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The learning disabled students and incorporating the virtual museum: Analysis study

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Abstract

Students with learning disabilities are different from other students. Their rational, behavioral and physical features differ from their classmates. Therefore, the education and other extracurricular activities should be planned according to their capabilities and empower them to interact with their healthy classmates. With the advancement of science and technology, there has been a rapid increase in the development of techniques and strategies for students with learning disabilities. The study focuses on the concept that virtual applications can act as learning agents for learning disabled students.The present study has analyzed to date pieces of literature that have employed the virtual environment for learning disable students. This study has explored different educational difficulties of learning disabled students and analyze the literature incorporating the virtual museum to cope with their disabilities. This study used a retrospective approach to explore different learning disabilities. Consequently, the application of advanced information technology techniques such as virtual environment or virtual museums to educate learning disabled students immensely impacts the interaction of disabled students with healthy students in a positive way. Based on this search's findings, it is clear that the use of virtual environments as a virtual museum for students with learning disabilities shows promise.Furthermore, virtual technology offers a healthy and fun atmosphere for students with learning disabilities to learn social skills such as mutual contact.

Keywords: learning disabilities, virtual museum, advanced information technology, educational difficulties, computer simulations

INTRODUCTION

Learning disabilities have been discovered for approximately 100 years. LD is predominantly a condition in which academic achievement deficits are highlighted and a major problem (Shapiro & Gallico, 1993). The National Joint Committee on Learning Disabilities, established in 1986, attempted to explain certain aspects of the previous definition of learning disabilities(Hammill et al., 1987). They describe learning disabilities as "a

generalized term that states to a heterogeneous group of disorders manifested as significant difficulties in acquiring and using listening, speaking, reading, writing, reasoning, or mathematical abilities." These diseases are selective in nature and are thought to be caused by a central nervous system's malfunction. A learning disability may occur in combination with other disabling conditions (e.g., sensory impairment, mental retardation, social and emotional disturbance) or environmental factors (e.g., cultural differences or insufficient/inappropriate instruction). Still, it is not the product of those conditions or influences". This concept highlights the diversity of learning disabilities, recognizes that they can occur at any age, and recognizes that they can coexist with other developmental disabilities and cultural disadvantages. Learning disabilities may be a problem with one feature of learning, but they are more likely to affect many areas of operation and, in some cases, become global.According to federal regulations, basic reading skills, reading comprehension, oral speech, listening comprehension, written expression, mathematical estimation, and mathematical reasoning are the seven areas in which a child can demonstrate learning difficulties. The most common of these conditions is dyslexia or reading deficiency.Those with a language disability, those with a spatial disorder, those with memory and attention deficits, and those with motor deficits may all be classified as learning disabilities involving written speech linked with linguistic dysfunction (Sandler et al., 1992; Linda Daniela, 2020; Enríquez et al., 2019).

Students with learning disabilities are different from other students. Their rational, behavioral and physical features differ from their classmates. Therefore, the education and other extracurricular activities should be planned according to their capabilities and empower them to interact with their healthy classmates. With the advancement of science and technology, there has been a rapid increase in the development of techniques and strategies for students with learning disabilities. Initially, the graphic organizers or visual displays have been designed to simplify the teaching and learning of learning disabled children. This method uses lines, arrows, and 3-D arrangements that efficiently describe the text content and structure of the text to help children with learning disabilities (Darch & Eaves, 1986). A new technique, called virtual museums, has a collection of digitally recorded images, sound files, text documents, and various other scientific, historical, and cultural data that can be approached through electronic media. Virtual museums have become an important aspect of learning; they are a powerful tool for studying and researching a particular subject. Learning disabilities restrict students' movement, virtual museums offering them to experience different learning perspectives that were previously unfeasible.

PROBLEM STATEMENT

The virtual museum helps people with learning disabilities experience things they could only imagine before by exploring a virtual environment at wishes and without restrictions. This paper will explore the educational difficulties of learning disabled

students and incorporatingthe virtual museum to cope with their disabilities.

MAIN OBJECTIVE

This analysis was driven by the following question: What is the current state of longitudinal research on the use of virtual environments as social ability treatments for students with learning disabilities?

