technological infrastructure is further complicated by the inadequate development of basic reading skills among children with intellectual disabilities, making the integration of avatars more complex. The Polish education system requires significant investment in infrastructure to ensure that all students, regardless of their geographical location, have access to the necessary technological tools.

In Spain, while urban areas generally have robust technological infrastructure, rural and economically disadvantaged regions face significant challenges. These disparities require targeted investments to expand broadband infrastructure and provide schools with adequate technology resources, including computers and reliable internet connectivity. Addressing these issues involves optimizing educational software for low-bandwidth environments to ensure equitable access across diverse regions. The Spanish education system should prioritize bridging the digital divide to ensure that all students can benefit from advanced educational technologies like avatar-based interventions.

Turkey also faces a pronounced urban-rural divide in technological infrastructure. Urban centers typically enjoy high-speed internet and modern computing devices, but rural areas suffer from limited broadband coverage and outdated equipment. This gap hinders the consistent use of avatar-based interventions in schools, particularly those serving SEN students in underserved areas. To mitigate these challenges, Turkey needs to implement nationwide initiatives aimed at improving internet connectivity and providing up-to-date technological equipment in all schools.

Greece shares these technological infrastructure challenges, with significant disparities between urban and rural areas. Inadequate infrastructure in rural regions hampers students' engagement with avatar-based learning platforms. Additionally, the Greek education system faces challenges in providing technical support and maintenance for existing technology, which further complicates the integration of new tools like avatars.

Across Europe, discrepancies in technological infrastructure are evident, with advanced nations like Germany and Nordic countries possessing robust digital ecosystems, while less economically developed regions such as Eastern Europe and the Balkans struggle to ensure equitable access to these innovative educational tools.





## 4.2 Educator Training and Professional Development

Educator training and professional development are vital components in the successful implementation of any new educational technology besides from avatars. For avatar-based interventions, the need for well-trained educators is even more critical, as these tools require a nuanced understanding of both the technology and the pedagogical strategies that make them effective. Without proper training, educators may lack the confidence and skills to integrate avatars into their teaching, potentially reducing the effectiveness of these interventions. Ensuring that educators receive comprehensive training and ongoing professional development can significantly enhance the impact of avatar-based learning tools in SEN education.

The readiness and competency of educators to utilize avatar-based technologies is another major challenge. In Cyprus, many educators do not receive comprehensive training on how to effectively incorporate avatar-based interventions into their teaching practices. This lack of training leads to uncertainties regarding the pedagogical benefits of avatars and a general reluctance to adopt these technologies. Professional development programs that focus on digital literacy and the pedagogical integration of avatars are crucial for overcoming these barriers.

In Poland, there is a notable lack of motivation among children with intellectual disabilities, which complicates the use of avatars. This necessitates personalized adaptation of avatar programs to cater to diverse needs and abilities, further emphasizing the need for specialized training for educators. Without sufficient training, educators may find it challenging to design and implement effective avatar-based learning experiences. Polish educators require tailored training programs that address the specific needs of SEN students and provide practical strategies for integrating avatars into their teaching.

Spanish educators have been identified as often lacking the necessary training and support to effectively integrate technology, such as avatars, into their pedagogical practices. Professional development programs tailored to the needs of educators, including training on avatar customization, interactive engagement strategies, and data interpretation for monitoring student progress, are essential. Ongoing support and mentorship can empower educators to leverage avatars as effective teaching tools. Spain's education system must invest in continuous professional development to ensure that educators are equipped to utilize advanced educational technologies.

Turkey faces similar issues, where many educators lack proficiency in using digital technologies, including avatar-based learning platforms. Comprehensive professional development programs are needed to provide hands-on training and build digital literacy among educators. Collaborative partnerships with government agencies, educational institutions, and technology companies have been shown as a means to facilitate the development and delivery of these training programs. By enhancing educators' digital competencies, Turkey can improve the integration and effectiveness of avatar-based interventions in SEN education.







Also in Greece, a lack of training and professional development opportunities for educators is a significant barrier. Many educators are skeptical about the effectiveness of avatar-based approaches and resistant to changing their traditional teaching methods. Overcoming these barriers requires tailored training initiatives that address educators' concerns and provide ongoing support as they implement avatar-based strategies. The Greek education system has been shown to lack the prioritization of professional development to ensure that educators are prepared to adopt and effectively use new educational technologies.

Across Europe, disparities in educator training programs exacerbate these challenges. Adaptation to diverse educational systems and practices within Europe is crucial. For example, the structured, teacher-centered approach prevalent in some Eastern European countries contrasts with the more student-centered, inquiry-based methods common in Nordic countries. Addressing these differences requires tailored training programs that cater to the specific needs and contexts of educators across Europe. Collaborative initiatives and knowledge-sharing platforms can help standardize and improve training programs, ensuring that educators across Europe are well-prepared to implement avatar-based interventions.

### 4.3 Cost and Resource Constraints

Financial constraints are a significant barrier to the implementation of avatar-based interventions in education across the globe. The costs associated with acquiring and maintaining the necessary technology, including hardware, software, and technical support, can be prohibitive for many schools, especially those in economically disadvantaged areas. Additionally, ongoing expenses related to updates and maintenance further strain limited budgets. Without adequate financial resources, schools may struggle to provide consistent and equitable access to these advanced educational tools, limiting their potential impact on student learning outcomes.

Financial considerations present significant barriers to the adoption and sustainability of avatar-based interventions. In Cyprus, the initial costs associated with acquiring avatar-based software and platforms, along with ongoing expenses for maintenance and updates, strain limited school budgets. These financial constraints are particularly challenging for schools in economically disadvantaged areas. The high cost of technological devices and software licenses makes it difficult for many schools to invest in these tools, leading to disparities in access and educational opportunities.

In Poland, budget limitations impact the ability of schools to invest in the necessary hardware, software licenses, and technical support for avatar-based interventions. Ongoing costs for maintenance and updates further exacerbate these financial burdens, making it difficult for schools to provide consistent access to these technologies. Poland is highlighted for a need to explore alternative funding models, such as public-private partnerships and grants, to support the widespread adoption of avatar-based interventions in schools.





Spain faces similar financial constraints, with public schools often struggling to allocate funds for new educational technologies. The costs associated with acquiring and maintaining avatar software, developing customized content, and providing technical support can be prohibitive. To overcome these barriers, additional funding, grants, or subsidies are needed, along with exploring collaborative partnerships with private sector companies or non-profit organizations to access discounted or donated technology resources.

In Turkey, schools, especially those in economically disadvantaged areas, face significant financial limitations that restrict their ability to invest in the technology resources required for avatar-based interventions. Beyond the initial investment, schools highlight a need to allocate resources for ongoing maintenance, repair, and updating of digital infrastructure, which can strain limited budgets. Turkey needs to implement national funding initiatives to support schools in acquiring and maintaining necessary technological resources.

Greece experiences similar budgetary limitations, impacting the ability of schools to invest in necessary hardware, software, and technical support. The ongoing costs for maintenance and updating of technology further strain school budgets, particularly in economically disadvantaged areas. Greece's education system must explore innovative funding solutions to support the integration of advanced educational technologies.

Across Europe, varying resource availability impacts the feasibility of implementing avatar-based interventions. Affluent nations may have the financial means to invest in these technologies, while less economically developed regions struggle to allocate funds, exacerbating educational inequalities. Addressing these disparities requires coordinated efforts to secure funding and provide equitable access to educational technologies across Europe.

#### 4.4 Cultural and Linguistic Adaptation Challenges

Cultural and linguistic adaptation is crucial for ensuring that avatar-based interventions are relevant and accessible to all students. Educational content must be tailored to reflect the cultural norms, values, and linguistic diversity of the student population. This is especially important in multicultural and multilingual contexts, where a one-size-fits-all approach is ineffective. Culturally and linguistically relevant content can enhance student engagement and learning outcomes by making the material more relatable and understandable. Developing such content requires collaboration with cultural experts, linguists, and educators to create inclusive and effective learning experiences.





Cultural and linguistic adaptation challenges significantly impact the effectiveness of avatar-based interventions in diverse educational settings. In Cyprus, the multicultural environment necessitates the development of culturally sensitive content that reflects the diverse backgrounds of students. Tailoring avatar interactions to align with cultural norms and values is essential for engaging students effectively. Language differences also pose challenges, requiring the development of multilingual content to accommodate the linguistic diversity of the student population.

In Poland, cultural adaptation is crucial due to the unique socio-cultural context and educational practices. Content developed in other countries may not be directly applicable, necessitating the localization of avatars to reflect Polish culture and language.

This involves collaborating with local educators and cultural experts to ensure that avatars are relatable and engaging for Polish students. Addressing these cultural and linguistic nuances is essential for creating effective avatar-based interventions that resonate with students.

Spain's linguistic and cultural diversity poses significant adaptation challenges due to the country's diverse regions with distinct cultural identities and languages. Educational content and avatars must reflect the cultural norms, values, and linguistic preferences of different communities. Providing multilingual support and offering content in regional languages can enhance accessibility and engagement for students from linguistic minority backgrounds. Spain is in need of prioritizing the development of localized educational content that respects and reflects its cultural and linguistic diversity.

Turkey's diverse cultural and linguistic landscape requires educational content and avatars to be culturally relevant and linguistically accessible. Consideration of language preferences, regional dialects, and cultural norms is essential to create effective learning experiences. Moreover, Turkey's diverse cultural landscape requires the development of content that respects and incorporates cultural traditions and norms. Adapting avatars to reflect Turkish culture and linguistic nuances can enhance student engagement and learning outcomes.





Collaborating with educators, linguists, and cultural experts from various regions can ensure that avatar-based interventions are inclusive and respectful of Turkey's cultural diversity.

Greece faces similar challenges in ensuring cultural relevance and linguistic accessibility in avatar-based interventions. Educational content fails to reflect the country's cultural heritage and accommodate the diverse linguistic backgrounds of its students. Collaborating with cultural experts and linguists can help develop inclusive and engaging content.



Across Europe, cultural and linguistic diversity presents significant adaptation challenges. Countries with multiple official languages or significant minority language populations must ensure that avatar-based interventions are accessible to all students. Tailoring content to reflect cultural norms and values across different regions is essential to create inclusive and engaging learning experiences. Collaborative initiatives that involve educators, cultural experts, and linguists from various countries can help develop standardized, yet culturally sensitive, educational content. Europe needs to prioritize the development of multilingual and culturally relevant content to support diverse student populations.

## 4.5 Ethical and Privacy Concerns

Ethical and privacy concerns are paramount in the use of avatar-based interventions, particularly when dealing with sensitive information about SEN students. Safeguarding data privacy and ensuring informed consent is critical to protecting students' rights and maintaining trust in educational technologies. Without robust policies and procedures, there is a risk of unauthorized access or misuse of personal data, which can have serious implications for students' privacy and security. Addressing these concerns requires comprehensive ethical guidelines and strict adherence to data protection regulations to ensure the safe and responsible use of avatar-based interventions.

A significant finding is the pervasive issue of ethical and privacy concerns surrounding data privacy, informed consent, and digital security. This issue transcends geographical boundaries and is a critical consideration regardless of the technological infrastructure, educator training, cost constraints, or cultural adaptation challenges.





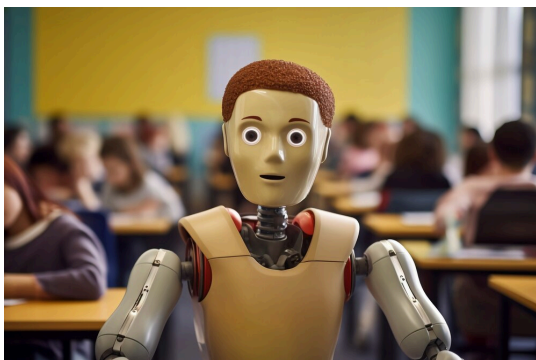
Safeguarding the privacy and autonomy of SEN students while utilizing avatars necessitates robust policies, procedures, and ethical guidelines. Ensuring data privacy and security is paramount to protect students' sensitive information from unauthorized access or misuse.

The diverse legal and regulatory frameworks across European countries further complicate compliance efforts, highlighting the need for unified approaches to ensure data protection and digital security in avatar-based interventions. Developers and educators must navigate complex regulations and implement stringent data protection measures to comply with national and international standards. Europe needs to establish standardized guidelines for data privacy and security in educational technologies to ensure consistent and robust protection across the continent.

## 4.6 Sensory Overload and Engagement Balance

Addressing sensory overload is another significant concern, as avatars incorporating multimedia elements risk overwhelming SEN students with excessive sensory input. Balancing engagement with sensory considerations is a delicate challenge in avatar design and implementation. Students with sensory processing difficulties may find the combination of visual, auditory, and interactive elements in avatars overstimulating, leading to reduced focus and engagement. Ensuring that educational tools are designed with sensory sensitivities in mind is essential to providing a supportive and effective learning environment for SEN students.

Strategies to mitigate sensory overload include simplifying visual and auditory stimuli, providing customization options for sensory preferences, and integrating calming features to enhance the learning experience. Developers and educators must work closely to design avatars that offer adjustable sensory input levels, allowing students to customize their learning environment to suit their individual needs. Europe needs to prioritize research and development in sensory-friendly educational technologies to support SEN students effectively.



While sensory engagement is vital for maintaining student interest and participation, the risk of overwhelming SEN students with excessive sensory input must be carefully considered. Robotic or null avatars, in particular, represent another challenge in meeting the socio-emotional needs of SEN students. Research indicates that these avatars are less effective in comparison with customized animated avatars in engaging SEN students and supporting their learning needs.





Balancing engagement with sensory considerations requires a nuanced approach to avatar design and implementation. Simplifying visual and auditory stimuli, providing customization options for sensory preferences, and integrating calming features are strategies to mitigate sensory overload. Overall, offering adjustable sensory input levels is crucial for avatars to accommodate individual needs and preferences, promoting a supportive learning environment for SEN students. Collaborative efforts between developers and educators are essential in designing avatars that are both engaging and sensory-friendly.

## Summary of Common Challenges

The common challenges in implementing avatar-based interventions in SEN education are multifaceted and interrelated. Technological infrastructure disparities, educator training and professional development, cost and resource constraints, and cultural and linguistic adaptation challenges are pervasive issues across all countries examined.

Inconsistent access to devices, unreliable internet connectivity, and insufficient technical support are widespread issues. The urban-rural divide exacerbates these disparities, particularly in economically disadvantaged areas. Also, there is a widespread need for comprehensive training programs to equip educators with the skills and confidence to use avatar-based interventions. Resistance to change and skepticism towards technology further complicate this challenge, necessitating tailored training initiatives and ongoing support.

On the other hand, financial limitations are a major common theme, with schools struggling to afford the initial investment and ongoing maintenance of technology. Budget constraints are particularly acute in economically disadvantaged areas, requiring additional funding and innovative financing solutions. Lastly, adapting avatar-based interventions to reflect cultural and linguistic diversity is a significant challenge. Ensuring cultural relevance and linguistic accessibility is crucial for effective engagement and learning, requiring collaboration with cultural and linguistic experts.

Examining the challenges associated with implementing avatar-based interventions reveals several overarching themes that transcend specific categories. One notable finding is the pervasive issue of ethical and privacy concerns. Ensuring data privacy, obtaining informed consent, and maintaining digital security are critical considerations. These issues are relevant regardless of the technological infrastructure, educator training, cost constraints, or cultural adaptation challenges. Safeguarding the privacy and autonomy of SEN students while utilizing avatars requires robust policies, procedures, and ethical guidelines. The diverse legal and regulatory frameworks across European countries further complicate compliance efforts, highlighting the need for unified approaches to ensure data protection and digital security in avatar-based interventions.

Another significant concern is addressing sensory overload. Avatars that incorporate multimedia elements risk overwhelming SEN students with excessive sensory input. Balancing engagement with sensory considerations is a delicate challenge in avatar design and implementation.





Strategies to mitigate sensory overload include simplifying visual and auditory stimuli, providing customization options for sensory preferences, and integrating calming features to enhance the learning experience while avoiding roboticization at the same time.

