Research Article

A STUDY BASED ON THE IMPACT OF VR AND AR TECHNOLOGIES IN DIGITAL MEDIA ART ON SPECIAL LEARNING DISABILITY CHILDREN'S EDUCATION

[1,2]Jun Dong and [1,*]Kamal Sabran

[1]School of Arts, University Sains Malaysia, Penang, Malaysia
[2]Animation and Digital Art Institute, Communication University of China, Nanjing, China

Abstract

VR and AR are based on the Internet. At present, the technology is very mature. The emergence of VR and AR has greatly enriched the art form of digital media and had a positive impact on children's education. In particular, it has important implications for the education of children with special learning disabilities. This paper will analyze the characteristics of digital media art under VR and AR technology to analyze the impact of VR and AR technology on the education of children with special learning disabilities. The first part of the paper discusses the characteristics of VR and AR technology in the digital art virtual space. The second part reviews the influence of VR and AR technology on the education of children with special handicaps, mainly from sld, adhd and asd. Finally, the impact of digital media art on children's healthcare experiences, supported by VR and AR technologies, is discussed and summarized. This study aims to provide a comprehensive and systematic reference for future VR and AR-based digital media art for children's education and health research.

Keywords: VR and AR technology, Special learning disabilities, Children's education, Digital media art.

INTRODUCTION

The full name of a special learning disability is Special Learning Disabilities, which is caused by an abnormality in the development of the brain. The central disorder, caused by a disorder of the central nervous system, causes school-age children to be unable to recognize and remember individual words automatically and fluently. It is a "hidden disorder" with no apparent features. It has nothing to do with intelligence, and children with special learning disabilities have absolutely normal or above average intelligence. Studies have suggested that most children with special learning disabilities cannot be treated directly with medication because it is not a "disease" per se, but rather a "disorder" or even a "defect" (Charleen Dere-Meyer, Brooke Bender, Einat Metzl, Kathryn Diaz, 2021). The situation would be improved if children with special learning disabilities were identified early and trained in effective interventions (e.g. visuospatial awareness training, artistic skills training, learning skills training, counselling sessions, speech interventions, etc.) and assistance. Typically, children with ADHD, ASD and other predispositions have special learning disabilities. A study of interventions in children with autism showed that participants improved their targeted behavior from baseline to intervention after intervention. This suggests that the system may provide an effective learning environment for promoting social understanding and skills in children with autism. In addition, a vr device with a headset was used in the study to intervene with ASD children to improve social understanding and skills in three ASD children. The study tested a system based on an immersive virtual environment. Targeted behaviors of nonverbal communication, social initiation and social cognition for each participant were also investigated, as well as

the future impact of the use of immersive digital devices on this population (Yufang Cheng, Cheng-Li Huang, and Chung-Sung Yang, 2015). Technological advances can lead to new and potentially more effective treatment strategies and improve the quality of life for asd patients and their families (Brown *et al.,* 1999). Virtual environments (VEs), a form of computer-based learning centered on visual representation, offer unique advantages for teaching abstract concepts. For example, a similar study theorized that the use of AR technology can increase frustration tolerance in children with ADHD. On the plus side, the study found a significant increase in children's resistance to setbacks when implementing ar-based interventions. This experimental study explored the use of AR technology to increase frustration tolerance in ADHD learners (children). Researchers used a learning app designed using augmented reality (AR) technology to assign activity tasks to children with ADHD. The UI interface design in digital media art was used to determine that ADHD participants were more resistant to setbacks in AR environments than groups without AR technology (Arnel *et al.,* 2018). Headgear vr and ar devices have the advantage of being small, expanding the user's field of vision and being light weight. And can form an interactive space, for example, using computer software to design a digital art APP, and establish a virtual cinema, analog campus environment, social environment. Therefore, future vr and ar technologies could help children maintain their level of attention, which is common in most children with special impairments. Therefore, it is advisable and advantageous to design a digital art APP based on vr and ar technology.