LITERATURE REVIEW

Learning disability is a condition in which a person's general mental skills, such as critical thought, problem-solving, planning, intellectual thinking, academic learning, and learning from own and others' experiences, are impaired. This condition also results in the person's inability to adapt to other people and the person's inability to be self-sufficient and capable. It may also cause issues in everyday life areas, such as social interactions and academic and professional success. Learningdisability occurs in infancy or at birth; learning disability is not a disorder in itself, but it could be the consequence of a disease in some situations(Foloştină et al., 2014;Cheng, 2017)

The physical and psychological attributes of students with learning disabilities show that certain architectural approaches must be considered before and during the classroom space design(Hardiman et al., 2009; Trollor et al., 2016; Watanabe & Kenjo, 2015). Furniture design in a U-shape, changing areas, foldable seats, ceiling height, soft music, architectural insulation, ventilation, natural lighting, colors, and sunspace are all examples (Szekeres, 2011).However, primary school classrooms built for students with learning disabilities seldom reach these architectural standards. This group of students requires a unique classroom that meets clear architectural criteria and specifications (Martí-Agustí et al., 2019), such as color, fabrics, furniture, lighting, ventilation, and architectural insulation based on the physical and psychological characteristics of their bodies and minds.

Many design flaws exist in today's typical primary school classrooms, such as the normal arrangement of furniture for healthy students (which causes disabled students to become bored and depressed) and the use of awkward materials without protection for the edges of furniture or seats, particularly the constituents of the floors. Many classrooms have plain tiles and no other fabrics or carpets, which is incompatible with disabled students' bodies(Wu et al., 2020).

Other than classroom architecture, the education system is also a major concern for learning disabled students. The traditionalteaching method is not suitable for students with any learning disability, as they cannot read from usual books. Over the last decade, science education has shifted from traditional textbooks and toward a constructivist inquiry-based approach(Scruggs et al., 1993).Students formulate their questions, make observations, and conduct inquiries as part of inquiry-based instruction to better understand science's creative thinking(Maroney et al., 2003). Amid the shift in educational practices, explanatory science texts continue to provide much of the material (i.e., textbooks, research materials, and websites).

When it comes to reading, students with learning disabilities often struggle with

fluency, decoding, and word recognition. Students' ability to comprehend text is hampered due to these issues (Jenkins et al., 2003; Petersen-Brown & Burns, 2011). Students with learning disabilities often lack prior awareness essential to comprehending higher-level concepts (Dexter & Hughes, 2011; Snider, 1989).Prior knowledge is crucial because to retain and generalize information; students must make logical associations between the text and their prior knowledge (Snider, 1989). Furthermore, students with LD often struggle to keep track of their understanding when reading. Students struggle to draw inferences(Baumann, 1984; Dexter & Hughes, 2011; Snider, 1989), identify key concepts, and explain information from the text when they read texts without sufficient prior knowledge and fail to use meta-cognitive techniques during reading (Kim et al., 2004; Osuna et al., 2019). Students with learning disabilities can struggle to comprehend and understand the material if they do not use effective enhancements and strategies during reading(Bos & Filip, 1984; Wong, 1994).

Different virtual applications enable access to information, learning, and travel to places a learning disabled student wouldn't be able to visit otherwise (Kapp, 2107).Virtual applications have become more convenient, appealing, and interactive and include an avatar feature directly connected to body parts, allowing for a better understanding of the reality seen (Linda Daniela & Aierken, 2020; Lombardo, et al., 2019). The user can communicate with virtual environmentsobjects, create their understanding, promote their imagination, and develop innovations. The graphical design, artifact aesthetics, information architecture, interoperability, and the possibility of using the established technological solutions in an educational setting are all examined. The study focuses on the concept that virtual environments can act as learning agents for learning disabled students but must be tested to be fully used in the educational setting.