Together with the main challenges the ethical, privacy, and sensory considerations also, underscore the importance of adopting a holistic approach to addressing challenges in implementing avatar-based interventions for SEN students with partial mental disabilities. Beyond technical and logistical issues, ethical and sensory factors play a crucial role in the successful adoption and efficacy of these educational tools.

Overall, implementing avatar-based interventions to enhance reading comprehension among SEN students with partial mental disabilities presents a myriad of challenges. Technological infrastructure disparities, educator training deficiencies, financial constraints, and cultural and linguistic adaptation issues are common obstacles across Cyprus, Greece, Turkey, Poland, and Spain.

Ethical and privacy concerns surrounding data protection and sensory overload further complicate the integration of these technologies. Addressing these challenges requires a holistic approach that includes targeted investments in infrastructure, comprehensive professional development for educators, innovative funding solutions, and the development of culturally and linguistically relevant content to enhance reading comprehension and overall learning outcomes for SEN students across Europe.





## Chapter 5: Best Practices in Avatar-Based Interventions for Reading Comprehension

### Overview

Reading comprehension is a fundamental skill in education, shaping students' academic success and lifelong learning journeys. However, learners with special educational needs (SEN), such as those with partial mental disabilities, often face unique challenges in mastering this skill. To address these challenges, educators are increasingly turning to innovative approaches, with avatar-based interventions emerging as a dynamic solution to engage and support these students effectively. Avatars, virtual representations of individuals, offer a multitude of advantages, including personalized customization, interactive learning experiences, immediate feedback mechanisms, and collaborative learning environments.

In this comprehensive exploration, we delve into the significance of avatar-based interventions, examining best practices and successful implementations across Cyprus, Spain, Poland, Turkey, Greece, and Europe as a whole. These interventions stand at the forefront of educational innovation, illustrating their potential to revolutionize student engagement, learning outcomes, and inclusive education practices. Through personalized avatar customization, interactive learning design, immediate feedback mechanisms, and collaborative learning environments, educators are harnessing avatars to create dynamic and inclusive educational experiences tailored to the diverse needs of all students, particularly those with special educational needs.

Avatar-based interventions have transformed educational practices, offering dynamic and interactive ways to enhance reading comprehension, especially for students with SEN. By leveraging personalized avatar customization, interactive learning design, immediate feedback mechanisms, and collaborative learning environments, educators can create inclusive and effective educational experiences. This chapter of the AvatarSEN guide is dedicated to outlining the best practices and successful implementations of avatar-based interventions in Cyprus, Spain, Poland, Turkey, Greece, and Europe demonstrating their impact on student engagement and learning outcomes.







## 5.1 Personalized Avatar Customization:

Personalized avatar customization is a pivotal aspect of avatar-based interventions, offering students the opportunity to create virtual representations that reflect their unique identities and preferences. Across Cyprus, Spain, Poland, Turkey, Greece, and Europe educators have embraced personalized avatar customization as a means to enhance student engagement, motivation, and ownership of the learning process.

In Cyprus, the utilization of personalized avatar customization has yielded remarkable results in engaging students with diverse cultural backgrounds and learning needs. By allowing students to create avatars that resonate with their identities, educators have witnessed increased participation and motivation in reading comprehension activities, particularly among those with special educational needs (SEN). This personalized approach fosters a sense of ownership and connection to the learning material, empowering students to take an active role in their education.

Similarly, in Spain, personalized avatar customization has been integrated into educational programs across various regions, including the Canary Islands. Through the INNOVAS network, educators have leveraged personalized avatar customization to enhance students' sense of ownership and engagement with reading comprehension activities. By providing students with the freedom to customize their avatars according to their preferences and interests, educators have created a learning environment that is both inclusive and motivating.

In Poland, personalized avatar customization has played a central role in bridging the gap between physical and virtual classrooms. Through programs such as the "Active Whiteboard," educators have empowered students to create avatars that reflect their individual identities and personalities. This customization not only fosters a sense of ownership but also promotes inclusivity by ensuring that all students feel represented and valued in the virtual learning environment.

In Turkey, personalized avatar customization has been instrumental in engaging students with diverse cultural and linguistic backgrounds, including those with SEN. By allowing students to create avatars that resonate with their personal identities, educators have cultivated a sense of belonging and connection to the learning material. This personalized approach accommodates different learning preferences and needs, making the educational experience more relatable and motivating for all students.

In Greece, personalized avatar customization has been embraced as a means to empower students to express their creativity and individuality while navigating virtual learning environments. By allowing students to customize their avatars, educators have fostered a sense of ownership and agency, enhancing engagement and motivation across diverse student populations. This personalized approach not only enhances the educational experience but also promotes self-expression and confidence among students.





In addition to practices observed in Cyprus, Spain, Poland, Turkey, and Greece, Europe has been pioneering innovative approaches to personalized avatar customization. Across countries like Slovakia, the utilization of 3D Virtual Learning Environments (VLE) for multi-impaired students has demonstrated the effectiveness of avatars as interactive guides within virtual environments. These avatars provide personalized support and scaffolding, catering to the diverse needs of students with multiple impairments. Similarly, in the United Kingdom and Israel, serious games for teaching emotion recognition skills to children with autism spectrum conditions (ASC) have incorporated avatars to enhance engagement and motivation. Through personalized avatar customization, European initiatives have showcased the potential of avatars to foster a sense of ownership and connection to the virtual learning environment, ultimately enhancing engagement and motivation among students with special educational needs.

## 5.2 Interactive Learning Design:

Interactive learning design is a cornerstone of effective avatar-based interventions, providing students with dynamic and engaging experiences that promote comprehension and retention of reading material. Across Cyprus, Spain, Poland, Turkey, and Greece, educators have embraced interactive learning design as a means to cultivate students' critical thinking skills, creativity, and problem-solving abilities.

In Cyprus, interactive learning design has been integrated into reading programs to create immersive experiences that captivate students' attention and enhance comprehension. Through the use of avatars in interactive reading platforms and educational games, students have the opportunity to actively engage with the text, participate in dialogues, and make decisions that shape the outcome of the story. This interactive approach not only makes learning more enjoyable but also fosters deeper understanding and retention of reading material, particularly among students with special educational needs (SEN).

Similarly, in Spain, interactive learning design has been instrumental in creating engaging and effective educational experiences for students across various regions. Through the integration of avatars into reading sessions and educational games, students have the opportunity to interact with virtual characters, engage in role-playing activities, and explore real-life scenarios that reinforce comprehension skills. This interactive approach promotes active participation and critical thinking, empowering students to take ownership of their learning and develop essential skills for academic success.

In Poland, interactive learning design has been embraced as a means to enhance student engagement and motivation in reading comprehension activities. Through the use of avatars in interactive storybooks and educational games, students have the opportunity to explore complex concepts in a dynamic and interactive manner. By incorporating elements of gamification, such as challenges, rewards, and progress tracking, educators have created immersive learning experiences that promote active participation and foster a love for reading among students of all abilities.





In Turkey, interactive learning design has been integrated into reading programs to create inclusive and engaging educational experiences for students with diverse learning needs. Through the use of avatars in interactive simulations and decision-making activities, students have the opportunity to apply comprehension strategies in real-life contexts and develop critical thinking skills. This interactive approach promotes collaboration, creativity, and problem-solving, empowering students to become active participants in their learning journey.

In Greece, interactive learning design has been embraced as a means to create immersive and engaging educational experiences that cater to the diverse needs of students. Through the use of avatars in virtual reality environments and educational simulations, students have the opportunity to explore complex concepts in a dynamic and interactive manner. By providing students with hands-on learning experiences that promote exploration and discovery, educators have fostered a love for learning and empowered students to become lifelong learners.

Europe's perspective on interactive learning design using avatars emphasizes the importance of simulating real-world scenarios and offering hands-on learning opportunities. For instance, in Slovakia, 3D VLEs have been instrumental in creating immersive learning experiences for students with multiple impairments, allowing them to engage with content in a dynamic and interactive manner. Similarly, in the United Kingdom, serious games integrating avatars have introduced challenges, rewards, and progress tracking mechanisms to enhance engagement and motivation. These examples highlight how interactive avatar-based activities can cater to diverse learning styles and preferences, providing students with agency and autonomy within the virtual environment.

### 5.3 Immediate Feedback Mechanisms:

Immediate feedback mechanisms are integral components of avatar-based interventions, providing students with timely guidance and reinforcement to support their reading comprehension skills. Across partner countries and Europe, educators have implemented immediate feedback mechanisms to create supportive learning environments that facilitate student progress and engagement.

In Cyprus, immediate feedback mechanisms have been successfully integrated into avatar-based interventions to provide students with personalized guidance and support during reading exercises. Through the use of avatars as virtual tutors, students receive instant corrective feedback and suggestions tailored to their individual needs. This immediate guidance helps students quickly identify and correct mistakes, reinforcing their learning and boosting their confidence. By providing timely feedback, educators have created a supportive learning environment that empowers students to take ownership of their learning and make continuous progress.





Similarly, in Spain, immediate feedback mechanisms have played a crucial role in enhancing student engagement and learning outcomes in reading comprehension activities. Through the use of avatars as virtual tutors, students receive real-time feedback on their performance, helping them understand their mistakes and learn from them instantly. This immediate feedback not only supports students in mastering reading comprehension skills but also fosters a growth mindset and resilience. By providing students with timely guidance and encouragement, educators have created a supportive learning environment that promotes academic success and personal growth.

In Poland, immediate feedback mechanisms have been leveraged to enhance student motivation and engagement in reading comprehension activities. Through the use of avatars as virtual tutors, students receive immediate corrective feedback and reinforcement during reading exercises. This personalized feedback helps students stay on track and make continuous progress, fostering a sense of achievement and mastery. By providing students with timely guidance and support, educators have created a supportive learning environment that promotes academic success and self-confidence.

In Turkey, immediate feedback mechanisms have been integrated into avatar-based interventions to provide students with real-time support and guidance during reading exercises. Through the use of avatars as virtual tutors, students receive instant feedback on their performance, helping them understand their mistakes and learn from them quickly. This immediate feedback not only facilitates comprehension but also promotes self-directed learning and autonomy. By providing students with timely guidance and encouragement, educators have created a supportive learning environment that fosters academic success and personal growth.

In Greece, immediate feedback mechanisms have been instrumental in supporting student learning and engagement in reading comprehension activities. Through the use of avatars as virtual tutors, students receive instant corrective feedback and reinforcement, helping them stay motivated and on track. This immediate feedback promotes active participation and reflection, empowering students to take ownership of their learning and make continuous progress. By providing students with timely guidance and support, educators have created a supportive learning environment that promotes academic success and lifelong learning.

In Europe, immediate feedback mechanisms using avatars have been instrumental in guiding students' learning progress and reinforcing positive behaviors. For instance, in Slovakia, avatars serving as interactive guides within 3D VLEs offer real-time feedback tailored to individual student needs, promoting self-reflection and continuous improvement. Likewise, in the United Kingdom and Israel, avatars integrated into serious games provide personalized feedback in response to students' actions and decisions, fostering goal setting and skill development. These examples demonstrate how avatars can play a vital role in offering timely and constructive feedback, ultimately enhancing students' learning outcomes and engagement levels.





## 5.4 Collaborative Learning Environments:

Collaborative learning environments facilitated by avatars play a crucial role in promoting social interaction, teamwork, and inclusive education practices among SEN students. Educators across Cyprus, Spain, Poland, Turkey, and Greece have embraced avatar-based interventions to create collaborative learning environments that foster peer interaction, communication, and collective problem-solving.

In Cyprus, avatars have been utilized in group reading activities where students collaboratively solve problems and discuss stories. These avatars serve as mediators, facilitating communication and collaboration among students with diverse backgrounds and learning needs. By promoting peer interaction, avatars enhance student engagement with the material and contribute to a sense of community within the classroom.

Similarly, in Spain, avatars have been employed to facilitate collaborative learning experiences among students with intellectual disabilities. Through group activities and virtual discussions, avatars encourage peer-to-peer interaction and knowledge sharing, promoting a sense of belonging and teamwork. This collaborative approach not only enhances students' social skills but also improves their comprehension of reading material through collective exploration and discussion.

In Poland, collaborative learning environments supported by avatars have been instrumental in promoting inclusive education practices. Avatars serve as virtual guides, facilitating group activities and discussions that encourage active participation and mutual support among students. By leveraging avatars to build collaborative virtual classrooms, educators create inclusive learning environments where all students, including those with special needs, can thrive academically and socially.

Similarly, in Turkey, avatars have been utilized to foster collaboration and teamwork among SEN students. Through group projects and interactive simulations facilitated by avatars, students engage in collaborative problem-solving and knowledge sharing. Avatars serve as catalysts for communication and cooperation, helping students develop essential social skills while deepening their understanding of reading material in a supportive and inclusive environment.

Lastly, in Greece, avatars have been integrated into collaborative learning scenarios that promote peer interaction and cooperative learning. Through virtual classrooms and group activities facilitated by avatars, students engage in collaborative projects, discussions, and knowledge exchange. Avatars serve as facilitators, encouraging active participation and fostering a sense of community among students with diverse learning needs. By promoting collaborative learning environments, educators empower SEN students to work together, learn from each other, and succeed collectively in their academic journey. Europe's approach to collaborative learning environments facilitated by avatars emphasizes the promotion of peer interaction, communication, and teamwork.





For instance, in Slovakia, avatars within 3D VLEs encourage collaboration among students with multiple impairments, fostering a sense of community and mutual support. Similarly, in the United Kingdom and Israel, avatars used in serious games facilitate group activities and collaborative projects, promoting social interaction and inclusivity. These initiatives showcase the potential of avatars to create inclusive learning environments where all students can thrive, regardless of their diverse learning needs.

## 5.5 Examples of Successful Practices from Partner Countries and Europe

Successful practices in education matter profoundly as they serve as blueprints for improving learning outcomes and fostering inclusive environments for all students. By identifying and highlighting effective strategies, educators can replicate these practices to enhance student engagement, promote academic achievement, and address the diverse needs of learners, particularly those with special educational needs (SEN). Successful practices not only demonstrate the potential of innovative approaches but also inspire educators to explore new methodologies and technologies to support student learning. Furthermore, they contribute to the collective knowledge base of educational research, informing evidence-based decision-making and policy development. Ultimately, the dissemination of successful practices empowers educators to create dynamic and inclusive learning experiences that cater to the diverse needs of all students, thereby driving positive outcomes in education.

In Cyprus, a pioneering initiative integrates avatars into reading programs, allowing students to customize their avatars to mirror themselves or their favorite characters. This approach significantly enhances engagement and motivation, particularly among students from culturally diverse backgrounds. By personalizing their avatars, students feel a stronger connection to the learning material, leading to increased participation and comprehension.

Spain has demonstrated remarkable success in using avatars to support students with intellectual disabilities in improving reading comprehension. Avatars provide immediate, tailored feedback during reading exercises, enabling students to correct mistakes promptly and build confidence in their abilities. This personalized guidance fosters a supportive learning environment, empowering students to overcome challenges and achieve academic success.

Greece has implemented innovative practices by employing avatars as interface tools in distance learning environments. Avatars serve as vital communication tools between teachers and students, facilitating personalized interactions and fostering a sense of belonging among learners. Through the use of avatars, students feel acknowledged and supported, leading to enhanced engagement and participation in virtual learning activities.





Poland's integration of avatars into the "Active Whiteboard" program has revolutionized reading activities in classrooms. By allowing students to personalize their avatars, this initiative promotes a sense of identity and belonging within the virtual classroom environment. Students are empowered to express themselves creatively, leading to heightened engagement and motivation in literacy-based tasks.

Turkey has adopted innovative practices by using signing avatars to aid students with hearing impairments in understanding social sciences curriculum. These avatars offer a dynamic and interactive approach to learning, surpassing traditional text-based methods. By visualizing concepts through signing avatars, students with hearing impairments can grasp complex ideas more effectively, leading to improved academic performance and confidence.

On a broader scale, Europe has witnessed transformative implementations of avatar-based interventions. In Slovakia, 3D Virtual Learning Environments (VLE) have been leveraged to meet the diverse educational needs of students with multiple impairments. Avatars serve as interactive guides within these environments, providing personalized support and scaffolding to enhance students' learning experiences. Additionally, serious games incorporating avatars have proven effective in teaching emotion recognition skills to children with autism spectrum conditions (ASC) in the United Kingdom and Israel. Through interactive experiences with avatars, students develop essential social and emotional competencies, leading to improved communication and interpersonal skills.

