



Using Visual Techniques to Develop Learning Skills in Autistic Students in Abu-Dhabi Autism Center during COVID-19

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ABSTRACT

ASD is a complex condition that affects individuals in different ways. Some people with ASD may have mild symptoms, while others may have more severe symptoms. ASD is characterized by a range of challenges, including communication difficulties, social interaction problems, and repetitive behaviors. In the context of education, students with ASD may face challenges such as paying attention in class, understanding complex concepts, and completing assignments. These challenges can make it difficult for students with ASD to succeed in school. While there is no cure for ASD, there are a variety of treatments that can help people manage their symptoms and improve their quality of life. These treatments may include behavioral therapy, speech therapy, and occupational therapy. With the right support, people with ASD can live fulfilling and productive lives. However, specialists maintain that individuals can optimize their study efficiency by successfully managing the disorder and improving their capacity for learning. This article will examine visual study methods and tools, such as the Internet of Things (IoT) and augmented reality models, that can enhance cognitive ability. 15 participants with autism spectrum disorder (ASD) from 5 schools in Abu Dhabi were selected for this study. The cognitive abilities of these

students using various mobile applications for teaching, such as educational games and memory-enhancing activities were observed, and the details about the use of these applications is elaborated in the article below.

Keywords: autism spectrum disorder, Abu-Dhabi, IOT, learning ability, cognition, virtual reality.

INTRODUCTION

The Centers for Disease Control and Prevention (CDC) and the Autism and Developmental Disabilities Monitoring (ADDM) network reported that globally there are currently 1 in 59 children diagnosed with autism every year. With 21.6 instances per 10,000 people recorded in the United States and 18.75 cases per 10,000 people in Europe, it is believed that the incidence of autism varies with life expectancy rate and quality of life (Mostafa 2020). According to Abduelkarem et al. (2019), the male-to-female ratio in ASD occurrence also ranged from 1.33:1 to 16:1.1 as well. Numerous investigations carried out with the same goal have revealed widespread prejudice and misunderstandings about children with autism spectrum disorder (ASD). However, there is not enough research on general attitudes, knowledge, and awareness in Abu Dhabi and Sharjah, United Arab Emirates (Alremeithi et al., 2021).

Since teachers play a critical role in educating children and their families about autism, the goal of these studies was to evaluate research on knowledge, teacher attitudes, and autism awareness. A better environment may be created for autistic children to be independent and communicate normally in all areas of life by identifying and addressing teachers' inadequacies, as well as those of parents and institutions. It has been recommended by Sharaan et al. (2021) that since there are fewer people with developmental disorders than there are people with intellectual disabilities such as autism, educational institutes need to improve the educational program in the UAE's elementary and secondary schools by employing various virtual learning platforms to increase the adequacy level of people.

The concept of sensory processing refers to how the human nervous system reacts to incoming sensory stimuli and subsequently manifests behavioral responses. Alremeithi et al. (2021) conducted a study to obtain a more comprehensive and nuanced comprehension of how an environment contributes to atypical alterations. It was highlighted by Khowaja et al. (2020), a different study conducted in 2014, in which the researchers explicitly examined the impact of visual disparities on atypical sensory processing in ASD children. The findings revealed that children diagnosed with autism spectrum disorder (ASD) undergo visual alterations that are linked to non-perceptual social stimuli. Children with autism spectrum disorder (ASD) exhibit a heightened response to environmental stimuli, which may manifest as increased anxiety and hypersensitivity to visual stimuli. The act of entering a particular space or location they begin to visually scan the place and discover the visual stimuli present in the place. Recent research has revealed that people who have been diagnosed with autism

spectrum disorder (ASD) encounter challenges when it comes to effectively regulating their sensory processing to prioritize various stimuli present in their surroundings. Additionally, this phenomenon poses challenges in maintaining attention on a single stimulus. One approach involves the utilization of visual approaches. Conceptual representations, known as visualizations, are utilized to convey and articulate ideas or concepts in either two or three dimensions. Various visual aids, such as pictures, symbols (depicting black and white drawings), photographs, or gestures, are utilized with the intention of augmenting comprehension of the spoken expressions that transmit a certain idea. The utilization of the visual system has the potential to augment children's comprehension of environmental interactions.