Background

The educational impact of digital media art on children with special disabilities based on VR and AR

"Special learning disabilities" include dyslexia, dyslexia, speech communication, nonverbal learning, visual perception,

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*Corresponding Author: *Kamal Sabran*
School of Arts, University Sains Malaysia, Penang, Malaysia.

mobility and other disorders. Reading, writing and mathematical computing skills will be hampered, as will the development of advanced skills such as organization, time management, executive ability, abstract thinking and reasoning, and memory and attention. Research from the Harvard Child Development Center shows that children and teens can acquire these specific abilities through nurture because they are not all innate. Special learning disabilities tend to occur in children with ADHD and asd, ADHD, whose full name is Attention Deficit Disorder (ADD). ADHD is short for ADHD, commonly known as "child hyperactivity disorder," and is often associated with a higher incidence of psychobehavioral problems in school-age children. It is mainly a dynamic and basic cognitive process, including impulsivity and difficulty in adapting to society. Autism Spectrum Disorder (ASD) is a widespread developmental disorder often referred to as autism. The World Health Organization estimates the global prevalence of autism at 62 per 10,000 (0.62 per cent), or one in 160 children. Studies from around the world suggest the true prevalence of autism may be higher. According to the CDC's Autism and Developmental Disorders Surveillance (ADDM), one in 59 children is autistic. The study found that 1-2 percent of Asians have autism, and that number is rising. And because many developing countries lack census data, only children with severe symptoms can be diagnosed, leaving many children with mild problems undiagnosed. The analysis showed that medication alone can only temporarily control ADHD and does not improve the ability of such children to cope. Combined with the extreme strain on medical resources in the context of the global novel coronavirus pandemic, the recovery situation for children with special impairments is challenging. For all of these reasons, this is where rehabilitative health care and intervention education come into play. Intervention takes the form of digital media art, a new art form based on digital technology and modern media technology that combines rational thinking in science with emotional thinking in art. Digital media art is based on technologies such as vr, ar, mobile app development, computer software development, virtual cinema and multimedia design. For example, we could group school-age children, use these interventions in education and rehabilitation care, and choose a time period in which one group would receive the rehabilitation training mentioned above, and the other group would not, and then collect test data from both groups. By comparing and analyzing the pre-and post-intervention data between the rehabilitation group and the non-intervention group, the results can provide a better reference for improving the recovery effect of sick children. Taken together, the study is worth pursuing.

Digital Media Arts Education Based on VR and AR Technology and Its Effectiveness

It is necessary to understand the role of digital media art and to use its vr and ar technology rationally to improve the learning and social environment of children with special disabilities. A comfortable learning environment can improve the learning initiative of children with special disabilities, and a good social life environment can reduce their discomfort. Studies have shown that ADHD participants' frustration tolerance in AR settings is measured higher than in groups without AR technology (Arnel *et al.,* 2018). Some studies have shown that gaming has both recreational and therapeutic benefits. A study has come up with a way to design serious games that use augmented reality (AR) to improve attention in school children

with attention deficit hyperactivity disorder (ADHD). Based on the art level of serious play, using the analysis of intrinsic motivation and cognitive behavioral interventions of emerging technologies and learning styles, the approach allows students to interact with digital virtual information embedded in real environments. This will eventually result in an augmented reality (AR) serious game, which can be seen as an intervention strategy for therapeutic alternatives, offering hedonistic play that positively impacts children's attention and willpower, and therefore stimulates their learning processes, social interaction, and pushes them to expand their critical thinking in this educational environment. In addition, it has been shown to be one of the most effective methods of rehabilitation in terms of daily life skills (Diego Fernando Avila Pesantez, Luis A Rivera, 2016), and most games have a music-art element, even in dementia and Parkinson's patients, to improve their cognitive ability and resilience, ease their mood and improve depression (Khanetal, 2016).