These exemplary practices underscore the diverse applications and benefits of avatar-based interventions in education. By leveraging technology to personalize learning experiences, educators empower students to overcome barriers, engage meaningfully with content, and achieve academic success. Through collaborative efforts across partner countries and Europe as a whole, the transformative potential of avatar-based interventions can continue to drive innovation and inclusivity in education.

The best practices extracted from the findings that educators can adapt to enhance their educational practices:

Best Practices	Description	Examples
Personalized Avatar Customization	Offer a range of avatar customization options, including physical attributes, cultural attire, and accessories.	Students in Cyprus customized avatars resembling themselves or their favorite characters, leading to increased engagement and motivation, especially among those from diverse cultural backgrounds.
	Encourage student involvement in the customization process to reflect their identities and preferences.	Avatars in Spain's INNOVAS network reflected diverse genders, ages, and ethnicities, enhancing student identification and engagement.





Interactive Learning Design	Incorporate interactive elements such as dialogues, decision-making scenarios, and role-playing activities to make learning dynamic and engaging.	Interactive avatars in Cyprus engaged students in conversations about the texts they read, enhancing comprehension and information retention.
	Design activities that apply comprehension strategies in real-life contexts.	Avatars in Greece facilitated role-playing activities and decision-making scenarios, making abstract concepts more concrete and understandable.
Immediate Feedback Mechanisms	Integrate feedback mechanisms into avatar-based interventions to provide real-time corrective guidance and reinforcement.	Avatars in Poland provided immediate, personalized feedback during reading exercises, helping students improve their reading skills rapidly.
	Tailor feedback to individual student needs for personalized learning experiences.	In Turkey, avatars offering immediate feedback helped students understand their mistakes and make continuous progress in reading comprehension.
Collaborative Learning Environments	Foster collaboration through group activities, discussions, and peer-to-peer learning experiences.	Group reading activities in Spain facilitated communication and collaboration among students, enhancing engagement and interaction with the material.
	Ensure inclusivity and accessibility to create a supportive and cooperative learning environment.	Avatars in Greece promoted social interaction and teamwork among SEN students through collaborative learning environments.

These best practices, drawn from successful implementations across different countries, can serve as valuable guidelines for educators seeking to optimize student engagement and learning outcomes in their educational settings.

## Chapter Summary

Overall, the exploration of avatar-based interventions across Cyprus, Spain, Poland, Turkey, Greece, and Europe as a whole reveals a wealth of innovative practices aimed at enhancing reading comprehension for students with special educational needs (SEN). Through personalized avatar customization, interactive learning design, immediate feedback mechanisms, and collaborative learning environments, educators have leveraged avatars to create dynamic and inclusive educational experiences tailored to the diverse needs of all students.







Key findings underscore the importance of personalized avatar customization in fostering student engagement and motivation by allowing students to identify with characters reflecting their identities and cultural backgrounds. Interactive learning design using avatars has proven effective in making abstract concepts more concrete and understandable, while immediate feedback mechanisms have facilitated rapid skill development by providing real-time corrective guidance.

Moreover, collaborative learning environments facilitated by avatars have promoted social interaction, communication, and teamwork among students, contributing to their holistic development. These best practices highlight the transformative potential of avatar-based interventions in revolutionizing traditional educational paradigms and paving the way for dynamic, inclusive, and effective learning experiences.

As educators continue to adapt and implement these best practices in their educational settings, it is evident that avatar-based interventions hold promise in fostering academic success and personal growth for students with special educational needs, and that is why projects like AvatarSEN are necessary.





## Chapter 6: Recommendations for Educators

### 6.1 Avatar Personalisation and Personalisation Strategies

Personalising avatars in teaching and learning can be a highly effective tool for engaging students and making them feel more connected to the educational process, especially when it comes to students with specific educational support needs.

Some recommendations for educators regarding avatar personalisation are as follows:

- **Variety and Diversity:** offer your students a wide range of options to personalise their avatars. This can include different skin colours, hairstyles, clothing, accessories, etc. As educators, we must ensure that there are options that reflect the diversity of all our students.
- **Incorporate Personal Interests:** allow students to choose elements for their avatars that reflect their interests and passions. For example, they could add accessories related to their favourite sports, hobbies, or characters from films or books they like, thereby enhancing their motivation.
- **Rewards and Achievements:** use avatar personalisation as a way to reward academic progress and achievements. For instance, students could unlock new personalisation options as they complete certain tasks or reach specific goals.
- **Encourage Creativity:** encourage students to be creative with their avatars. You can organise avatar design contests or assign projects where students have to create avatars that represent specific concepts or historical figures.
- **Reinforce Positive Identity:** use avatar personalisation as an opportunity to reinforce students' self-esteem and positive identity. Start with the students' intrinsic motivation and help them choose elements that make them feel confident and proud of themselves.
- **Promote Inclusion:** ensure that all students feel represented and respected in the avatar personalisation process. Consider offering personalisation options that reflect a wide variety of gender identities, cultural backgrounds, and functional diversity.
- **Integrate Personalisation into Learning Activities:** use personalised avatars as part of learning activities, such as in online discussions, educational games, or simulations.

Incorporating avatar personalisation in the classroom can create a more interactive, inclusive, and motivating environment for our students.





The following are various strategies for avatar personalisation in our educational context:

- **Preference Questionnaires:** at the start of the course, send out questionnaires to students where they can indicate their preferences regarding aspects such as favourite colour, type of clothing, hairstyle, etc. Use this information to tailor the avatar personalisation options you offer.
- **Group Design Sessions:** organise sessions where students can design avatars together. They can share ideas, provide feedback, and learn from each other. This promotes collaboration and creativity.
- **Personalisation Challenges:** create challenges where students must personalise their avatars according to a specific theme. For example, you could propose a "superhero avatar" challenge or an "avatar based on a book" challenge.
- **Special Events:** organise special events where students can personalise their avatars to celebrate occasions such as Earth Day, Peace day or cultural festivals. This would promote awareness and inclusion, especially important for our students with special educational needs.
- **Achievement Bonuses:** offer additional personalisation options as rewards for academic achievements or active class participation. For example, you could award a special accessory for completing an important project or for participating in an online discussion.
- **Avatars in Presentations and Projects:** encourage students to use their personalised avatars in presentations and projects. This allows them to express their identity and creativity in a unique way.
- **Integration with Educational Platforms:** utilise online educational platforms that allow students to personalise their avatars. This can include reward systems, virtual accessory shops, and advanced personalisation options.
- **Avatars as Tools for Self-Expression:** encourage students to reflect on identity and self-expression through their avatars. Provide reflective activities or journals where they explore how their avatars reflect aspects of their personality, interests, and aspirations.

## 6.2 Designing Interactive Learning Environments

Designing interactive learning environments significantly enhances student engagement and participation and can be a valuable tool for addressing diversity and integrating students with intellectual disabilities.





When considering the design of interactive learning environments, we should follow certain steps or preliminary considerations, which are outlined below:

- **Identify Learning Objectives:** before designing the environment, it is important to have clear learning objectives. What concepts or skills do you want students to acquire or improve? How does this relate to the curriculum and specific competencies? How can I adapt the proposal to each student's curricular reference level?
- **Know Your Students:** understand the needs, interests, and learning styles of your students. This will help you tailor the design of the environment to be relevant and engaging for them.
- **Use a Variety of Multimedia Resources:** incorporate a variety of multimedia resources, such as videos, images, animations, and simulations, to make the environment more interactive and engaging. This can help maintain students' attention and facilitate the understanding of complex concepts.
- **Encourage Collaboration:** design activities that promote collaboration among students, such as online discussions, group projects, and problem-solving activities. This provides them with the opportunity to work together, share ideas, and learn from each other.
- **Provide Immediate Feedback:** use tools and activities that allow students to receive immediate feedback on their progress and understanding. This can include online quizzes, educational games with real-time scores, and self-assessment activities.
- **Personalise Learning:** offer personalised learning options and pathways so that students can progress at their own pace and according to their individual interests and needs. This can include optional activities, technical aids, additional resources, and progress tracking tools.
- **Integrate Technology Effectively:** use technology strategically to enhance the interactivity and accessibility of the learning environment. This can include the use of online learning platforms, synchronous and asynchronous communication tools, and educational applications.
- **Evaluate and Adjust the Proposal:** regularly evaluate the effectiveness of the learning environment and gather feedback from students to identify areas for improvement. Make the necessary adjustments to optimise the learning experience.

By following these steps and considerations, we can design interactive learning environments that are stimulating, effective, and motivating for all students, respecting all learning paces.





## 6.3 Integration of Avatars in Various Subjects and Curricular Areas

Integrating avatars into various subjects and curricular areas can be a creative and effective way to increase student participation and engagement in learning.

Below are some examples of how avatars can be integrated into different subjects and curricular areas:

### Language and Literature:

- **Basic Literacy:** For the acquisition of reading skills and the subsequent development of oral language, avatars will be used as phonological models for the students that require it, paying special attention to the special educative needs of students with partial mental disability.
- Teachers and students will be able to interact with avatars in different languages in order to improve oral expression and the necessary alternative communication to develop augmentative communication systems with avatars.
- **Character Avatars:** students could create avatars of characters from novels or stories they are reading in class. They could write dialogues between the avatars to explore character relationships and better understand the plot.
- **Literary Debates:** organise online literary debates where avatars represent different authors, defending their styles and works.
- **Literary Genres:** use of avatars to represent different literary genres such as poetry, narrative, and theatre. Students can create avatars of famous poets, narrators, and playwrights, exploring the characteristics and conventions of each genre through their works.
- **Creative Writing Projects:** challenge students to create creative writing projects using avatars as main characters. For example, they could write short stories, poems, or plays where avatars interact and face challenges in a virtual environment.
- **Literary Research Projects:** have students undertake literary research projects using avatars as presentation tools. For example, they could create virtual presentations analysing the lives and works of famous authors, exploring their historical context, influences, and literary legacy.





## Mathematics:

- **Maths Problems Comprehension:** avatars will be used for the segmentation of simple mathematical problem-solving texts in order to structure the designing of exercises and their development. This aspect will not only benefit students in ordinary class but also students with partial mental disability.
- **Mathematical Avatar:** avatars will be used as a tool previous to a cognitive process that requires great skills to facilitate comprehension and mathematical logical problem solving.
- **Maths Problems with Avatars:** avatars could be used as characters in maths problems. For example, students could solve geometry problems by helping their avatars build figures in a virtual environment.
- **Maths Games:** create maths games where avatars compete in mental arithmetic or problem-solving challenges.
- **Personalised Math Tutors:** provide each student with a personalised avatar tutor to guide them through maths activities and exercises. Avatars could offer step-by-step explanations, hints, and feedback, helping students solve problems.
- **Mathematical Modelling Projects:** challenge students to create mathematical modelling projects using avatars as visualisation tools. For example, they could create virtual models of real-world situations and use their avatars to explore and analyse mathematical data.

## Science:

- **Science texts:** avatars will be used to help students to understand scientific texts and to structure information in a clear way.
- **Science vocabulary:** avatar could be used as phonological models to help students learn specific science vocabulary.
- **Virtual Ecosystems:** students could design and personalise avatars representing different living organisms in a virtual ecosystem, exploring how they interact with each other and their environment.
- **Exploring Ecosystems:** avatars can represent students in virtual environments where they can explore different ecosystems and learn about biodiversity. For example, they could create explorer avatars investigating the Amazon rainforest, coral reefs, or tropical jungles.
- **Scientific Simulations:** use avatars to represent students in simulations of scientific experiments. They can conduct virtual activities where they manipulate variables, record data, and observe results, using their avatars as interactive tools.
- **Virtual Scientific Trips:** organise virtual trips to important scientific places, such as research labs, science museums, or nature reserves. Students can create avatars representing them during these trips, exploring and learning about different aspects of science in a virtual setting.
- **Concept Visualisation:** use avatars to represent abstract scientific concepts in a more concrete and visual way. For example, avatars could represent atoms and molecules in a chemistry simulation, or cells and organisms in a biology simulation.





## History:

- **History texts:** avatars could be used to bring students closer to the most representative historical realities of societies, thus achieving an immersion in the past cultures and also improving the comprehension of written texts to work in the subject.
- **Historical Debates:** avatars could represent famous scientists in debates about historical scientific discoveries.
- **Historical Re-enactments:** avatars could be used to recreate important historical events in a virtual environment. Students could research and create avatars based on historical figures and then participate in simulations of events like political debates or battles.
- **Virtual Time Travels:** organise virtual time travels where avatars visit different historical periods and learn about daily life, culture, and significant events of each era.

## Physical Education:

- **Virtual Sports Activities:** avatars could represent students in physical activities and virtual sports. They could participate in team games, athletic competitions, and guided exercise activities.
- **Personalised Sports Avatars:** students could create personalised avatars reflecting their interests and skills in different sports and physical activities.
- **Virtual Sports Competitions:** organise virtual sports games and competitions where students' avatars compete in various sports disciplines, such as races, ball throws, jumps, among others. Design challenges requiring specific physical skills and track students' progress over time.
- **Virtual Coaches:** use avatars as virtual coaches guiding students through exercise routines and physical activities. Avatars can demonstrate correct movements, provide instructions, and offer feedback on students' techniques.
- **Simulated Sports Events:** create simulations of sports events like the Olympics, where students' avatars participate in virtual competitions. They can represent athletes from different countries and sports disciplines, learning about teamwork, perseverance, and fair play.
- **Virtual Celebrations of Achievements:** organise virtual celebrations of sports achievements where avatars are the protagonists. Award prizes and recognitions to students for their participation, effort, and demonstrated sports skills in Physical Education activities.





## Art and Music:

- **Art Models:** avatars could be used as models for drawing or painting in art classes. Students could create portraits of their avatars using different techniques and artistic styles.
- **Virtual Concerts:** organise virtual concerts where avatars represent student musicians playing instruments and singing songs on a virtual stage.
- **Virtual Musicians:** invite students to create avatars representing virtual musicians. They can personalise their avatars with musical instruments, concert outfits, and other music-related elements.
- **Exploring Musical Genres:** encourage students to create avatars representing different musical genres such as rock, jazz, classical music, or folk music. They can research the history and characteristics of each genre and then share their avatars and knowledge in a virtual forum.
- **Online Talent Competitions:** organise online talent competitions where students' avatars compete in different categories, such as best singer, best instrumental musician, or best composer. Invite external judges or let the students vote for their favourites.

## Emotional and Creative Education:

- **Emotional Avatars:** create avatars representing different emotions and moods. Students can personalise the appearance of their avatars to reflect how they feel at a given moment and use them as a way to express and explore their emotions.
- **Narrative Creation:** encourage students to create stories or narratives using their avatars as main characters. They can explore emotional themes such as empathy, resilience, and self-esteem through their avatars' experiences in a virtual environment.
- **Role-Playing Games:** organise role-playing games where students' avatars interact with each other in challenging emotional situations. For example, they could represent conflict resolution, negotiation, or stress management scenarios, using their avatars as vehicles to practise social and emotional skills.
- **Creative Self-Expression:** use avatars as tools for creative self-expression, allowing students to personalise their avatars to reflect their interests, values, and personal aspirations. This can help them explore their identity and develop a sense of emotional self-awareness.
- **Diversity Exploration:** invite students to create avatars representing different cultures, identities, and emotional experiences. They can explore how emotions are perceived and expressed differently in various cultural contexts, developing a greater sense of empathy and intercultural understanding.
- **Mindfulness Practices:** use avatars as virtual guides in mindfulness and emotional well-being practices. Students can follow their avatars in guided meditations, breathing exercises, and other relaxation techniques, using visualisation and imagination to enhance their emotional well-being.







- **Emotional Art Projects:** challenge students to create digital art projects exploring important emotional themes for them. They can use their avatars as models or inspiration for their artworks, expressing their emotions creatively through drawings, paintings, or animations.