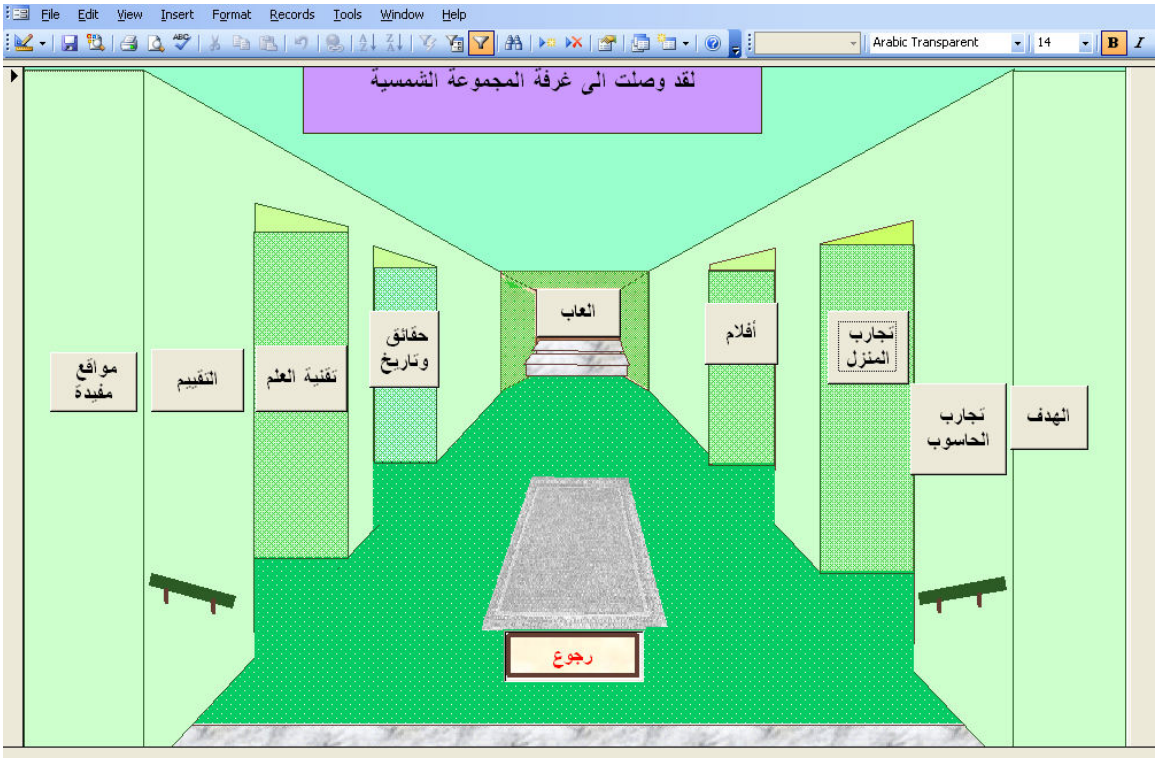

Fig 1. Solar system's virtual room as an example

VIRTUAL MUSEUMS AS LEARNING AGENTS

Virtual museums can be used as a medium for learning through entertainment, where learning takes place by critical reflection, collaboration with virtual agents (Lepouras et al., 2004), or contact with a humanlike and capable of interacting virtual narrator. The use of multiple narrators is suggested to give the learning disabled student a sense of presence (Ioannides et al., 2017), where artifacts (smart objects), which are theoretically simple implantedstructures with sensors, actuators, and networking competencies(Kopetz, 1997), can be interacted with. The use of technical solutions as learning agents helps students with learning disabilities interpret, assimilate, contextualize, and synthesize their information, resulting in new levels of thought and positively affecting such students' learning motivation by gaining a deeper understanding of relevant knowledge (L Daniela & Strods, 2018). In this manner, virtual museums are seen as learning agents that promote situational learning (Lave & Wenger, 1991) or authentic mobile learning (Burden & Kearney, 2016) by providing access to knowledge concentrated in museums and restricted artifacts within them. Individuals can link to this information using their mobile devices, allowing learning to be coordinated in a particular environment and under certain conditions that could not be accessible without the use of virtual applications.