METHODOLOGY

The study selected literature covering the period from 1995 to 2022. The first task is to identify search terms. Digital media art is an emerging art form that combines art and technology. Its application forms mainly use digital technology or digital media to create visual art or design works, such as digital video and digital film, display art design, and so on. Its expressive methods extend to a wider range, including ar technology interactive devices, vr technology multimedia devices, web video games, cartoon animation, digital photography and more (Yang Shuwen, 2020). What distinguishes it from other art forms is that its form or creative process must be based on digital technology. For example, the vr, ar technique, which is the focus of this paper, is a clear proof. Next we found that the main target groups affecting the recovery experience included children, their parents and school staff. Therefore, iterative search keywords include artistic intervention; Digital media art; AR and VR technology; 3D virtual technology; Art Creation Psychology; Children with ADHD; Autism (ASD); special learning disabilities (SLD); Special education; Rehabilitation health care;Family environment; School environment; Medication; Environmental awareness; interpersonal relationships. The databases used include Elsevier, PubMed, WOS, Springer open, Scopus, Google Academies, China Cnki, and more. In general, the advanced search function is used to enter keyword search results. In order to improve the quality and novelty of the literature and data obtained, this study used the period 1995-2022 as a scope for literature search. Once the overall retrieval scheme is established, and in the principle of searching for high-quality literature for reading, the layers of selected literature titles and abstracts are read one by one to determine whether any of the papers meet the relevant screening criteria. After that, we will read the methods of each article, the participants, the experimental testing process and the analysis and discussion of the results. Finally, the selected results are classified and summarized, and corresponding data analysis tables are drawn up.

RESULTS OF ANALYSIS

Special learning disability propensity

Digital media art, as a non-pharmaceutical intervention, can reduce the level of disturbance in real social environment and

improve the rehabilitation environment of children with special handicaps. One study investigated the effectiveness of a 3D social understanding system with a headset display. They designed and tested a computational software system based on an immersive virtual environment. And in the system was designed a personalised role to match children with special disabilities, designed by Digital Art 3d. Non-verbal communication, social activities and social cognition of each participant were also studied, as well as the impact of the use of immersive digital devices on this particular group of children with disabilities. They conducted a preliminary empirical study of three children with special impairments, which showed that children with special impairments experienced improvements in various behaviors after using the software system. This suggests that the system may provide a more effective learning environment for improving the social understanding and skills of children with special disabilities (Yufang Cheng, Cheng-Li Huang, and Chung-Sung Yang, 2015). Researcher Mansi Vora at RIT's School of Imaging Arts and Sciences has created a new way of learning about the project. The new method will help students focus and also help them understand math concepts. The project uses computer software and aims to meet the needs of children with mathematical learning disabilities. Activate a new way of learning while enjoying the game. The study focused on mathematical information provided through digital animation games. The format is scalable, allowing children to practice more (Mansi Vora, 2012).

A research team of four teachers and six students collected data using a Design Watch, Student Watch and Standard Reference Assessment Tool. The results show that AR technology is appropriate for use in education, helping children with special impairments develop and empowering them with authentic experiences. They also found that students showed a higher level of desire and anticipation for the course when they were tested. In fact, they observed that these children were more active in courses under this type of AR technology, their interest in these subjects, which are highly associated with AR technology, increased, and they became more active and more likely to answer questions correctly. Based on the results of this study, it is possible to recommend the use of this developed AR-based digital media artist-designed environment in all aspects of capacity development in children with special learning disabilities (Recep Cakir, Ozgen Korkmaz, 2018). Currently, a number of studies are using digital media art systems, of which (VR) technology has been applied to some groups of people with special needs, mostly children with special impairments. However, it also has limitations, namely appropriate human resources (educators using the technology) and high equipment costs. On the other hand, (AR) technology is constantly evolving and gaining popularity due to its augmented reality features.