## 6.4 Training Educators and Capacity Building

Maximising students' capacities through the use of avatars requires prior training for educators. Below are some recommendations for training educators in the design and use of avatars in education:

- **Understand the educational purpose of avatars:** Before starting to use avatars in the classroom, it is important for educators to understand how they can enhance the learning experience. Avatars can be used to encourage participation, create immersive learning environments, teach social and emotional skills, and personalise teaching to meet the individual needs of students.
- **Explore avatar creation tools and platforms:** Familiarise yourself with different tools and platforms that allow educators and students to create personalised avatars. Popular options include Voki, Bitmoji, Genially, and Adobe Character Animator. It is important to choose tools that are accessible and easy to use so that educators can effectively integrate avatars into their educational practice.
- **Develop design and customisation skills:** Educators should learn to design and customise avatars that reflect the diversity of their students and promote an inclusive environment. This may include selecting physical characteristics, choosing clothing and accessories, and incorporating cultural and identity features. Additionally, educators can explore how to adapt avatars to teach specific concepts or create characters that represent historical figures or fictional characters.
- **Integrate avatars into the educational curriculum:** Educators need to learn how to effectively integrate avatars into their educational curriculum to enhance teaching and learning. This can include using avatars to present information, guide learning activities, facilitate communication between students and teachers, and provide personalised feedback. Educators can also use avatars to create simulated learning scenarios and educational games that actively engage students.
- **Promote digital literacy and online safety:** It is important for educators to teach students how to use avatars responsibly and safely online. This includes educating about online privacy, respect for others, and the importance of keeping personal information secure. Teachers can also provide guidance on how to identify and avoid cyberbullying and other forms of inappropriate online behaviour.





Given the above, it is necessary to outline an example of a training plan aimed at teachers on the theme of creating virtual learning environments:

**Objective of the training plan:** to train teachers in the effective creation of virtual learning environments to improve teaching, learning, and student engagement in a digital setting.

**Duration of the training plan:** this training plan will be developed over a period of four weeks, with weekly scheduled training sessions.

## **Week 1: Introduction to Virtual Learning Environments**

### **Session 1: Basics of Virtual Learning Environments**

- Definition of virtual learning environments.
- Importance of virtual environments in current education.
- Examples and use cases of virtual environments in different educational contexts.

### **Session 2: Tools and Platforms for Creating Virtual Environments**

- Review of different tools and platforms available for creating virtual environments.
- Comparison of features, advantages, and limitations of different tools (e.g., Moodle, Canvas, Google Classroom).
- Practical demonstrations on how to use these tools to create effective virtual environments.

## **Week 2: Instructional Design and Content Organisation**

### **Session 3: Instructional Design for Virtual Learning Environments**

- Instructional design principles applied to virtual environments.
- Strategies for effectively organising content and sequencing learning activities.
- Considerations for designing interactive activities and multimedia resources.

### **Session 4: Personalisation and Adaptation of the Virtual Environment**

- Strategies for personalising the virtual environment according to students' needs and learning styles.
- Tools and techniques for content adaptation and personalised feedback.
- Promoting interaction and collaboration among students through the virtual environment.

## **Week 3: Evaluation and Monitoring of Learning**

### **Session 5: Assessment in Virtual Environments**

- Types of assessments used in virtual environments (formative, summative, self-assessments, peer assessments).
- Tools and techniques for creating and administering online assessments.
- Using data and analytics to monitor student progress and make instructional decisions.





## Session 6: Feedback and Student Support

- Importance of feedback in virtual learning environments.
- Strategies for providing effective and motivating feedback to students.
- Support and resources available for students needing additional assistance in a virtual environment.

## Week 4: Implementation and Practice

### Session 7: Planning and Implementing the Virtual Environment

- Developing an action plan for implementing a virtual environment in the classroom.
- Logistical and technical considerations for successful implementation.
- Collaboration and teamwork among teachers to support the implementation of the virtual environment.

### Session 8: Practice and Reflection

- Opportunities for teachers to practise creating and managing virtual environments.
- Reflection on the challenges and lessons learned during the training process.
- Planning next steps and strategies for continuing to develop skills in creating virtual environments.

The above training plan will provide teachers with the skills and knowledge necessary to design and use effective virtual learning environments, thus improving the quality of teaching and learning in a digital setting. However, this training is not the only one needed. To complete the training of educators, a second training plan aimed at the use of avatars in the classroom is necessary.

Below is an example of what such a plan could look like:

**Objective of the training plan:** to train teachers in the effective use of avatars as an educational tool to improve student engagement and participation in learning.

**Duration of the training plan:** four training sessions

### Week 1: Introduction to Avatars in Education

- Concepts of Avatars in the Classroom
- Definition of avatars and their role in education.
- Importance of using avatars to promote engagement and identification with learning.
- Examples and use cases of avatars in different educational contexts.
- Exploration of different types of avatars, such as 2D, 3D, and virtual reality avatars.
- Practical demonstrations on how to use these tools to create personalised avatars.





## Week 2: Design and Customisation of Avatars

- Principles of Avatar Design
- Considerations for designing avatars that reflect the diversity and identities of students.
- Strategies for personalising avatars according to students' preferences and characteristics.
- Importance of inclusive representation and positive identification in avatar design.
- Examples of integrating avatars into different curricular areas and educational levels.
- Strategies for adapting avatars to teach specific concepts and promote student engagement.
- Collaboration and teamwork among teachers to share ideas and resources on creating classroom avatars.

## Week 3: Implementation and Use of Avatars in Learning Activities

- Integration of Avatars into the Curriculum
- Planning and designing learning activities that effectively incorporate avatars.
- Using avatars to present information, guide learning activities, and provide personalised feedback.
- Examples of learning activities that leverage avatars to enhance student engagement and participation.
- Strategies for assessing the impact of avatar use on student learning and engagement.
- Reflection on teachers' experiences in implementing avatars in the classroom.
- Identification of areas for improvement and opportunities to continue developing skills in using avatars in teaching.

## Week 4: Practice and Application in the Classroom

- Opportunities for teachers to practise creating and adapting avatars for learning activities.
- Development of educational resources using avatars, such as presentations, videos, and interactive learning materials.
- Collaboration and feedback among teachers to improve the quality and effectiveness of created resources.
- Development of an action plan for implementing the use of avatars in the classroom.
- Monitoring student progress and engagement in activities involving avatars.
- Continuous evaluation and revision of teaching practices to improve the use and integration of avatars in the classroom.

Therefore, having developed the section on recommendations for educators, a summary and conclusion of the section will establish a series of recommendations for all those teachers who wish to delve into the wonderful world of using avatars in the classroom and thus develop their capacities in the use of avatars in education.





If you are intrigued by the fascinating world we are addressing in this project, we recommend:

**1. Research and familiarise yourself with available tools:** spend time exploring different tools and platforms that allow you to create and use avatars in the classroom. Investigate the features, functionalities, and limitations of each tool to determine which best suits your needs and those of your students.

**2. Practise creating and customising avatars:** experiment with creating and customising avatars to familiarise yourself with the process and develop skills in designing digital characters. Play with different customisation options, such as physical traits, clothing, accessories, and facial expressions, to create avatars that are unique and representative.

**3. Integrate avatars into your teaching activities:** look for opportunities to integrate avatars into your teaching activities to enhance student engagement and participation. Use avatars to present information, guide learning activities, provide feedback, and encourage interaction among students.

**4. Promote inclusion and diversity:** when creating avatars, ensure that they represent the diversity of your students and promote inclusion in the classroom. Be aware of the importance of positive representation and personal identification in avatar design, and work to create digital characters that reflect the cultural, ethnic, gender, and ability diversity of your students.

**5. Encourage creativity and personal expression:** encourage your students to be creative and express their personal identity through the creation and customisation of avatars. Provide opportunities for students to design their own avatars and use digital creation tools to explore different aspects of their identity and personality.

**6. Evaluate the impact of avatar use on learning:** conduct continuous evaluation of the impact of avatar use on student learning and engagement. Collect qualitative and quantitative data on student performance, participation in activities involving avatars, and students' perceptions of their learning experience.

**7. Participate in professional communities and networks:** join online professional communities and networks where you can share ideas, resources, and experiences about using avatars in education. Participate in discussions, share your own experiences, and learn from the successes and challenges of other educators who are using avatars in their educational practices.

By following these recommendations, you will be able to develop your skills in using avatars and make the most of this tool to improve teaching and learning in the classroom while promoting educational inclusion.





## Chapter 7: Guidelines for Policymakers

### 7.1 Investing in customizable avatar platforms for SEN education

Special Educational Needs (SEN) refers to learning difficulties or disabilities that make learning more challenging for children compared to most children of the same age. That need can affect various aspects of a child's learning experience, including behavior, social skills, reading, writing (e.g., due to dyslexia), concentration and physical abilities like writing.

The fundamental principle states that every child has the right to an education tailored to their needs, ensuring that children with special needs are given equal educational opportunities. Traditionally, children requiring special educational needs are segregated into separate learning environments. Examples include providing material in larger fonts, one-to-one support, communication through sign language, small class sized or placing children in different year groups [4]. Additionally, there are healthcare and social care provisions that contribute to education and training, such as speech and language therapy (improving communication skills), occupational therapy (teaching daily skills like using the toilet or dressing), and cognitive behavioral therapy or mindfulness (managing anxiety) [4].

Research [1] has shown mixed results regarding the academic achievements of SEN students in inclusive classrooms. It also highlighted that many students often experience negative emotions and lower self-esteem.

Some of the most common types of Special Educational Needs are [5,6]:

- **Attention Deficit Hyperactivity Disorder (ADHD):**  
ADHD is characterized by behaviors that impact a person's ability to concentrate and manage impulses. It is typically diagnosed in early childhood.
- **Anxiety:**  
Many children and young people experience anxiety. While anxiety can be a normal part of life, it can also become a special educational need when it interferes with a child's ability to participate in everyday activities, particularly at school. Common forms of anxiety include school phobia, social phobia, separation anxiety, and panic disorder.
- **Autistic Spectrum Condition (ASC):**  
ASC is a developmental condition that makes it difficult for children to develop social and interaction skills, often leading to isolation.
- **Behavioral Difficulties:**  
Children with behavioral difficulties exhibit emotional and behavioral responses that differ from their peers. This can include antisocial behavior, disruptive behavior, aggression, and difficulty forming relationships.
- **Dyslexia:**  
Dyslexia is a learning difficulty that makes understanding words and language challenging. Signs of dyslexia include misspelling words, reading slowly and without fluency, skipping parts of text, poor organizational skills, and poor memory and concentration.





- **Visual Impairment:**

Visual impairments can affect a child's ability to learn, depending on the severity of the condition. Special educational provision may be needed for the child to continue learning effectively. In cases where significant hearing impairment is also present, the child may require specialized teaching and equipment.

- **Down Syndrome:**

Down Syndrome is a genetic condition resulting from an extra chromosome. Children with Down Syndrome often have distinctive physical features and generally experience learning difficulties. They may also have other medical issues such as visual impairments, heart problems, and thyroid disorders.

Avatar customization involves altering various characteristics of a character, granting players the ability to modify physical attributes like body shape and demographic features such as age, race, and gender, along with elements like clothing and accessories [21]. This feature is particularly significant in digital realms like virtual reality, gaming, and digital education, where personalized avatars have demonstrated positive impacts across various domains [20].

Using customizable avatars in Special Educational Needs (SEN) settings can greatly improve the learning journey for students with special needs. These platforms create personalized and interactive learning spaces, catering to individual preferences and abilities. Allowing students to design their avatars promotes a sense of ownership and identity, which in turn increases motivation and participation.

Avatar customization in educational settings can have several positive impacts, particularly in the context of SEN. Firstly, allowing students to personalize their avatars promotes a stronger sense of engagement, especially among those with SEN. Additionally, avatars can be tailored to accommodate various disabilities or special needs. For example, avatars can represent physical attributes such as wheelchair use or sensory preferences like hearing aids, making the virtual environment more inclusive for all students.

Avatars can facilitate social interactions in virtual environments, providing opportunities for students with SEN to engage with peers in comfortable and controlled settings. This can be particularly beneficial for students who may struggle with face-to-face interactions due to social anxiety or communication difficulties.

Lastly, personalized avatars can enhance students' motivation and sense of ownership in their learning experiences. By allowing students to design their avatars and navigate virtual environments according to their preferences, educators can promote a sense of autonomy and agency, which are crucial for building intrinsic motivation. Customization may have enabled players to create characters closer to their ideal selves, potentially increasing their identification with their characters [8].





A recent study [7] provides valuable insights into avatar-based disability representation from the perspective of disabled users. According to this research, many participants emphasized the importance of disclosing disabilities in virtual settings. For individuals with hearing impairment, displaying cochlear implant identifiers on their avatars facilitated smoother communication without the need for verbal acknowledgment. This approach underscores the significance of avatar customization in promoting inclusivity and accessibility in virtual environments.

Moreover, another study [13] investigates whether avatar customization enhances persuasive effects through self-affirmation in three lab experiments. The first study discovered that avatar customization significantly enhances how participants feel about themselves and induces self-affirmation. The second and third studies found that avatar customization improves persuasion by reducing defensive processing of self-threatening health information. This highlights how avatar customization can positively impact users' engagement and responsiveness to information, which is particularly relevant in educational settings.

Further research [14] explores how avatars in virtual worlds impact real-world behaviors. The study investigates how avatar customization influences users' self-care actions, revealing that personalized avatars are associated with increased efforts to maintain health. Additionally, avatars reflecting one's identity are found to effectively encourage self-preserving behaviors. This underscores the broader implications of avatar customization beyond educational settings, demonstrating its potential to influence positive behavioral changes in real life.

Finally, another research [21] revealed that a significant proportion of the total population indicated that customization significantly influenced their enjoyment. In comparison to other game features such as sound and graphics, participants consistently rated customization as a more crucial factor for their overall enjoyment.

## 7.2 Ensuring accessibility and universal design

The goal of inclusive education is to provide every student, regardless of their background or ability, with equal opportunities. Universal design principles are crucial in making educational environments accessible to diverse learners [15]. In recent years, terms like accessible design and universal design have emerged to describe design concepts that ensure user-friendliness, especially for individuals with disabilities. These concepts apply to various areas, such as distance learning courses, websites, and instructional materials.

The idea of universal design, which aims to create settings and educational opportunities that are useful and accessible to every person, regardless of their unique requirements and qualities, is at the core of this philosophy [15]. Accessibility involves a design process that specifically considers the needs of people with disabilities, ensuring that services can be independently used by individuals with various disabilities.







By making learning environments, tools, and materials accessible to all students, regardless of their abilities or disabilities, universal design significantly supports inclusive education.

Universal design is defined as "the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design" [2]. Usable design, like accessibility and universal design, is crucial for creating products that are easy and efficient to use.

The key principles of universal design include [3,15]:

- **Equitable Use:** The design is useful and marketable to people with diverse abilities. It ensures that all users, regardless of their abilities, can access the environment.
- **Flexibility in Use:** The design is useful to people with diverse abilities. It ensures that all users, regardless of their abilities, can access and benefit from the product or environment.
- **Simple and Intuitive Use:** The design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level. Clear instructions help users navigate the product without the need for extensive training or prior knowledge.
- **Perceptible Information:** The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities. This includes using visual, auditory and feedback to ensure that information is accessible to everyone.
- **Tolerance for Error:** The design minimizes hazards and the adverse consequences of accidental or unintended actions. Features such as emergency stop buttons or undo functions are incorporated to help prevent errors, enhancing safety and user confidence.
- **Low Physical Effort:** The design can be used efficiently, comfortably, and with a minimum of fatigue. Products should require minimal physical effort to operate making them accessible to users of varying physical capabilities.
- **Size and Space for Approach and Use:** Appropriate size and space are allotted for approach, reach, and manipulation, regardless of the user's physical characteristics such as size or mobility. This ensures that everyone, including those with mobility impairments, can use the product comfortably and effectively.

Over the past decade, ensuring accessibility and equal opportunities in the digital age has become increasingly important. Unfortunately, many products that perform well in usability tests are not accessible to people with disabilities. To implement universal design effectively, it is essential to first understand the diversity of users and their needs. Involving a varied group of stakeholders, including people with disabilities, older adults, and experts in Universal Design, in the design and decision-making process is crucial [15]. Additionally, providing instruction and training on key principles and best practices of universal design is vital [15].