METHODOLOGY

This study used a descriptive qualitative method that explores different learning disabilities and the use of advanced information technology techniques such as virtual environment or virtual museums to educate learning disabled students so that they can interact with healthy students.From 2009 to 2013, a systematic analysis of the literature was performed through four major library databases over 5 years. Ebscohost (ERIC), PsycInfo, Education Full Text, and Web of Science/Knowledge were the four databases chosen for the study. Three critical elements had to be present in the papers to be included in this analysis. The papers were first data-driven, with quantitative or mixed designs. Essays, reviews of literature, rebuttals, and editorials were not included. Second, each study had to include students with disabilities in grades K-12. Third, papers must include a virtual environment variable in their analysis. We read each article and extracted relevant details from the methodology section, such as participant demographics, study environment, empirical research style, and impairment diagnosis.

This article discusses the technology-based advancements in the learning procedure of students with learning disabilities, and the author divided it into five parts. Part I: Introduction; Part II: Literature review, Part III: Virtual museums as learning agents;Part IV; Methodology, Part V; Results and discussions including three main types of learning disabilities; Part V: is a conclusion and suggestion that provides a mechanism that allows future research and encourages more participation in the field of information and communication technology use specifically for the students with certain learning disabilities.

RESULTS AND DISCUSSION

A total of 19 observational studies involving K-12 students with learning disabilities whose eligibility status was assessed by IEP criteria were presented. When the 19 papers were broken down by disability category, 14 articles concentrated on autism, 1 on ADHD, and 4 on intellectual or developmental disabilities. The students in the studies ranged in age from 5 to 18, with 11-14 years old being the most common. The studies' sample sizes ranged from three to 56 people. (For demographics, see Table 1.) Eight studies used a multiple baseline single-subject design (3 to 4 participants). The four largest trials involved 36-79 participants in different treatment settings in randomized group design experiments. Virtual environments, computer-based video instruction, CVLE, simulation training, 3D emotion system, animated television series, avatars, electronic screen media, and mobile cognitive support application are some of the virtual environments styles that can be further described.Emotion recognition, emotional competence, practical and social life skills, and executive functioning were among the social skills interventions. (For a list of technology forms, see Table 2.) Based on this search's findings, it is clear that, although restricted, research into the use of virtual environments as a social skills intervention and virtual museum for students with learning disabilities shows promise(Aguayo et al., 2020; Papaefthymiou et al., 2017).The research mainly focused on

using virtual environments to teach emotion recognition and social competence, which makes sense considering the key deficits that students with learning disabilities face. Furthermore, virtual technology offers a healthy and fun atmosphere for students with learning disabilities to learn social skills such as mutual contact. (For a list of social intervention forms, see Table 3.).

Table 1. (Vasquez et al., 2015)

Learning disabilities categories		
Disability type	**Number of studies**	**Percentage (%)**
Autism spectrum disorder (LEARNING DISABILITIES)	14	74
Attention deficit hyperactivity disorder (ADHD)	1	5
Intellectual disability	4	21
Total	19	>100.0

Table 2. (Vasquez et al., 2015)

Virtual Environment (VE) Technology Types		
Technology type	**Number of studies**	**Percentage(%)**
Virtual environments	5	26
Computer-based video instruction	4	22
Simulation training	1	5
3D emotion system	1	5
A collaborative virtual learning environment	4	22
Animated television series	1	5
Avatars	1	5
Electronic screen media	1	5
Mobile cognitive support application	1	5
Total	19	>100.0

Table 3. (Vasquez et al., 2015)

Social Skills Intervention Types		
Intervention type	**Number of studies**	**Percentage(%)**
Functional and social life skills	4	22
Social competence	5	26
Emotion recognition	8	42
Executive functioning	2	10
Total	19	>100.0