However, most studies involving ar and ar technology have focused on physical therapy for patients. Therefore, a study proposes an AR framework with playful features to aid learning in children with special impairments in the form of computer games. Finally, the study describes how teachers, with the help of the framework, can guide concepts and improve cognitive skills in children with special disabilities (Rogério Colpani, Murillo Rodrigo Petrucelli Homem, 2015). Dyslexia is a special learning disorder in children and is actually a complex psycho-cerebral syndrome that affects children in various ways, including verbal and non-verbal communication, social interaction, speech comprehension, reading, writing, learning, etc. AR technology is a digital media technology that places 3d virtual objects in real time. In one study, an inspirational model of digital media learning was combined with ar technology to treat a specific learning disability called dyslexia. Using digital media applications based on interactive ar technology to provide appropriate educational approaches for these special children, this study establishes a unique new dimension to help these children overcome their deficiencies in a very interesting and simple way. The study included the design of a learning framework for an interactive ar-based digital media application that will focus on and enable children affected by specific learning disabilities to interact with the framework with a view to improving their dyslexia, among others (Zeeshan Bhatti *et al.*, 2020).

ADHD tendencies in children

AR and VR technology in the digital media art system is also effective in improving children's adhd. The prevalence of Attention Deficit Hyperactivity Disorder (ADHD) in children has become a global social problem today, echoing traditional physiotherapy methods that are virtually ineffective. A study presented the concept of interaction from the perspective of art therapy, combined with past pathologic clinical experience in children with ADHD, focusing on the basic requirements, design process, and implementation of immersive AR animation therapy, providing a rationale for interdisciplinary research between the field of digital media art and ADHD therapy (Yunpeng Tang, 2021). Low frustration tolerance in special learning disabilities is a hallmark of children with special learning disabilities, which can hinder a person's ability to achieve a goal. Studies have shown that this blockage occurs mostly in children with (ADHD). An experimental study tested the use of (AR) technology to improve frustration tolerance in children with ADHD. The study assigned learning tasks to children with ADHD using a learning app with AR features. They analyzed measurements of frustration tolerance in children with ADHD in AR settings. In addition, they recorded the time participants spent in each activity in different environments and analyzed and compared them. They found that the use of AR technology can increase frustration tolerance in children with ADHD. In contrast, the researchers found no significant change in frustration tolerance data in settings where ar-based techniques were not implemented (Arnel B. Okay, Reynold A. Rustia, Thelma D. Palaoag, 2018). An experiment has been conducted to see if ar technology has an impact on word recognition learning. The study developed an interactive ar video for word learning. Using a mobile phone's camera, connect it to a real-life view and place a 3d virtual object in a real-life scene through the camera.

The study involved two fifth-graders with predispositions for attention deficit hyperactivity disorder (ADHD) and dyslexia. The study used experimental subgroups in the ABA 'model, with A representing the baseline group, B representing the intervention group, and A' representing the maintenance intervention group. Over nearly three months, the results showed two children with predispositions such as ADHD and dyslexia had significantly higher scores during the intervention. And there was still a significant improvement during the intervention maintenance period (Chien-Yu Lin, Wen-Jeng Yu, Wei-Jie Chen, Chun-Wei Huang and Chien-Chi, 2016).

Table 1. Review of studies that improve Special learning disability

Year	Course No.	Participants No.	Man days	% of variation between the year		
				Course No.	Participants No.	Man days
2012	01	1	30	01	1	30
2015	01	3	180	01	3	180
2018	01	6	180	01	6	180
2018	01	3	28	01	3	28
2019	01	66	180	02	66	180

Table 2. Review of studies that improve ADHD tendencies in children

Year	Course No.	Participants No.	Man days	% of variation between the year		
				Course No.	Participants No.	Man days
2016	02	2	90	02	2	90
2019	01	1	30	01	1	30

Table 3. Review of studies that improve ASD tendencies in children

Year	Course No.	Participants No.	Man days	% of variation between the year		
				Course No.	Participants No.	Man days
2016	01	3	63	01	3	63
2018	01	5	180	01	1	180
2020	01	10000	180	01	62	180
2020	01	10000	180	01	169	180