## 7.3 Fostering collaboration among stakeholders

Inclusive education requires the participation of various stakeholders, each playing a pivotal role. Educators and school leaders design curriculum adaptations and provide necessary support. Parents and families are essential partners in their child's education, contributing valuable insights and reinforcement. Students, as stakeholders, benefit from collaborative learning, which fosters mutual understanding and empathy. Community organizations also play a crucial role by raising awareness and providing resources.

During the early 2000s, educational systems evolved to accommodate the inclusion of students with special educational needs (SEN), enhancing communication and collaboration between families and educational stakeholders [8]. Research indicates that digital technologies can significantly improve collaboration among stakeholders in inclusive education by providing insights into design considerations and guidelines for developing effective tools. Effective collaboration between educators, parents, and service providers is crucial for a child's educational development [9].

Technology has transformed professional development by expanding access to information and encouraging teacher reflection and collaboration. One study [10] examined educators' perceptions of collaborating with parents of children with disabilities. It found that those who engaged in online professional development had a greater appreciation for the importance of family collaboration.

Effective collaboration among diverse stakeholders is vital for supporting the developmental and educational opportunities and outcomes of students with disabilities [11]. Collaboration among various entities within the educational ecosystem, including government agencies, educational institutions, organizations, parents, and students, offers numerous advantages. Firstly, it facilitates the exchange of resources and knowledge, leading to more effective solutions to educational challenges. Secondly, collaboration allows for a holistic approach to addressing complex educational issues by considering diverse perspectives and factors contributing to student success. Additionally, it fosters an environment of innovation and creativity, as stakeholders bring different ideas and approaches to the table. Lastly, collaboration establishes support networks for students, educators, and families, ensuring access to essential resources and assistance.

Collaboration between partnerships is crucial for the education of all students enrolled in school programs [12]. To encourage this collaboration, it is important to establish regular communication channels such as meetings, newsletters, and digital platforms to facilitate information sharing. Organizing workshops on various topics can help educators and school leaders learn together and exchange insights. Additionally, employing co-teaching methods, where multiple educators work together in the same classroom, can create a dynamic learning environment and strengthen collaboration among stakeholders.





## 7.4 Addressing ethical considerations and promoting digital citizenship

The digital age has introduced an increasingly important concept in education: digital citizenship. Digital citizenship refers to the responsible and ethical use of technology to participate in society [16]. It involves norms of behavior when participating in online communities, using digital resources, and engaging with digital media [16]. Findings from a recent study [17] reveal that integrating case studies into digital citizenship education can effectively enhance learning outcomes. These findings emphasize the importance of structured inquiry, clear guidance, and peer engagement through discussions for promoting critical thinking among students.

Digital citizenship is the appropriate and responsible use of the internet, computers and digital devices. Teaching digital citizenship is more than just having students follow rules, policies and procedures, but is to ensure that students think critically, behave safely, participate responsibly and maintain their health and wellness in the digital world.

The components of digital citizenship include [18]:

- **Legal:** Understanding the rights and limitations when using digital devices, including the risks of personal and financial information theft, harassment, and cyberbullying.
- **Access:** Ensuring equitable access to technology for all individuals, irrespective of their socio-economic status, abilities, or geographical location
- **Digital Etiquette:** Developing an understanding of how one's digital actions affect others and taking responsibility for online behavior, treating others online with respect.
- **Digital Literacy:** Incorporating reading, writing, critical thinking, and the evaluation of online resources and social media content for accuracy, perspective, and validity.
- **Communication:** knowing when and how to effectively utilize various forms of digital communication, such as text messaging or social media platforms, is vital for successful online interactions.
- **Commerce:** Safely navigating e-commerce sites, verifying their legitimacy, and safeguarding personal and financial information.
- **Rights and Responsibilities:** Understanding one's rights and privileges in the digital realm, recognizing potential online dangers, and reporting issues to authorities when necessary.
- **Health and Wellness:** Recognizing the importance of maintaining a balance between online and offline activities to ensure quality time with family and friends.

Ethical considerations are a set of principles that guide design and practices, playing a crucial role in the development and deployment of systems. In education for people with special educational needs, the domain of legal and ethical considerations is a crucial component of educational structures, addressing the rights, responsibilities, and complexities surrounding the provision of quality education for students with disabilities [19]. These principles include voluntary participation, informed consent, anonymity, confidentiality, and communication of results.





The key elements of ethical considerations are [20]:

- **Voluntary participation:** Ensuring that they give their consent to participate in avatar customization activities.
- **Informed consent:** Ensuring that all participants, including students and their parents/guardians, understand the purpose and implications.
- **Privacy and Confidentiality:** Keep safe the personal information and identities of students involved in avatar customization activities.
- **Accessibility:** Ensuring that avatar customization tools and platforms are accessible to all students, regardless of their abilities, to promote inclusivity and equal participation.
- **Respect for diversity:** Respecting the diverse background, cultures and identities of students to avoid any form of bias.





## Chapter 8: Parental Engagement and Support

Parents play a very important role in the life of every child. They accompany them throughout childhood and adolescence, and in the case of children with special educational needs, very intensively throughout their lives. Consequently, they shape their attitudes, values, beliefs, and also participate in their educational process. The involvement of parents in the educational process of children with SEN is crucial, as these children often need the support of their closest relatives.

They may sometimes feel challenged and notice that they are not achieving the same results as their peers. To support their progress, they benefit from additional exercises at home to reinforce the knowledge and skills acquired in the classroom.

It is essential for parents and teachers to undertake joint efforts aimed at increasing the effectiveness of the educational process.

Currently, there are many practical guides for teachers that contain tips on how schools can collaborate with the parents of students with special educational needs. There is no shortage of publications aimed at school principals, which discuss the organization of joint activities of educators, specialists, and teachers with the parents of students with disabilities. Parents can also benefit from publications dedicated to how they can work together with the school and teaching staff to support actions for the benefit of their child.

Good relationships, mutual cooperation, and the engagement of both teachers and parents significantly influence the educational process of children. Both parties are invested in the child's optimal development. Parents and teachers alike strive to ensure that the child's potential is fully realized. They put in every effort to support the child and facilitate their journey through the educational process. Specialists working with children with special educational needs select appropriate methods and forms of work tailored to the child's abilities. They strive to make the activities engaging so that the student is interested and can develop. In special education, we primarily focus on the child's strengths, constantly adapting to their needs, to ensure they can function as effectively as possible in everyday life.

Why, then, do so many difficulties still exist in the area of successful cooperation between parents and teachers? This is primarily due to attitudes, awareness of the importance of this relationship, as well as the personal beliefs and motivations of both parents and teachers. We must remember that we are dealing with a very heterogeneous group of individuals. Some parents are aware, demanding, trust the school, and believe in the professionalism of the staff. They are willing to engage, support teachers, and even challenge them for the benefit of the child. Another group consists of parents who are uninterested in what happens at school. They send their children with disabilities to school hoping that they will receive appropriate care, upbringing, and education there.





Another group includes those with additional difficulties, who, besides caring for a child with a disability, experience other life challenges and sometimes view the school as an additional burden or expect the school to provide extensive support, almost to the point of taking over their responsibilities.

Teachers themselves also constitute a very heterogeneous environment, varying in terms of work experience, professional background, the type of institution they work in, values, worldviews, and their preparation for the profession and the role of educators for students with special educational needs.

Different groups, therefore, have various expectations of themselves, the people they will work with, and the ideas of education and cooperation. Without attitudes based on tolerance and acceptance, it is impossible to establish good cooperation based on trust and partnership.

In terms of successful cooperation, which plays such a significant role in a successful and effective educational process, mutual cooperation, collaboration, and partnership are of crucial importance. Despite repeated references to cooperation, collaboration, and partnership in school-parent relationships, they still provoke controversy and lead to misunderstandings. Mieczysław Łobocki uses these terms interchangeably. He mainly emphasizes the common goal of "as a joint action of parents and teachers to achieve the good of individual students, classes, and even the entire school community in the process of teaching and upbringing" (Łobocki 1985). In other words, cooperation and collaboration primarily involve undertaking various tasks in pursuit of jointly agreed-upon goals. This includes actions carried out solely by teachers or solely by parents, in accordance with previous agreements and decisions made in this matter. Acting in such a team, some play a leading role, while others, understanding the necessity of such actions, engage in the process, not necessarily with an awareness of the ultimate goals. Fulfilling these expectations can be particularly challenging in the context of school cooperation with parents of students with special educational needs. Amid the daily duties associated with the disabilities of children, caregivers often lack the space for additional actions and exploring the goals of the teacher's work.

The lack of understanding of motives and the loss of meaning in partial tasks are the sources of many misunderstandings. Parents of students with special educational needs often cooperate with less involvement, often due to difficult life situations. The lower involvement of these parents contributes to tensions and misunderstandings. Parents are often overwhelmed by their responsibilities, feeling helpless, inadequately competent, unsure how to cope, and where to seek help. Schools must therefore take full responsibility for directing this process, which means discussing cooperation rules thoroughly, defining the duties of both parties, and how they will be enforced. However, reality often differs—parents and school representatives may not know what tasks to perform as part of joint actions. There is a lack of a specific work program and awareness of their limitations resulting from the division of responsibilities.





If cooperation generates problems, perhaps partnership will meet the expectations of both parents and teachers. In such a relationship, parents may feel more appreciated and believe in their capabilities. It entails achieving a goal but in a more formalized form, allowing for relative equality.

The foundation of establishing such relationships is the genuinely felt, non-imposed desire to connect with another person. Following this principle, teachers expect parents to be engaged and fully understand their actions, while considering equality of roles. According to Jacek Kielin, however, expecting partnership from parents is a mistake. They will never be equal partners to therapists in the healing process because, despite their great willingness, warm hearts, and love for their child, they lack professional training, specialized knowledge, and the predispositions necessary for therapeutic work. Emphasizing partnership in education builds unrealistic expectations that are not understood and fulfilled.

This only diminishes mutual trust and loyalty. In the complex life situation of parents of children with disabilities, a better solution is to provide them with broadly understood assistance. In the school context, this refers to the actions of teachers and specialists towards taking full responsibility for the educational process of students. Parental participation is then considered an opportunity rather than a necessity. "Parents need help and advice to sustain their sense of parental competence; after all, while raising a child with special needs, they experience failures and setbacks; the child's progress is slow, hardly noticeable, and their behavior is often disturbed. Parents need not only advice but also acceptance and support from the teacher - educator. It must not be forgotten that teachers also need to feel respected and appreciated" (Olechnowicz 1979).

## 8.1 Importance of parental involvement in avatar-based interventions

Maria Grzegorzewska, a pioneer of special education in Poland, emphasized that "every person has an Achilles' heel (weak point) and an Archimedean point (point of strength), thanks to which it is not only possible to 'move the world from its foundations,' but also to discover such power in a disabled person that can change them and preserve the fullness of their humanity despite their weaknesses." It is worth referring here to Information and Communication Technology (ICT), which opens a wide window of perspectives for us to use in the education of children with special educational needs (SEN). Increasingly common information tools create new possibilities for conveying knowledge to students. Already today, we can observe that both children and adults eagerly use various electronic devices, which are increasingly tailored to the needs of people with various disabilities. By adopting information technology to the needs of children with SEN, they can learn, communicate, and in the future, work. Currently, there are many examples of digital tools on the market that directly address the needs of students with SEN.

For children with visual impairments, ICT offers beyond visual forms of communication, activating the senses of touch and hearing.





The most important tools include: computer systems for enlarging graphics and text with camera capabilities, such as: Edytor Eye Relief, ZoomText Plus, Microsoft Windows. Changes involve differences in size, contrast, and positioning; Speech synthesizers - Kubuś, Apollo, ECE, DEctalk; Braille monitors and notebooks - Notex 24 and Notex 40, as well as Brailloem; Braille printers and 3D printers; Scanners converting tactile images into digital form; Optacon reading device cooperating with a computer; Specialized software making the smartphone accessible.

In cases of deficits related to hearing, ICT serves as an alternative to oral communication. In such instances, specialized software enhances the visual or tactile capabilities of the student. Worth mentioning examples include: Talking Pictures Program - associating heard sounds with pictures depicting animals, objects, and devices emitting the heard sounds; Logo-Games Package - 10 programs in the form of interactive games enhancing speech therapy exercises; Sign Language - finger alphabet.

Since today's world offers us such possibilities, why shouldn't we take advantage of them? However, let us remember that both teachers and parents play an incredibly important role in the entire educational process. It is precisely the parents of children with special educational needs who should be partners to both the children and the specialists. Educational partnership is defined as entities based on purposeful and universally recognized actions, with education as their area of focus. According to Maria Mendel, it is a type of activity in which partners pursue common educational goals, previously creating conditions for cooperation, a relationship based on the mutual influence of individual members of the educational environment, forming an educational community. For such collaboration to be possible, it is necessary to recognize that parents are our partners in carrying out school tasks, and we are their partners in educating and nurturing children.

In today's knowledge- and information-based society, children with special educational needs belong to a group of students for whom effective functioning, both in the educational sphere and in everyday life, depends on their ability to utilize the opportunities provided by Information and Communication Technologies (ICT). Bringing education closer to a reality where existence without digital media is virtually impossible has transformed special education. It is almost evident that through ICT, it is possible to work more effectively with students with special needs, overcoming their disabilities, which would be impossible to overcome without, for example, using computers. The field of knowledge that teaches us how to adapt the environment to give individuals with disabilities as much autonomy as possible is referred to as assistive technology. Assistive technology is a broad concept that encompasses various devices designed to facilitate the functioning of individuals with different limitations (Pilch, 2008). The Convention on the Rights of Persons with Disabilities obliges us to "promote access for persons with disabilities to new technologies and information and communication systems, including the Internet."







Let's work with the resources of our students and involve their parents in this process. Since children today eagerly use computers, we can easily utilize them as motivators for students with cognitive disorders. With their help, we can support the learning process, especially in acquiring basic school skills such as reading, writing, and counting. Here are a few examples:

- Zondle Platform ([www.zondle.com](http://www.zondle.com)), which enables the creation of educational games supporting mathematical education, improving speech, and facilitating the reinforcement of spelling and grammar rules;
- PowToon Tool (<http://www.powtoon.com>) for creating animations;
- Friendly Plan Program, which teaches children how to perform individual tasks without hints;
- Good Game/Happy Alphabet app for learning to read and practice speech;
- Mathematics for Kids app, which supports the learning of basic mathematical skills for children;
- Spatial Orientation Game, which presents various environments of everyday life, allowing for training in basic spatial categories;
- FingerFace app, where children can develop the ability to read emotions;
- Kids Timer and Time In apps for visualizing the passage of time;
- Sketch - an app where you can draw using virtual pencils, markers, and magic brushes, import images, and modify them using fun and colorful stickers;
- Book Creator Free app for creating your own books on a tablet.

Currently, descriptions of solutions using digital technologies in working with students with special needs can be found in:

- Printed publications such as J. Łaszczyk (ed.), "Komputer w kształceniu specjalnym – wybrane zagadnienia" (Computer in special education - selected issues); Siemieniecki, B. (ed.), "Technologia informacyjna w pedagogice specjalnej" (Information technology in special education); Siemieniecki, B., "Komputer w edukacji. Podstawowe problemy technologii informacyjnej" (Computer in education. Basic problems of information technology),
- Websites such as "Wykorzystanie TIK w nauczaniu i uczeniu się uczniów ze specjalnymi potrzebami edukacyjnymi" (Utilizing ICT in teaching and learning for students with special educational needs) - Ośrodek Rozwoju Edukacji ([ore.edu.pl](http://ore.edu.pl)), content ([amu.edu.pl](http://amu.edu.pl)).

Information and communication technology is developing at a rapid pace, offering teachers numerous possibilities. One of them is the ability to create avatars through which students can learn to read. Avatars are primarily known to the younger generation through computer games and virtual reality, serving as virtual representations of users in the digital world. In an educational context, they serve as tools that allow students to identify with different characters and express themselves in a creative and safe manner. When used appropriately, they can become excellent tools for learning to read and improving reading comprehension skills. Parents of students play a crucial role in this process.