BACKGROUND

Videos, animations, and graphics are among the most widely used visual learning techniques in Abu Dhabi's elementary and pre-school education institutions in the post-COVID-19 era. They are helpful tools for immersing children with learning difficulties, especially those with autism. On the other hand, the amount of motivational effects on individual cognitive ability varies from child to child. Children with autism spectrum disorder fall into three kinds of behavior, according to Mentel and Bujniewicz (2020): mixed, hypoactive, and hyperactive patterns. For a hypoactive person to remain calm and concentrated, they require frequent sensory input. Low sensory input is essential to keep an overactive schema calm and focused, yet high or low mixed sensory input may be necessary to appropriately reflect the complexity of the subject matter being covered in class (Khowaja et al., 2020).

Visual learning can be a beneficial instructional approach for students diagnosed with autism spectrum disorders, particularly those who exhibit abnormal verbal abilities (hypoactive behavior). Consequently, these individuals tend to exhibit a preference for simpler language patterns. Visual learning is a pedagogical approach that employs visual aids, including drawings, diagrams, and films, as a means of imparting information. Visual learning has been proven to be highly beneficial for children who have challenges with academic language proficiency. This approach considers the visual capabilities of autistic pupils and has the potential to enhance their educational experience as well as their proficiency in academic language, thereby facilitating more efficient and effective learning. Children with autism who exhibit hypoactive behavior therefore require motivated learning approaches that are novel and show a tendency to engage individuals for longer durations.

METHODOLOGY

We have established a study to evaluate video platforms in Abu Dhabi autism centers. Considering the research design, first of all, we utilized different information portals to evaluate the most suitable video learning approach for ASD and chose mobile application platforms. Our research design is based on experimental design, as we

selected 15 individuals and experimented through video platforms to monitor their cognitive responses in terms of academics. In this section, we outlined the objectives of the evaluation participant profiles, the research methodology and data analysis, as well as the evaluation outcomes. A total of 15 children from the Abu-Dhabi special school were chosen to participate in the evaluation. There were eight boys and seven girls among them. Their ages ranged from 4 to 9 years old, with an average age of roughly 5 years. Screening was done during the selection process to make sure that no one was familiar with the subjects or terminology (e.g., COVID-19 safety, field safety measures, etc.). None of the participants had any prior experience using mobile learning applications incorporated with IoT mechanisms.

RESEARCH PROCEDURE

Repondents evaluated the instrument over the course of three consecutive sessions spread across four days in order to truly grasp the evaluation data. For each of the three sessions, performance statistics were recorded. The participants in the evaluation study, including the students and their teachers, were given a brief explanation of the study's goals on the first day. They were then given the chance to use the proposed system for around 15 minutes after the presentation of the approach. Finally, it was time for the activity-based educational video to begin.

The first video's opening was regarding safety precautions for COVID-19, such as hand washing and the symbol of COVID-19. We questioned students about hand washing, masks, 6-foot distance, video timing, and overall concept understanding. Test sessions were videotaped and audiotaped for the purpose of data gathering, and the recorded videos were meticulously examined to code or compile the data for performance analysis. In this instance, descriptive statistics were used to gather and analyze quantitative (objective) data.

On the final day, three teachers were asked to provide their opinions on the platform's usability and effectiveness, as well as how the technology affected students' learning. Additionally, the teachers were requested to provide more ideas on how to make this topic better. The researcher transcribed the audio files for qualitative data analysis.

DATA ANALYSIS AND RESULTS

To assess user performance, responses were evaluated. Two factors were examined in order to gauge the performance: the videos' efficacy and efficiency. Al-Wakeel et al. (2015) show that by effectively accomplishing particular tasks with the least amount of effort, efficiency can be quantified. In this study, we used two variables—success and number of attempts (the total number of attempts in each game)—to assess the tool's efficacy. These videos' success rates were determined independently. The participants discovered that they had to use their memories to accurately recall each step in the hand washing bag.

As previously indicated, all of the data was gathered over several sessions spaced four days apart. According to the recorded data, the average success rate for the videos in the first, second, and third sessions shows that children are more engaged and responded more actively. As a result, more videos were (some in-game format) played successfully in each game in the following encounters. All replayed movies were examined, and it was discovered that performance improved hand-washing period initiative able gradually with each session. Performance improved by 0.43 from first to second and by 0.09 from second to third. The films also demonstrated a noticeable improvement in outcomes.

FINDINGS AND DISCUSSION

The findings of this study support the objective of visual strategy significance in that teaching hand washing practices and other precautionary measures to an autistic student through video modeling was successful. However, teachers find it challenging to operate a visual learning system with any form of new computational technique due to its low adequacy.