ASD tendencies in children

The use of virtual reality (VR) technology in the education of autistic children has reached scale and has been a focus of research for more than two decades. Some researchers believe this form of technology could provide real "real world" training in social and life skills in a safe, controlled and repeatable virtual environment. Real "real world" settings are provided in a safe, controlled and repeatable virtual environment for social and life skills training. The development of low-cost VR headsets, such as Google Cardboard and Oculus Rift, has revived interest in their use in a wide range of applications, including education for people with autism (Ryan Bradley and Nigel Newbutt, 2018). A lot of research is talking about these issues. One study, for example, looked at how AR technology taught continuous tasks to three primary-age students with (ASD) tendencies. AR technology integrates digital media information into the real world. Using an AR-based digital cue sign, the study designed a digital video model of students brushing their teeth and triggered playback. It successfully guided all students to learn how to brush their teeth alone, and the children were able to retain this skill nine weeks after the AR intervention. The study discusses the link between technology theory and teachers in the context of using new technologies to educate ASD children (David F. Cihak, Eric J. Moore, Rachel E. Wright, Don D. McMahon, Melinda M. Gibbons, and Cate Smith, 2016). Researchers at the University of Florida investigated the impact of VR video feedback on social communication in five students with autism and social impairment. The researchers recruited two children of the same age without disabilities as social partners for asd children and formed five three-person groups with each asd child. Experiments were conducted twice a week, including 10 minutes of vr visual stimulation and social interaction, and personal feedback and self-assessments. The results showed that the target's social communication skills improved when the intervention was implemented. One participant's performance in class improved. In addition, the data showed that children were more motivated to interact. These findings support the proposed use of vr-based visual cue instruction in digital media art to guide language development in asd children (Kathy *et al.,* 2018).

DISCUSSION

As we can see above, vr and ar technologies and the art of digital media have been shown to improve the condition of children with special learning disabilities, children with ADHD, children with autism, and improve their physical and mental health in various intervention settings. In terms of children's association with symptoms, there are certainly more children with mild symptoms in real life than children with moderate to severe symptoms, because in most developing countries, lack of census data directly results in a lack of attention for children with mild symptoms. Worryingly, under the current novel coronavirus pandemic, individual countries have stricter home isolation policies. In most countries, educational institutions and schools have moved to online instruction for academic subjects, leaving families without contact with the outside world and exacerbating learning difficulties for their children. Extreme events due to educational problems occur frequently in Asian countries, including mainland China, Japan, South Korea and others. Therefore, it is urgent to carry out regular physical and mental health tests for school-age children, while all aspects of school, family, community and society should work together to form a diverse education system and intervene in education in a timely manner. As a non-mainstream approach to education, vr and ar technologies and digital media art may be successful in improving children's ability to learn and their physical and mental health. Nevertheless, some relevant studies indicate that there is a wide range of views on which types of education are appropriate for interventions for children with special disabilities. However, this does not contradict the findings of the universal study, and some studies and experiments are mostly case studies or small sample studies, and it is clear that larger samples are slightly less than systematic studies. At the same time, children with special handicaps should be treated with caution when choosing means and methods of education. Painting, calligraphy, clay sculptures, and even photographic photography are all ways to achieve successful education, in addition to the AR technology headset 3D interactive device, vr technology 3D virtual design, and visual media design software covered in this article. Vr and ar technology is also currently considered unsuitable as a form of education. Some

interviewees believe that headset 3D interactive devices and computer games based on digital media art are distracting children from their learning progress, and that there are still gaps and controversies in practice due to the relatively high cost of use, lack of popularity, and the number of distractions associated with prolonged play.

Conclusion

The purpose of this study was to describe educational methods for children with special disabilities, to summarize and analyse the impact of relevant intervention experiences, and to investigate the implications of using vr and ar technologies and digital media art as educational tools. Most studies show that a range of vr and ar technologies and digital media art interventions have a positive impact on children's ability to learn. The impact of the school environment, teacher groups and interpersonal relationships on children with special disabilities must be properly considered in the implementation of interventions. According to the review of research and literature, sound educational methods and interventions, healthy learning environments, excellent teacher groups and good interpersonal relationships may help children with special impairments to improve their abilities in many ways, reduce their psychological stress and reduce their learning difficulties. This is important because of the interaction between different forms of technological innovation and the full range of digital media art interventions in education. In addition, the theoretical research experience is not enough to influence all kinds of children with disabilities compared to the practical research, so we still have a long way to go in the theoretical research and practice of intervening in education.

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