Firstly, their role involves motivating children to use avatars for educational purposes. Through play, children acquire key skills such as reading ability. It's an excellent way to spend quality time together with the child. Through interactive gaming with avatars, parents can support their child's educational journey, ensuring that learning is enjoyable rather than just a burdensome task. Avatars used in games can take various forms, representing characters from fairy tales, favorite heroes, or even reflecting the child or parent themselves. This encourages creative use of time, stimulates the child's creativity, showcases the results of their efforts, and motivates them to continue using informational tools with avatars. Children with special educational needs, using information and communication technology, may feel a greater sense of agency and achieve their intended goals more quickly, which serves as a wonderful motivator for further engagement.

Another equally important role of parents in using avatars for playful learning is monitoring their child's leisure time. As we know, the modern world and easy access to electronic devices have led to increased dependency on the internet and electronic tools, both among children and adults. Therefore, parents, as individuals responsible for their child's development and education, should monitor the time spent by the child using information technology. It's also important to consider how students utilize this time. Parents should teach children to use devices rationally and encourage them to engage in educational games instead of, for example, watching cartoons.

Utilizing avatars in the teaching and learning of students with special educational needs requires active participation from both teachers and parents. When using avatars as a tool for reading instruction, it's important to consider their three main characteristics:

1. **Compensatory:** This refers to the technical support provided by the avatar, enabling students with special educational needs to actively participate in interactions and communication with their environment. These supportive tools facilitate access to information, enhancing the process of integration and communication with the surroundings. This includes technologies that can, to some extent, compensate for or replace biological functions that are lacking or lost.
2. **Didactic:** Avatars serve as aids in teaching and learning, introducing a new dimension to pedagogy that enhances individual student development. This aspect involves a shift in the attitudes of teachers, parents, and educators in education, as well as changes in teaching methods and assessment of students with diverse educational needs.
3. **Communicative:** Avatars mediate communication with children with disabilities. In such cases, the avatar serves as a resource that allows children with communication disorders to demonstrate their abilities in a more comfortable manner, and it enables students with associated impairments to initiate communication with the external environment.





By understanding and leveraging these characteristics, both teachers and parents can effectively utilize avatars as valuable tools in the education and development of students with special educational needs.

Many studies indicate that children with special educational needs experience situations of independent activity to a limited extent. Involving avatars in this process and utilizing ICT (Information and Communication Technology) significantly encourages various activities more than traditional methods of work. For a student to engage with a specific ICT tool, they must first see, hear, and understand what is happening on the screen, activating a range of cognitive processes. Avatars are attractive to children and make them eager to use them. The mere possibility of understanding the consequences of actions in a short time helps students realize how significant their decisions can be and how they can significantly influence their own and others' situations.

A substantial group of children with autism is interested in interacting with computers and tablet devices. For this group of students, applications and mobile devices provide conditions for predictability and the development of a sense of control over their environment. ICT also has the power to stimulate intellectual activity. By receiving various media messages and engaging different senses, children develop attention, perception, and thinking. Avatars are an excellent alternative for students who have not previously succeeded due to their deficits. When working on tablet applications or interactive educational platforms, students often solve tasks intuitively, enabling them to achieve success and feel a sense of agency.

Utilizing avatars by children requires not only knowledge of software and specialized equipment from teachers and parents but also skills in adapting them to the individual needs of each child. It is beneficial for parents to try using the avatar themselves before suggesting it to their child, to understand how it works and determine if and how a child with special educational needs can benefit from it. Remember that what we provide to children with special educational needs must be tailored to their psychomotor abilities. A parent who successfully masters the use of this tool can utilize it for individual work with the child at home, reinforcing what the child has learned at school. It's important to note that for some students, certain activities, such as writing or communication difficulties, would be entirely impossible without individual work using a computer.

In the book "Utilization of ICT in Teaching and Learning of Students with Special Educational Needs using the example of the government program for developing competencies of students and teachers in the use of information and communication technologies 'Digital School'" by A. Białek, we read that according to specialists, some children, such as those with autism, who experienced moments of rebellion and reluctance, became more lively or calmer and were motivated to work in class when introduced to computer-based learning using avatars in games. Working with the computer proved to be particularly important as it helped maintain concentration, increased motivation, and sparked the child's curiosity.





Parents, responding to the needs of the child, can utilize an avatar, thereby making the child an active participant who effectively receives and processes the information provided. In order for the child to want to use the proposed avatar, the example of the parent is also important, showing the child that they also use educational applications and engage together with the child. Children need guides, so-called models, indicating the correct way to use the tool, and these patterns should be provided by parents and teachers. Just as young children learn to speak by participating in communicative situations with adults and siblings, observing and interacting with them, they also learn communication technologies by watching how household members use them and how they incorporate them into daily activities.

## 8.2 Strategies for empowering parents to support their children's learning

Parents of children with special educational needs face many difficulties, accompanied by a plethora of diverse emotions, not necessarily pleasant. Among these myriad emotions, fear begins to dominate at a certain point. Parents fear their child's disability and its consequences. They worry about their child, the quality of their life, and their future. They fear the reactions of their surroundings (M. Kościelska, 1995). They are also paralyzed by fear of their own negative emotions and helplessness. In this situation, to survive, they need professional support. Teachers and specialists working with their children can provide them with such support. Parents of children with SEN experience very different experiences, and therefore, different emotions accompany them. As a result, they adapt to the new situation – their child's disability and themselves as parents of a child with SEN – in very different ways. It is often difficult for them to come to terms with it and accept it. Usually, this is a prolonged process during which a parent learns about the disability and their disabled child, becomes accustomed to the situation, and learns to overcome the difficulties arising from it. In the literature, we find descriptions of the adaptive process and various approaches to its phases. Andrzej Twardowski distinguishes the period of shock (critical, emotional shock), the period of emotional crisis (despair or depression), the period of apparent adaptation (irrational adaptation attempts and defense mechanisms), and the period of constructive adaptation to the situation (real help to the child, acceptance of their situation). Meanwhile, Lech Kowalewski, presenting the stages of a person's adaptation to disability, distinguishes: experiencing disability, realizing limitations, attempting to function with the disability, and adaptation. These stages can be viewed through the lens of parents, who also experience their child's disability, realize its consequences, first try to live with it, and then simply live with it. Acceptance of all changes in the family system resulting from the arrival of a child with a disability will indicate parents' adaptation. These changes encompass many dimensions.

The primary task of the school, which is to support the family's educational function and provide parents with information about the progress and difficulties of the student, is often not fully realized.





This is influenced by both deepening differences arising from views, beliefs, and values between teachers and parents, as well as increasingly divergent approaches of both groups to the subject of upbringing, understanding the role, goals, and essence of the educational institution and the family. The assistance provided to parents of children with disabilities must be multi-aspect and multidimensional. In school, it can be expressed through support in the following ways:

- Emotional support, involving the creation of an atmosphere of mutual trust, acceptance, and care, expressed through verbal and non-verbal communication.
- Informational support, concerning the provision of advice, necessary guidelines to understand the child's disability, and the exchange of experiences and common observations.
- Valuative support, which involves acceptance and appreciation of the parent's potential (Kawczyńska-Butrym, 1998).

Such assistance enables both parents and teachers to highlight the competencies inherent in their roles. Parents often reluctantly engage in their children's educational process. In terms of relationships, cooperation between parents of children with special educational needs (SEN) and teachers is often unsatisfactory despite many efforts. To fully meet the expectations regarding a good teacher-parent relationship, it is important to remember that without changes in attitudes, values, attitudes, or beliefs of both teachers and parents, this will not be realistic and fully utilized.

In the teacher-parent relationship, fundamentally simple rules are important: "to speak good but real things, to listen to what they have to say, not to hide ignorance in a given area and openly admit it, to notice and appreciate their child's actions and progress, to seek support from others if there is a need" (Żejmis, Jurga 2016). Both parents and teachers appreciate the importance of positive mutual relationships. We must remember that joint actions of parents and teachers aim to increase the effectiveness of the educational process and influence the optimal development of the child. Therefore, it seems appropriate to focus more on building a climate of teamwork, mutual understanding, and interactions between people in building relationships between the school and parents of children with disabilities.

A family with such a child should be approached systemically, and the support provided should be interdisciplinary so that parents do not feel isolated and helpless due to the situation they find themselves in.

How can we support parents and, consequently, support their position in supporting children in learning? The most important principle should be to build an atmosphere of mutual trust and support for parents. Therefore, it is worth paying attention to several very important factors influencing the cooperation and partnership between parents and teachers.

Information, primarily comprehensive and reliable information, is crucial for parents. They need full, truthful, and exhaustive information to navigate through the maze of terms and legal regulations.





It is important at every stage of the child's life: at the time of diagnosis - so they know the child's condition, developmental limitations, and life possibilities, what to do to support the child, and ensure optimal development; during therapy - so they understand what is happening with the child and how they can support their child's therapy; in important, difficult moments of life such as choosing an educational path, or situations of illness. For parents of children with special educational needs, such comprehensive and exhaustive information is extremely necessary for a sense of security. Often, it makes them feel more competent and less helpless.

Another factor should be the establishment of a designated space in the school for parent meetings. It should be a permanent place where parents can feel safe and ensure a sense of privacy during conversations. This space should serve not only for meetings with parents and building a comfortable atmosphere during discussions but, above all, make them feel their place in the school. Equally important is the development of consistent rules for organizing such meetings. Both the moment of welcoming the parent and concluding the conversations are important. Extending a handshake and escorting them to the door is a fairly obvious way of treating a guest. Such gestures are not very common in schools, but it may be worth taking care of parents in such a professional manner.

It is also worth considering setting up a corner for parents - a designated space (e.g., near the entrance to the school or classroom) where there is a notice board intended for them. Through this form of contact, they can familiarize themselves with interesting articles or books describing the issues related to their child's functioning, including the specifics of a chosen disability. Exhibitions of children's work, interesting projects, or documentation from the class's life will also play an important role here. It is reasonable to allow parents to view their children's work as well as the classrooms where their children learn every day. This will undoubtedly make parents feel welcome in the institution.

In the teacher-parent relationship, the formula of open classes brings many benefits. It allows observing the child with special educational needs (SEN) during classes among peers. Observing the child during activities, verifying the skills of children, and their knowledge base, as well as individual problems related to this, often make parents aware of the difficulties faced by both children and educators. Another benefit of parents participating in open classes is realizing that their child also needs their support, assistance, and additional practice at home. Parents, through observation, gain knowledge about how to work with children with special needs, what methods teachers use, and what forms of work they employ. It is also an excellent opportunity to provide parents with guidance for home-based activities after the classes. Often, the invitation of parents to open classes and the willingness of teachers to engage in such open contact instill respect and trust among parents. This makes parents feel safer leaving their child in the hands of such a specialist. Open classes can also take the form of workshops during which parents and children work on a joint project (e.g., making holiday cards, decorating eggs in art classes). In the classroom attended by a student with SEN, such a meeting is an excellent opportunity to integrate and deepen emotional bonds on various levels.





Another form of integration is school ceremonies – for many parents, this is yet another opportunity to get to know the children better and the atmosphere prevailing in the institution. For students, especially those with disabilities, such events are an opportunity to demonstrate their abilities and skills. Excursions also play an important role, allowing for joint decision-making with parents and considering the individual psycho-physical capabilities of each student. It is worth involving parents of students in their organization and encouraging joint outings. Through such activities, outsiders can perceive the diversity of challenges facing teachers and appreciate their efforts in meeting the educational needs of all students.

In special education, support groups play an important role, providing parents of children with special educational needs the opportunity to meet, talk, offer mutual support, and exchange experiences. Within support groups, it is valuable to organize meetings with the participation of experts. This could be a person suggested by a teacher when they need the support of authority, or a specialist who can address parents' issues. However, parent education should focus not so much on theoretical lectures but on discussing specific topics and jointly analyzing problems arising from life situations. Some topics can be planned in advance (e.g., at the beginning of the school year), while others arise spontaneously from current needs and classroom situations. It is essential, however, to regularly seek parents' opinions (e.g., using surveys) on issues related to school/class activities and expectations of the institution, even if meeting those expectations seems impossible. According to L. Prusko and E. Arkuszewska, a support group for parents of children with special educational needs is a group whose goal is to support parents and children in building healthy relationships with the external world and provide them with opportunities to understand their emotions related to their feelings, perceptions, and self-understanding. This group coordinates the activities of four mutually supportive systems, creating: a parent support group, a peer support group, a volunteer support group, and a group supporting individual development. In the book "Elementary Concepts of Social Pedagogy and Social Work," edited by D. Lalak and T. Pilch, it is stated that "Social support" (Latin: *auxilium sociale*) is a key term in the field of social pedagogy, social work, health promotion and protection, social psychology, and therapeutic activities. Support as a process constitutes an inherent attribute of methods with an interactive character, taking on either individual ("to support someone, to help") or group forms (support by a group or institution). The essence lies in mutual support and mutual care within the community. Social support operates on two levels: as social integration in certain life conditions and through direct interaction among participants in a problematic situation. This is undoubtedly appropriate in preventing the alienation of lost, lonely, isolated individuals, and people who cannot cope with life's difficulties, as written by K. Popiolek.

The most frequently and willingly chosen form of contact between teachers and parents are telephone conversations and email communication. These are standard communication methods, but other solutions conducive to cooperation are often forgotten. These can include letters, diplomas, commendation letters sent to parents and students, in which progress and achievements of students can be described, as well as attention can be drawn to areas that still need improvement. Such forms of communication often instill pride, increase trust in the school, and enhance engagement in school life – both for the student and their family members.





The general principle to follow here is to gain the trust and goodwill of parents, which is unlikely to be achieved by informing them only about their children's shortcomings and faults during meetings. Therefore, always remember to start by highlighting the strengths of the student.

There are many areas within the scope of cooperation and possibilities for collaboration between the school and parents, which are usually chosen depending on the specific nature of the school and the needs of the school community. However, it is worth emphasizing that primarily the competencies of teachers and their personality influence whether cooperation will be an easy or difficult process for parents. In summary, it can be said that a good teacher can have a greater impact on building cooperation than excellent organization or the most refined educational system.

A special school undertakes various activities for the benefit of students and their parents, which are of great interest. A good example is the Henryk Sienkiewicz Special School and Educational Center in Świdnik, which carries out many projects supporting the functioning of both students and entire families on a daily basis. In addition to its statutory activities, the center implements the following projects: Rehabilitation 25+ (4th edition), Erasmus, For Life (since 2017), Future Laboratories, Specialized Center Supporting Inclusive Education (SCSIE), and Support and Testing Center (STC). The Świdnik Special School and Educational Center implements many pedagogical innovations, and students participate in competitions and tournaments. The achievements of students and the effects of their work are presented to the local community during school and community events. The school attaches great importance to local history and builds a sense of identity and patriotism based on it.

Among the good practices utilized in the Special School and Educational Center are the organization of many conferences, including:

- Conference titled "School, Life, Work - the Challenge of Education for All" – March 25, 2022.
- "New Doesn't Mean Difficult?!" – Training and Consultation Meeting for Directors of Special Education in the Lublin Voivodeship – October 26, 2022.
- "Education for All – Opportunity or Challenge?" - Workshops for Educational Supervisors from the Lublin Regional Education Authority – November 22, 2022.
- "AAC in the Modern IEP Model" – International Scientific and Training Conference – December 10, 2022.
- "Inclusive Education, Why (Not)?" - May 31, 2023, summary of the SCSIE pilot.

The Special Educational and Care Center named after Henryk Sienkiewicz in Świdnik, in cooperation with the Support and Testing Center (OWiT) operating within it, creates conditions for establishing a support system for children, adolescents, and later also adults. The ecosystem as support for individuals with diverse needs represents a comprehensive approach to people with disabilities and their environment in their natural surroundings.







The ecosystem approach assumes that a person with a disability is part of a larger system, and it is impossible to help them without considering the environment in which they live, which affects them and is also influenced by their functioning. The primary goal is to strive to improve the functioning of people with disabilities by initiating support in their living environment. This is precisely what OWiT offers, where individuals with diverse needs can seek professional advice in choosing the right equipment, as well as rent and test it in their home environment.

The aim of support is to strengthen the competencies of people with disabilities and to create the most favorable conditions for their further development. The ecosystem approach necessitates support not only for the disabled person but for their entire environment, which has a decisive influence on them. Therefore, cooperation between teachers, specialists, and families is crucial here, along with accurate information sharing, establishing common actions, and building relationships. Good cooperation requires educational staff to acknowledge that parents are our partners in fulfilling school tasks, and we are their partners in educating and raising children.

