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Virtual Classrooms: An Inclusive Approach to Educate the Children with Autism

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ABSTRACT

ASD children often struggle with social interactions, leading to difficulties in interpersonal relationships and academic achievements. Inclusive education is crucial for their success, providing them with the environment they need while giving non-ASD children an equal chance. Virtual classrooms, utilizing technology like Zoom and Microsoft Teams, facilitate meaningful interactions and convenient learning processes, offering flexibility and reducing power disturbances. Teacher training and support are essential for the success of virtual learning. This article examines the impact of virtual classrooms on inclusive education for autistic learners, comparing their interaction and academic achievement in virtual settings to regular classrooms. The study uses a phenomenology design to analyze the experiences of primary school students with disabilities in virtual education post-COVID-19. Virtual classrooms are suitable for accommodating individual needs, increasing accessibility, and providing a secure environment. However, cost and accessibility remain major obstacles for families. The consequences of virtual learning on children with autonomy and responsible technology use remain unanswered. The article suggests that improving the accessibility and inclusivity of virtual classrooms could significantly enhance their efficacy. Advancements in technology and educational regulations have made virtual classrooms beneficial for children with Autism Spectrum Disorder (ASD). They cater to individual needs, increase accessibility, and provide a secure environment. However, challenges remain, and AI technologies could improve inclusive education.

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1. Introduction

ASD (Autism spectrum disorder) is a complex neuro-developmental disorder that significantly impacts social interactions and behavioral changes in children (Lord et al., 2018). The symptom presentations and intensity of ASD vary, necessitating individualized education methodologies for ASD children. Children with ASD often exhibit problems in social interactions and communication, leading to difficulties in interpersonal relationships and social interactions (Woodbury-Smith & Dein, 2014). They also display stereotypes or restricted behaviors, which can provide comfort but may hinder learning and social interaction (Rice et al., 2012).

Children with ASD display a wide range of symptoms, from difficulty in expressing themselves to fluency in reading and calculation, but difficulty understanding social cues. This variability highlights the need for targeted educational techniques that cater to the individual student's learning disability. Supportive learning environments are crucial for ASD children to thrive (Woodbury-Smith & Scherer, 2018).

In typical classroom environments, children with ASD face challenges related to their nervous system sensitivity, such as the inability to tolerate bright light, noisy environments, or large groups. Even general interactions can cause distress, as they struggle to comprehend social signals and participate in group studies. These challenges can result in isolation, frustration and negate academic achievements (Boyd & Shaw, 2010; Soto-Chodiman et al., 2012).

The lack of inclusion for children with Autism in the classroom is a significant concern. Inclusive education allows ASD children to be placed in the class with other typically developing children and participate in relevant learning activities. This helps eliminate stigma and

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ensures that all students learn from the discriminated group. Inclusive education benefits children with ASD by providing them with the environment they need to thrive while also giving children without ASD an equal chance to succeed (Kumar & Shahi, 2013; Parsons, 2014).

Virtual classrooms are teaching and learning environments that utilize technology to facilitate meaningful interactions and convenient learning processes (Maanvizhi et al., 2020). These environments are particularly beneficial for children with Autism, as they provide a rich and flexible learning environment that can be adapted to their needs. Key elements of virtual classrooms include video-conferencing applications like Zoom and Microsoft Teams, as well as activities like quizzes, polls, and discussion forums. These tools enable synchronous interaction, allowing students to learn in their preferred locations (Kumar & Shahi, 2013).

Virtual classrooms offer several advantages, including flexibility, enabling differentiation of learners, and reducing power disturbances like noise and light. This partial openness is particularly beneficial for children with Autism, who may struggle in a standard classroom environment. Virtual classrooms also allow for the differentiation of learners, allowing them to work at their own pace and style. In conclusion, virtual classrooms provide a rich and flexible learning environment that caters to the unique needs of children with Autism. Virtual classrooms can provide students with a more inclusive and effective learning experience by utilizing tools like Microsoft Teams and other online platforms.

Regular classes can be challenging for students with Autism Spectrum Disorder (ASD), leading to challenges in learning and interaction. To enhance teaching, virtual classrooms must be designed with the right environment and support (Soto-Chodiman et al., 2012). This includes choosing the right technology, creating an environment that supports it, and ensuring teachers are ready to work with it. Technological requirements include computers or tablets with cameras and microphones, access to authentic video conferencing software, stable internet access, and digital learning tools with interactive features. Designing autism-friendly virtual classrooms involves minimizing sensory overload for the learner, implementing specific working procedures, and utilizing visuals to help manage the environment (Woodbury-Smith & Dein, 2014).