As respondents already watched videos numerous times after 3 days, without watching the films, the participants could complete every step of the hand washing process. Furthermore, it was observed that participants were already practicing 6 feet of distance after watching the videos once. This suggests that the efficiency and efficacy of video modeling approaches affect the learning capabilities of autistic individuals. Another scholar, Khowaja et al. (2020), who also conducted the same experiment, found out that all participants learned COVID-19 precautionary approaches in a short period of time, indicating that employing video models on portable devices is a successful method of instructing students. Our findings also corroborate those of a study by Mentel and Bujnowicz (2020), in which students modified a commercial video model to demonstrate various cognitive abilities. In that regard, it can be verified by the responses that videos based on IoT and AR mechanisms are effective measures to increase individual comprehension.

The study by Banire et al. (2015) suggests that autistic students frequently respond favorably to visual signals that speed up brain processing, like images or films. The patient can understand the topic with a more practical prism when visual techniques are implemented due to its straightforward user interface. The implementation of video techniques in schools is to offer a user interface for learning math, building computer abilities, and building reading skills using audible sounds and word pairings, as well as visual cues to match the sounds. Novel innovative methods help in learning for autistic children and foster growth. Moreover, video modeling approaches offered by IOT, VR, and AI modify lessons to be easy and enjoyable for autistic children, and children are likely to pass an exam more quickly in comparison to traditional methods.

However, it has been found through the experiment that every individual's observing capacity is different. Some students were taking initiatives only after first

viweing, and there were also a few students who found it difficult to maintain a 6-foot distance or wearing masks. In that context, it could be assumed that video modeling might be the most resilient approach at the moment for enhancing cognitive ability. But the fact cannot be avoided that video modeling is only beneficial for every student in the Dubai Autism Center when teachers are also trained to help students memorize the video actions.

A learning environment that sparks interest in developmental work must always be established for an autistic child to prosper in terms of conduct and education. With touchscreen phones, this make it simpler for kids to interact with the device constantly, and the range of adaptable stands makes each interface more appealing and user-friendly. Using postcards with words on them is the fundamental teaching strategy that can be incorporated into the mobile application. Most autistic children benefit from developing abilities through a strong visual memory. Simple educational tools like films or DVDs can be used to determine a child's perception and cognition. Moreover, the listening approach, in which kids connect the sounds with a picture of a cherished animal, can be employed as a learning activity. This might be useful in establishing a daily routine for the child that directs and follows the parent's plan because people with autism tend to remember pictures and words better than words alone (Al-Wakeel et al., 2015).

CONCLUSION

The analysis of the data revealed that when the video method of learning is incorporated into autistic students in Abu-Dhabi schools, learning is prioritized more. Based on the experimental assessment and study findings, a considerable number of the students were more engaged and learned new topics with higher accuracy through understanding the rationale behind the activity. The outcomes also validated the title, which is whether AR and IoT-based video mechanisms should be incorporated in autistic Abu Dhabi centers or not. Therefore, by giving autistic children more effective (presentational) images and stimulating (decorative) effects that balance and enhance their non-standard sensory responses, the proposed framework is more effective than the traditional framework for extending the learning time of autistic children.

RECOMMENDATIONS

Since there is currently little research on how to increase the effectiveness of future visualization methods and future visualization models for increasing cognitive ability in the learning domain, we recommend that more institutions take part in these types of experimental studies. Moreover, we also recommend incorporating special education courses offered by regular teachers in schools. It is also important to provide teachers in Abu Dhabi and the UAE with the necessary training to alter present practices to achieve the goals of inclusive education. Future studies should use early diagnosis tool for autism spectrum disorder since it can be more effective, which was

not utilized in this research due to limited budget and time constraints. These teachers also need to pass the exam for an autistic spectrum diagnosis to receive a credential.

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AUTHOR(S) CONTRIBUTION

Ibrahim Hassan Alzoubi: Conceptualization, data collection, analysis, writing of the original draft.

Sarifah Nurhanum Syed Sahuri: Supervision, methodology review, manuscript editing.

Hayati Ismail: Validation, review and editing, academic guidance.

All authors read and approved the final manuscript.

CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest regarding the publication of this paper

ETHICS STATEMENT

This study was conducted in accordance with ethical principles for educational research.

Participation was voluntary, and informed consent was obtained from parents/guardians and the participating institutions where applicable. The confidentiality and anonymity of participants were maintained throughout the study.

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