This holistic approach provides greater opportunities for improving the situation of individuals with disabilities, personal development, fostering independence, resourcefulness, and activity. It supports learning, the development of communication, cognitive, and social functions, and also prepares for future employment.

The created ecosystem support model for individuals with diverse needs will improve access to specialized assistance, Assistive Technologies, and enhance the effectiveness of assistance, as support is directed towards the entire microsystem of the individual.

These actions are also met with recognition from other individuals and institutions working for children and their families, especially those experiencing disabilities and the resulting consequences. Support from authorities, interest from the local community, and evidence of support from the institution inspire optimism and motivate further actions – whether carried out independently or in collaboration. It is worth emphasizing that these actions take on the character of systemic interventions, implemented continuously, systematically, and purposefully.

### 8.3 Facilitating communication between educators and parents

Correctly implemented multimedia education makes the student an active participant who effectively receives and processes the information provided by the teacher. In this context, special attention is deserved by the competencies of teachers that respond to the diverse needs of students. Especially since currently in the educational reality, one group often consists of children with normal intellectual abilities, diverse disabilities, and gifted students. Such diversity among students requires ensuring broadly understood individualization and, consequently, considering very diverse forms of using ICT.





Achieving the mentioned goal is particularly challenging because it should allow some children to reveal their latent abilities and develop innate predispositions, while enabling others to achieve harmonious development and join the level of their peers.

The role of the teacher is not only to adapt appropriate tools for the student but also to support the parent so that they can use them to work with the child at home. It is worthwhile to invite the parent to a demonstration lesson to see how a child with special needs uses avatars for learning, and also allow them to actively participate with the child in this lesson. Finally, it is advisable to provide the parent with guidance for further work. Good practice also involves conducting training for parents and providing them with valuable knowledge on how to select and use avatars for the child's needs at home.

Despite the vast number of educational games available today, it's important to remember that many of them unfortunately do not meet accessibility standards for children with special educational needs. They often fail to consider the child's deficits in abilities. They are often incomprehensible and inadequate for the perceptual capabilities of children with special educational needs. Applications overloaded with colors, sound effects, a huge number of options, and dialogues often make children with special educational needs reluctant to use them. And if they do, they often limit themselves to performing unproductive activities, such as repeatedly launching the same animations instead of completing educational tasks. That's why consistency in interactions, communication, and collaboration between teachers and parents is so important. For the benefit of the child and to maximize their potential, it is crucial to choose appropriate games, tools, and avatars tailored to children with special educational needs.

Child, starting their education at any stage, has an Individual Educational and Therapeutic Program (IETP) created for them and later modified as needed. This program is developed by teachers, specialists, and therapists with the involvement of the parent of the child with special educational needs. One of the recommendations addressed by Karen Douglas and colleagues to teams working on the IETP suggests including whether the person with special educational needs should use any type of application, and if so, which one. Therefore, at this stage, it is worth including which ICT tools will be used in the educational process and how the avatar will be utilized.





## Chapter 9: Future Directions and Emerging Trends

### Overview

As the digital age progresses, the integration of advanced technologies in education has become increasingly prominent, offering innovative solutions to age-old challenges in the learning environment. One such promising avenue is the use of avatar technology, which holds significant potential for transforming educational experiences, particularly for Special Educational Needs (SEN) students with partial mental disabilities.

This chapter delves into the future directions and emerging trends in this realm, exploring the potential advancements in avatar technology, the importance of longitudinal studies to assess efficacy, the exploration of immersive virtual reality experiences, and the adoption of inclusive design approaches.

The use of avatars in education is not a novel concept; however, recent technological advancements have significantly enhanced their capabilities and applications. Avatars, as digital representations of characters, can be used to create highly interactive and personalized learning environments that cater to the diverse needs of students. For SEN students, who often face unique learning challenges, avatars can offer tailored support and engagement that traditional educational methods may lack. By providing visual and interactive elements, avatars can make learning more accessible and engaging, helping students to better understand and retain information. The potential advancements in avatar technology are vast and multifaceted. One of the most exciting developments is the incorporation of artificial intelligence (AI), which allows avatars to adapt in real-time to students' responses and learning progress. This adaptability can lead to more personalized instruction, offering immediate feedback and adjusting teaching strategies to meet the individual needs of each student. Furthermore, advancements in natural language processing (NLP) enable avatars to engage in more natural and intuitive conversations with students, enhancing communication and comprehension. The integration of biometric data, such as eye-tracking and facial expression recognition, can also provide insights into student engagement and emotional states, allowing avatars to modify their teaching methods accordingly.

In addition to technological advancements, it is crucial to assess the long-term efficacy of avatar-based learning through longitudinal studies. These studies can provide comprehensive data on the effectiveness of avatars in improving academic skills, such as reading comprehension, over extended periods. By tracking the progress of students using avatar-based interventions across different educational stages, researchers can evaluate both immediate and sustained impacts on learning outcomes. Such research is essential for identifying potential limitations and ensuring that avatar-based learning strategies are optimized and inclusive for all students.





Another exciting development in educational technology is the exploration of immersive virtual reality (VR) experiences. VR can create fully immersive environments where students interact with avatars and educational content in a highly engaging and effective manner. This technology allows for the creation of customized learning scenarios that cater to the specific needs of SEN students, making abstract concepts more tangible and easier to grasp. VR can also facilitate experiential learning, where students participate in virtual field trips or simulations, providing hands-on experiences that enhance understanding and retention of educational material.

Inclusive design is a fundamental aspect of successfully implementing avatar-based learning tools. This approach ensures that educational technologies are accessible and effective for all students, regardless of their abilities or disabilities.

Inclusive design involves creating avatars and educational content that are adaptable to the diverse needs of SEN students, providing multiple means of engagement, and ensuring that avatars can communicate in different languages and dialects. Involving SEN students in the design and development process is crucial for creating effective and user-friendly educational tools that empower students and enhance their learning experiences.

As we look to the future, it is evident that avatar technology has the potential to revolutionize education for SEN students. By leveraging advancements in AI, NLP, VR, and inclusive design, educators can create highly personalized and engaging learning environments that cater to the unique needs of each student. However, it is essential to conduct thorough research and longitudinal studies to assess the efficacy of these technologies and ensure that they are implemented in ways that are inclusive and beneficial for all students. This chapter aims to explore these future directions and emerging trends in avatar-based learning, providing insights into how these technologies can be harnessed to create more inclusive, engaging, and effective educational experiences.

The growing interest in leveraging technology for educational purposes has revealed both opportunities and challenges. While the potential of avatars to enhance learning outcomes is substantial, there is a notable gap in research specifically focusing on their use with SEN students. Recognizing this gap, our project, supported by the Erasmus+ programme, seeks to systematically review existing studies and practices, identify limitations, and highlight areas in need of further investigation. By doing so, we aim to shed light on the current state of knowledge and pinpoint the challenges and barriers encountered in the effective deployment of avatars for educational enhancement. Through a meticulous literature review followed by data collection on current practices in Turkey, this guide will culminate in actionable strategies for the utilization of avatars in reading comprehension programs. By addressing the nuances of partial mental disability within the SEN spectrum, our project aspires to foster a deeper understanding of how digital avatars can be optimized for educational success, ultimately contributing to a more inclusive and adaptive educational landscape.





In the following sections, we will focus on the specifics of potential advancements in avatar technology, the importance of longitudinal studies, the exploration of immersive virtual reality experiences, and the adoption of inclusive design approaches. Each of these areas offers exciting possibilities for enhancing the educational experiences of SEN students, paving the way for innovative and effective learning strategies that can meet the diverse needs of all learners.

## 9.1. Potential Advancements in Avatar Technology

The evolution of avatar technology holds immense potential for enhancing educational experiences, especially for Special Educational Needs (SEN) students with partial mental disabilities. Avatars, which serve as digital representations, can create highly interactive and personalized learning environments. Advancements in this technology are likely to make avatars more realistic and responsive, enabling them to better engage students and cater to individual learning needs.

One significant advancement is the development of more sophisticated artificial intelligence (AI) that allows avatars to adapt in real-time to students' responses and learning progress. This AI-driven adaptability can facilitate more personalized instruction and provide immediate feedback, which is crucial for students with learning disabilities. For example, in a study by Chen et al. (2020), AI-driven avatars were used to help students with reading comprehension by adapting the difficulty of texts and providing hints based on the student's performance. This personalized approach helped students to improve their reading skills more effectively compared to traditional methods.

Additionally, improvements in natural language processing (NLP) will enable avatars to better understand and respond to student queries, enhancing communication and comprehension. As NLP technologies advance, avatars will be able to engage in more natural and intuitive conversations with students, providing explanations, answering questions, and offering encouragement in a way that feels personal and supportive. This can significantly boost student motivation and engagement, particularly for those who may find traditional learning environments intimidating or inaccessible. For instance, according to Lu and Li (2021), an educational avatar equipped with advanced NLP capabilities was able to conduct interactive dialogues with students, clarifying complex scientific concepts in real-time and adapting the conversation based on student responses.

Moreover, the integration of biometric data (e.g., eye-tracking, facial expression recognition) can provide insights into student engagement and emotional states, allowing avatars to adjust their teaching methods accordingly. For example, in research by Xu et al. (2018), avatars equipped with eye-tracking technology were used to monitor students' focus during online lessons. When the avatar detected signs of distraction, it would prompt the student to re-engage with the material through interactive activities or short breaks, resulting in improved attention and retention rates.





Advancements in graphical rendering and animation technologies also play a crucial role. More lifelike avatars with realistic facial expressions and body language can enhance emotional connection and engagement. Davis et al. (2021) demonstrated that students interacting with avatars displaying human-like emotions were more engaged and empathetic, which positively impacted their learning outcomes. For example, an avatar that smiled or nodded in response to correct answers provided positive reinforcement, making students feel more confident and motivated.

Further developments include the use of virtual and augmented reality to create more immersive learning environments. Avatars can be integrated into these environments to guide students through complex topics and provide a hands-on learning experience that is both engaging and educational. Kawasaki et al. (2020) explored the use of avatars in a virtual chemistry lab, where students conducted experiments under the guidance of an avatar. This setup not only made the learning process more interactive but also allowed students to experiment in a safe and controlled environment, enhancing their understanding of the subject matter.

In addition, the customization of avatars to reflect diverse cultural and linguistic backgrounds can significantly enhance their effectiveness in multicultural educational settings. For instance, avatars that speak multiple languages or dialects can make learning more accessible to students from different linguistic backgrounds, as shown in a study by García et al. (2019). This customization ensures that all students feel represented and can engage with the educational material in a language they are comfortable with.

## 9.2. Longitudinal Studies to Assess Efficacy

In recent years, the integration of digital avatars in educational contexts has emerged as a powerful tool to enhance learning experiences. Avatar-based learning, which utilizes digital characters to facilitate interaction and engagement, has shown promise, particularly in special education. However, to truly understand the efficacy of these interventions, longitudinal studies are essential. This chapter focuses on the significance of longitudinal studies in evaluating avatar-based learning, discussing their methodology, findings, and implications for future educational practices.

### Understanding Avatar-Based Learning

Avatar-based learning involves the use of digital characters or avatars to represent students, teachers, or other figures within an educational platform. These avatars can engage learners through interactive simulations, role-playing, and personalized instruction. This approach has been particularly beneficial for students with special educational needs (SEN), providing tailored support and a safe learning environment.





## Applications in Education

**Language Acquisition:** Avatars can simulate native speakers, allowing learners to practice pronunciation, vocabulary, and conversational skills in a controlled, repeatable manner. Research indicates that learners can significantly improve their language skills through repeated interactions with avatars.

**Social Skills Development:** For students with autism spectrum disorders (ASD), avatars can provide scenarios to practice social interactions and responses in a low-pressure setting. Studies have shown that students with ASD exhibit marked improvement in social skills after engaging with avatar-based simulations.

**STEM Education:** Avatars can guide students through complex scientific and mathematical concepts using interactive, visual, and experiential learning methods. This approach has been found to enhance students' understanding and retention of STEM subjects.

## Benefits for SEN Students

Avatar-based learning offers several advantages for SEN students:

**Customization:** Avatars can be tailored to meet individual learning needs, offering personalized pathways and feedback. This customization ensures that each student receives the specific support they require, enhancing the learning experience.

**Engagement:** The interactive nature of avatars can enhance motivation and engagement, crucial factors in effective learning. Engaged students are more likely to participate actively and retain information.

**Safety:** Virtual environments provide a safe space for students to experiment and learn without the fear of real-world consequences. This safety is particularly important for SEN students who may experience anxiety or fear in traditional learning environments.

## The Role of Longitudinal Studies

To validate the benefits of avatar-based learning and understand its long-term impact, longitudinal studies are indispensable. These studies involve following the same group of students over an extended period, allowing researchers to track changes and developments in their learning outcomes.

**Efficacy Evaluation:** Longitudinal studies provide data on the sustained impact of avatar-based learning, helping to determine if initial improvements are maintained over time.

**Developmental Insights:** These studies offer insights into how learners evolve, adapt, and benefit from avatar-based interventions across different stages of their educational journey.





**Sustainability:** By examining long-term outcomes, researchers can assess the sustainability of benefits and identify any diminishing returns or areas needing improvement (Smith et al., 2021).

**Comprehensive Analysis:** Longitudinal studies consider various influencing factors, providing a more holistic understanding of the effectiveness of avatar-based learning.

## Methodology of Longitudinal Studies

Longitudinal studies typically involve selecting a diverse group of students to ensure that findings are generalizable. It is crucial to have a representative sample that includes various socio-economic backgrounds, learning abilities, and educational contexts.

Data collection in longitudinal studies is multifaceted, including:

- **Standardized Tests:** To measure academic performance and progress.
- **Surveys and Questionnaires:** To gather feedback from students, parents, and teachers.
- **Observations:** To assess behavioral changes and engagement levels.
- **Interviews:** To gain in-depth insights into the experiences of participants

Analyzing longitudinal data involves sophisticated statistical methods to track changes over time and identify patterns. Researchers use techniques such as growth modeling, regression analysis, and mixed-method approaches to draw comprehensive conclusion. The findings from longitudinal studies on avatar-based learning have been promising:

- **Sustained Improvement:** Many studies report that initial gains in academic and social skills are maintained or even enhanced over time
- **Enhanced Engagement:** Students using avatar-based learning platforms consistently show higher levels of engagement and motivation
- **Positive Behavioral Changes:** For SEN students, particularly those with ASD, there are significant improvements in social behaviors and interactions.

## Implications for Future Research and Practice

The findings from longitudinal studies underscore the potential of avatar-based learning to bring about meaningful, lasting improvements in education. However, continuous research is necessary to refine these technologies and adapt them to evolving educational needs.

- **Integration with Traditional Methods:** Combining avatar-based learning with traditional teaching methods could offer a balanced approach, leveraging the strengths of both
- **Teacher Training:** Educators need adequate training to effectively implement and maximize the benefits of avatar-based learning







- **Technological Advancements:** Ongoing technological improvements will enhance the capabilities and accessibility of avatar-based learning platforms (Johnson & Lester, 2018).
- **Policy and Funding:** Support from educational policymakers and funding bodies is crucial to facilitate large-scale adoption and research

To sum up, avatar-based learning represents a significant advancement in educational technology, offering personalized, engaging, and effective learning experiences. Longitudinal studies are vital in validating these benefits and understanding their long-term impact. The promising results from existing studies highlight the potential of this approach, particularly for SEN students. As research continues and technology evolves, avatar-based learning is poised to play an increasingly important role in shaping the future of education.

### 9.3. Exploration of Immersive Virtual Reality Experiences

Immersive VR has a wide range of applications across various educational fields:

#### STEM Education

- **Virtual Laboratories:** VR enables the creation of virtual labs where students can conduct experiments and explore scientific concepts without the need for physical lab equipment. This enhances understanding and allows for safe experimentation (Makransky et al., 2019).
- **Astronomy and Space Exploration:** Students can explore the solar system, visit distant planets, and experience space missions through VR, making abstract concepts more tangible and engaging.