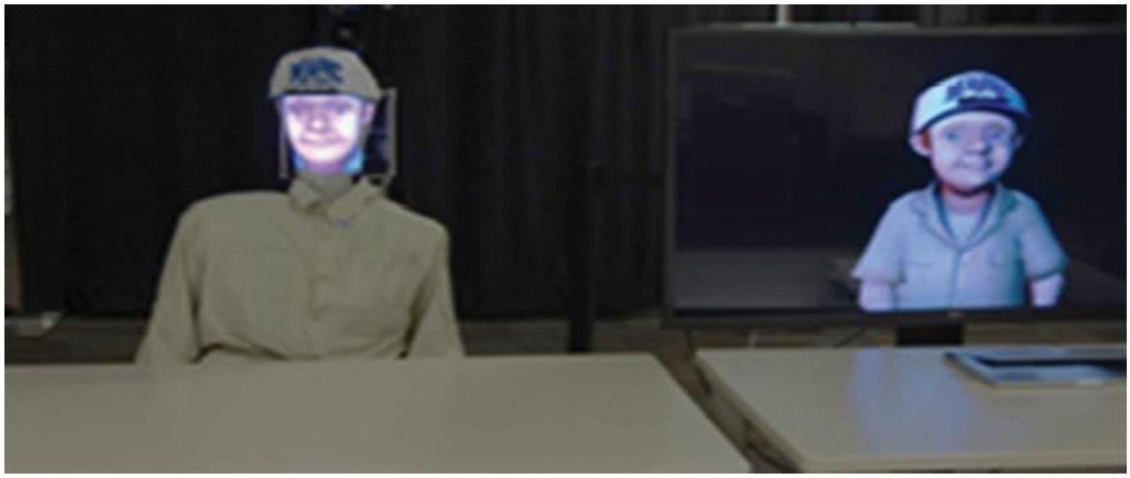

Fig 2. Different manifestations of the same virtual character (digital avatar) were used during a formative study. Left: Robotic manifestation referred to as a Physical-Virtual Avatar. Right: 3D Virtual Avatar displayed on a large 2D Flat Screen. (Vasquez et al., 2015)

In both conditions, preliminary results of the interaction data showed an improvement in reciprocal responses and response length for nearly all subjects (i.e., interaction with the 2D Flat Screen Avatar as well as the Physical-Virtual Avatar).Although the research isn't definitive, it does show that students with LEARNING DISABILITIES tend to communicate with avatars in virtual worlds rather than conventional social human interaction.This is in line with other research in the field, which has shown that these students favor technology, and these results provide a base for more research into the importance of virtual environments. According to preliminary results, students with autism strengthened their ability to differentiate between different emotions (Hughes, 2014; Sirakaya & Cakmak, 2018). (A screenshot of the game is shown in Figure 2.)

CONCLUSION

While virtual environments such as virtual museums and computer simulations are still

new and evolving technologies, they have the potential to provide significant educational benefits. Supporting the education of learning disabled students and its efforts to build more versatile and broadly available curricula is one of their greatest fields of promise.Virtual environments and computer simulations, for sure, are mutually supportive emerging technologies.Instead of being 'just one more thing, they're a great factor for other kinds of education reform. This system allows different educational change approaches, especially for learning disabilities, to be more realistic by integrating new learning insights and technical applications.Virtual environments and computer simulations will be a worthy focus of interest for academics, teachers, and all educational change supporters as they continue to develop and the related research base expands.

Simulations are now standard professional training methods in industry, medicine, engineering schools, and the military.Simulations can be used in education to provide authentic personalized learning platforms customized to meet the specific needs of each user; however, a persistent weakness noted in many of the studies above and the current professional literature is the inability of participants with learning disabilities to generalize skills learned in virtual environments (VEs) to real-life social circumstances in K-12 settings.More research is needed, whether it's replications or large-scale experimental designs, to identify techniques for promoting educational institutes' generalized ability and to establish the use of virtual environments as an evidence-based practice.In order to take advantage of emerging technologies as they evolve, researchers should also study technical advances occurring in the education sector outside of virtual learning environment.

Since virtual environments like virtual museums and computer simulations are so different from what is currently available in the classrooms of learning disabled students, integrating them into the classroom would significantly enhance teachers' ability to provide a range of content and resources. These resources can be highly entertaining for students because they are non-print, interactive, multisensory, 3-dimensional, and in some cases, hands-on. Virtual museums could offer students vibrant, multisensory models, and it is relatively simple to provide students with a wide selection of such models. A student learning to give an oral presentation, for example, might go to a virtual world full of scientists, businessmen, writers, and politicians and listen to some or all of them give a presentation.

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