#### Medical Training:

- **Surgical Simulations:** VR provides realistic simulations for medical students to practice surgical procedures. This hands-on experience improves skills and confidence without the risk to real patients (Barsom et al., 2016).
- **Anatomy Exploration:** VR allows students to explore the human body in 3D, providing a detailed understanding of anatomy and physiology that surpasses traditional methods.

#### Humanities and Social Sciences

- **Historical Reenactments:** VR can recreate historical events and environments, allowing students to immerse themselves in different time periods and gain a deeper understanding of historical contexts (Rosenbaum et al., 2007).
- **Cultural Experiences:** Students can virtually visit museums, archaeological sites, and cultural landmarks, enhancing their appreciation and understanding of different cultures and histories (Liestøl, 2014).





## Special Education

- **Skill Development:** VR can provide personalized and engaging experiences for students with special educational needs, helping them develop social, cognitive, and motor skills in a supportive environment.
- **Therapeutic Interventions:** VR can be used for therapeutic purposes, such as treating phobias, anxiety, and autism spectrum disorders, by providing controlled and immersive environments for therapy sessions

## 9.4 Case Studies

### Case Study 1: VR in Medical Education

A study conducted at Stanford University explored the use of VR in medical training, particularly in surgical education. The study found that VR simulations significantly improved the surgical skills of medical students, providing a safe and effective platform for practice (Barsom et al., 2016). Students reported increased confidence and competence in performing surgical procedures after engaging in VR training modules.

### Case Study 2: Virtual Field Trips

Google Expeditions is a VR application that allows students to take virtual field trips to various locations around the world. Schools that implemented this technology reported increased student engagement and enthusiasm for learning.

Students could explore places like the Great Barrier Reef, the International Space Station, and historical landmarks, providing immersive learning experiences that were previously unattainable (Freina & Ott, 2015).

### Case Study 3: VR for STEM Learning

A study by Makransky et al. (2019) investigated the use of VR laboratories for teaching chemistry concepts. The findings indicated that students who used VR labs demonstrated a better understanding of chemical reactions and safety procedures compared to those in traditional lab settings. The immersive nature of VR labs made abstract concepts more accessible and engaging for students.

## Challenges and Considerations

While immersive VR holds great promise for education, several challenges need to be addressed:

- **Cost and Accessibility:** The high cost of VR equipment and software can be a barrier for many schools and institutions. Ensuring that all students have access to VR technology is crucial for equitable learning opportunities (Merchant et al., 2014).





- **Technical Issues:** VR systems require robust technical infrastructure and support. Schools need to invest in reliable hardware, software, and maintenance to ensure smooth operation (Fernandez, 2017).
- **Teacher Training:** Educators need proper training to effectively integrate VR into their teaching practices. Professional development programs are essential to equip teachers with the skills and knowledge to use VR technology effectively (Dede, 2009).
- **Health Concerns:** Prolonged use of VR can cause motion sickness, eye strain, and other health issues. It is important to establish guidelines for safe and healthy use of VR in educational settings.

Immersive VR represents a transformative approach to education, offering engaging, experiential, and personalized learning experiences. The potential applications of VR in education are vast, spanning STEM, medical training, humanities, and special education. However, to fully realize the benefits of VR, challenges related to cost, accessibility, technical support, and teacher training must be addressed. As research and technology continue to evolve, immersive VR is poised to play a crucial role in shaping the future of education, providing students with unique and impactful learning experiences.

## 9.5 Adoption of inclusive design approaches

The rise of immersive virtual reality (VR) technologies has revolutionized the educational landscape, offering unprecedented opportunities for experiential and inclusive learning. Inclusive design in VR ensures that these advanced technologies cater to diverse learner needs, particularly those with special educational needs (SEN).

This chapter explores the potential of immersive VR experiences, the importance of inclusive design, and their application within the AVATAR SEN project. By examining current research and practical examples, this chapter aims to provide a comprehensive overview of how immersive VR can transform inclusive education. Immersive VR refers to a technology that creates simulated environments, providing users with a sense of presence and interaction within a virtual world.

Typically involving VR headsets, motion controllers, and haptic feedback devices, immersive VR can deliver engaging and interactive educational experiences. This technology's potential for inclusivity lies in its ability to offer personalized, adaptable learning environments.

### Key Features of Immersive VR

- **Three-Dimensional Environments:** VR creates realistic 3D spaces that provide a sense of depth and space.
- **Interactivity:** Users can interact with virtual objects and environments, enhancing engagement.





- **Sensory Feedback:** Advanced VR systems offer haptic feedback and spatial audio, enriching the sensory experience.
- **Presence:** VR generates a sense of presence, making users feel physically situated in the virtual environment.

## Benefits of Immersive VR in Education

Immersive VR offers numerous benefits for education, particularly for students with SEN:

- **Enhanced Engagement:** The immersive nature of VR captures students' attention and motivates them to participate actively in learning activities. The novelty and interactivity of VR experiences make learning more enjoyable and memorable (Merchant et al., 2014). This heightened engagement can lead to improved learning outcomes and increased motivation for students who may otherwise struggle with traditional educational methods.
- **Experiential Learning:** VR allows students to engage in hands-on, experiential learning, which facilitates deeper understanding and retention of complex concepts (Dede, 2009). For instance, VR can simulate scientific experiments, historical events, or complex mathematical problems, providing students with a tangible and interactive way to grasp abstract ideas.
- **Safe Learning Environments:** VR provides a safe space for students to experiment and make mistakes without real-world consequences. This is crucial for subjects that involve hazardous or delicate tasks, such as chemistry or medical training (Kaufmann & Schmalstieg, 2003). In a virtual lab, students can conduct experiments that might be too dangerous or costly to perform in a physical lab.
- **Accessibility:** VR offers access to environments and experiences that might be otherwise inaccessible due to geographical, financial, or physical constraints (Fernandez, 2017). For example, students can take virtual field trips to historical sites, explore the depths of the ocean, or travel to outer space—all from the safety and comfort of their classroom.
- **Personalized Learning:** VR can be tailored to individual learning needs, providing personalized feedback and adaptive learning paths (Freina & Ott, 2015). This customization ensures that each student receives the specific support they require, enhancing the learning experience. For students with SEN, this means that VR can adapt to their unique needs, making learning more accessible and effective.
- **Inclusive Design in Immersive VR:** Inclusive design ensures that VR experiences are accessible and effective for all learners, including those with disabilities. It involves creating VR environments that accommodate diverse needs and abilities, thereby fostering an inclusive educational landscape.

## Principles of Inclusive Design

- **Equitable Use:** VR environments should be usable by people with diverse abilities.
- **Flexibility in Use:** VR experiences should accommodate a wide range of individual preferences and abilities.





- **Simple and Intuitive Use:** The design should be easy to understand, regardless of the user's experience, knowledge, or concentration level.
- **Perceptible Information:** The design should communicate necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities.
- **Tolerance for Error:** The VR environment should minimize hazards and the adverse consequences of accidental or unintended actions.

## Implementing Inclusive VR in Education

To effectively implement inclusive VR in educational settings, several key steps must be taken:

- **Developing Inclusive Content:** Content developers must prioritize inclusivity from the start. This involves working with educators, students, and accessibility experts to understand the diverse needs of learners and designing VR content that meets these needs. Inclusive content development might include providing alternative interaction methods, ensuring compatibility with assistive technologies, and creating adaptable learning scenarios.
- **Teacher Training:** Educators play a crucial role in the successful integration of VR into the classroom. Comprehensive teacher training programs are essential to equip educators with the skills and knowledge to use VR technology effectively. This training should cover not only the technical aspects of VR but also the principles of inclusive design and strategies for adapting VR content to meet the needs of all students.
- **Technological Infrastructure:** Schools and educational institutions must invest in the necessary technological infrastructure to support VR. This includes high-quality VR headsets, powerful computers or VR consoles, and reliable internet connectivity. Additionally, schools must ensure that they have the technical support needed to maintain and troubleshoot VR equipment.
- **Policy and Funding:** Support from educational policymakers and funding bodies is crucial to facilitate the large-scale adoption of inclusive VR. Policies should promote the integration of VR into the curriculum and provide funding for the necessary technology, training, and content development. Public and private partnerships can also play a role in funding and supporting inclusive VR initiatives in education.

## Challenges and Considerations

While inclusive VR holds great promise for education, several challenges need to be addressed:

### 1. Cost and Accessibility

The high cost of VR equipment and software can be a barrier. Ensuring equitable access to VR technology is crucial for inclusive education (Merchant et al., 2014). Schools must find ways to secure funding and resources to provide all students with access to VR, regardless of their socio-economic background.





## 2. Technical Issues

VR systems require robust technical infrastructure and support. Schools must invest in reliable hardware, software, and maintenance to ensure smooth operation (Fernandez, 2017). Additionally, ongoing technical support is necessary to address any issues that may arise and ensure that VR technology remains functional and up-to-date.

## 3. Teacher Training

Educators need proper training to effectively integrate VR into their teaching practices. Professional development programs are essential to equip teachers with the skills and knowledge to use VR technology effectively (Dede, 2009). This training should also include strategies for using VR to support inclusive education and meet the needs of diverse learners.

## 4. Health Concerns

Prolonged use of VR can cause motion sickness, eye strain, and other health issues. Establishing guidelines for safe and healthy use of VR in educational settings is important. Schools should implement policies that limit VR usage to safe durations and provide breaks to prevent discomfort or health issues among students.

## 5. Future Directions

The future of immersive VR in education is bright, with continued advancements in technology and an increasing focus on inclusivity. Future directions in this field may include:

## 6. Enhanced Personalization

As AI and machine learning technologies advance, VR systems will become even more adept at personalizing learning experiences. These systems can adapt to the individual needs, preferences, and learning styles of each student, providing a truly customized educational experience.

## 7. Broader Accessibility

Ongoing efforts to reduce the cost of VR technology and develop more affordable solutions will make VR more accessible to a wider range of students. Additionally, advancements in assistive technologies will further enhance the inclusivity of VR experiences, ensuring that all students can benefit from this innovative learning tool.

## 8. Collaborative Learning

VR has the potential to facilitate collaborative learning experiences, allowing students to work together in virtual environments regardless of their physical location. This can promote social interaction and teamwork skills, as well as provide opportunities for cross-cultural exchange and collaboration.





## 9. Integration with Other Technologies

The integration of VR with other emerging technologies, such as augmented reality (AR), artificial intelligence (AI), and the Internet of Things (IoT), will further expand the possibilities for immersive and inclusive education. These technologies can work together to create rich, interactive, and adaptive learning environments that meet the diverse needs of all students.

### Summary

Immersive VR represents a transformative approach to education, offering engaging, experiential, and personalized learning experiences. By adopting inclusive design principles, VR can create accessible and effective learning environments for all students, including those with SEN. The AVATAR SEN project exemplifies how VR can be tailored to meet diverse educational needs, enhancing learning outcomes and fostering inclusivity. As research and technology continue to evolve, immersive VR is poised to play a crucial role in shaping the future of inclusive education, providing students with unique and impactful learning experiences.





## Conclusion

This guide, prepared under the auspices of the AvatarSEN project, aims to provide a comprehensive and in-depth exploration of leveraging avatar-based interventions to enhance reading comprehension for students with special educational needs (SEN). By synthesizing a wide array of research, practical strategies, and case studies, this guide equips educators, policymakers, and parents with the tools and knowledge necessary to effectively implement these innovative interventions.

**Chapter 1** laid the groundwork by introducing the concept of avatar-based interventions within special education. The vital importance of reading comprehension for SEN students was underscored, and the guide's purpose and scope were outlined, establishing a clear framework for the detailed discussions that followed. This chapter set the stage for understanding how avatar technology can address the unique learning challenges faced by SEN students.

In **Chapter 2**, the multifaceted nature of reading comprehension challenges specific to SEN students was explored. This chapter provided a thorough examination of the cognitive, linguistic, and sensory impairments that impact reading comprehension. Understanding these challenges is crucial for developing more targeted and effective intervention strategies to support SEN students in their reading development.

**Chapter 3** offered a detailed overview of avatar technology, elucidating the nature of avatars and their role in educational settings. Different types of avatars used in special education and their potential benefits were discussed, such as enhancing student engagement, offering personalized learning experiences, and providing immediate feedback. This chapter highlighted the transformative potential of avatars in addressing the educational needs of SEN students.

**Chapter 4** analyzed the common challenges associated with implementing avatar-based interventions. Key obstacles were identified and discussed, including technological infrastructure disparities, the need for educator training, cost and resource constraints, cultural and linguistic adaptation challenges, ethical and privacy concerns, and the risk of sensory overload. Addressing these challenges is crucial for the successful and sustainable integration of avatar technology in educational settings.

In **Chapter 5**, best practices for implementing avatar-based interventions were presented. Actionable strategies were offered, such as personalized avatar customization, interactive learning design, immediate feedback mechanisms, and collaborative learning environments. Additionally, examples of successful practices from partner countries and Europe were provided, offering evidence-based insights and recommendations for integrating avatars into teaching methods.







**Chapter 6** focused on practical advice for educators utilizing avatar technology. Strategies for lesson planning, classroom management, and personalized learning approaches with avatars were discussed. This chapter also emphasized the importance of educator training and capacity building, ensuring that teachers possess the necessary skills and knowledge to effectively use avatar technology in their instructional practices.

**Chapter 7** provided guidelines for policymakers aimed at supporting the adoption of avatar technology in special education. The importance of investing in customizable avatar platforms, ensuring accessibility and universal design, fostering collaboration among stakeholders, and addressing ethical considerations were emphasized. These guidelines are intended to facilitate the systemic and responsible use of avatar technology, promoting digital citizenship and empowering students to navigate the digital world effectively.

**Chapter 8** highlighted the critical role of parental engagement and support in avatar-based learning. Strategies for empowering parents to support their children's learning using avatars were discussed, and the importance of effective communication between educators and parents was emphasized. Parental involvement is key to creating a supportive learning environment and maximizing the educational benefits of avatar-based interventions.

Finally, **Chapter 9** explored future directions and emerging trends in avatar technology. Potential advancements, such as immersive virtual reality experiences, were discussed, and the importance of longitudinal studies to assess the efficacy of avatar-based interventions was emphasized. This chapter also highlighted the adoption of inclusive design approaches, ensuring that avatar-based tools continue to evolve and meet the diverse needs of SEN students.

In conclusion, this guide, developed under WP2 of AvatarSEN project, has provided a thorough and comprehensive examination of avatar-based interventions for reading comprehension in SEN education. By offering in-depth knowledge, practical strategies, and evidence-based recommendations, the guide aims to empower educators, policymakers, and parents to effectively leverage avatar technology. The ultimate goal is to enhance reading comprehension and overall educational outcomes for SEN students, creating supportive, engaging, and inclusive learning environments. As the future unfolds, continued innovation, research, and collaboration will be essential in harnessing the full potential of avatar technology to transform special education and improve the lives of SEN students.





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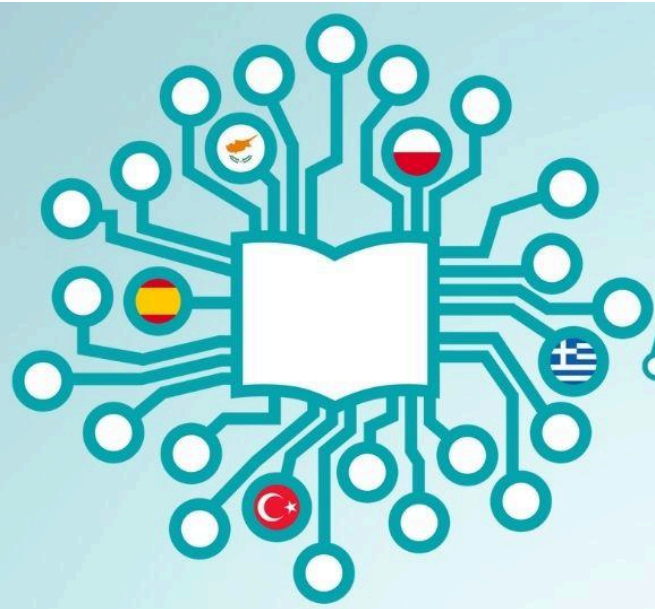
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# Avatar SEN

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