Teacher training and support are crucial for the success of virtual classrooms. Teachers must undergo programs that ensure they know how to use the tools and technologies involved, such as technology tools, moderate classroom interactions, and modify lessons for synchronous teaching. Training should also cover methods of working with children using Autism techniques to manage them. Professional development and proper support are critical to ensure teachers maintain up-to-date information and knowledge about technology and teaching children with ASD. Supporting teachers with a network can also improve their teaching practices and achieve positive learning outcomes among all learners (Parsons, 2014).

Interaction is a critical component in the learning process for children with ASD, and virtual environments can be beneficial in facilitating their academic performance. To measure engagement, consider various forms of engagement, such as participation, attentiveness, and interactions during teaching (Woodbury-Smith & Dein, 2014). Technologies like check-in registers, participation sheets, and attention-monitoring software can be employed to gauge participation rates. Case studies and examples show practical approaches to interactions in virtual classrooms, particularly for children with ASD. For instance, some virtual learning programs have adopted learning through a game-playing system, including visual prompting aids. When implementing virtual learning, particularly for ASD children, teaching aids such as quizzes, games, and visual narratives can help enhance participation. Regular breaks, sensory content, and instructions, along with additional encouragement and positive feedback, also increase students' engagement (Sait et al., 2019; Seo et al., 2019).

Academic performance disparities exist between virtual and traditional classrooms, especially for children with ASD. Research and evidence support that virtual classrooms can be beneficial when providing a customized learning environment and adequate encouragement. However, the success of these environments depends on the quality of instructional design, integration of technologies, and access to personal assistance (Self et al., 2007). Case studies demonstrate the viability of virtual learning for children with ASD in achieving academic milestones, supporting differentiated learning, and the type of assistive technology that should be incorporated in the classroom based on the child's learning profile. Specific techniques such as adaptive learning platforms and individual lessons have promoted achievement, demonstrating how learning in virtual environments meets the learning styles of these children (Self et al., 2007; Seo et al., 2019).

Factors influencing academic performance in virtual classrooms include individual instruction, parental engagement, and adjusting virtual classes to avoid discomfort for other children. ASD-taught children face challenges in regular classrooms due to overwhelming stimuli and anxiety. To enhance their learning experience, virtual classrooms have emerged as a suitable model for delivering education(Seo et al., 2019). These classrooms offer a less restrictive and more customized education program, with options like custom graphical designs, limited distractions, and time

control. Web technologies have made virtual classes more real and authentic, making them more accessible to autistic learners (Sait et al., 2019).

This article explores the impact of virtual classrooms on delivering inclusive education to autistic learners, comparing the achievable interaction and academic achievement of children with ASD taught in virtual settings to those in regular classroom settings. The advantages and disadvantages of virtual education are also discussed, offering recommendations for educators, parents, and policymakers.

2. Literature review

Autism spectrum disorder (ASD) is a complex developmental disability characterized by persistent impairments in social communication and interactions, restricted behavior, and repetitive patterns of interest. The Diagnostic and Statistical Manual of Mental Disorders (DSM) and the International Classification of Diseases (ICD) are used to diagnose ASD, with the latter being updated to facilitate diagnosis. ASD cases have increased worldwide due to risk factors such as genetic predisposition, adverse environmental conditions, and gynecological interventions. The World Health Organization's ICD-11 guidelines, set to be implemented in January 2022, have attracted global attention and are part of a larger effort to understand and treat ASD (Joon et al., 2021).

A study examines the association between neighborhood disadvantage and the diagnosis of Autism Spectrum Disorder (ASD) in children from Kaiser Permanente Southern California (KPSC). The research found that children from disadvantaged neighborhoods had a higher likelihood of ASD diagnosis, particularly those from minoritized racial and ethnic groups. There was an interaction between maternal race and ethnicity and neighborhood disadvantage, with an increase in ASD diagnosis among children of White mothers. Maternal education and child sex did not significantly modify the neighborhood-ASD association. The study highlights the need for further research to understand the mechanisms behind neighborhood-related disparities in ASD diagnosis and to provide resources for early intervention and family support in communities with a higher likelihood of ASD (Yu et al., 2024).

Another study aimed to understand the impact of a physical education Service-Learning (SL) program on children with Autism Spectrum Disorder (ASD) and their families. The program involved Physical Education Teacher Education (PETE) students and 25 children with ASD. The qualitative approach involved group interviews and reflective journals, while the quasi-experimental design involved 25 children with ASD. Results showed significant improvements in moderate physical activity, manual dexterity, and balance variables from the MABC-2 test. The SL program was beneficial for all parties involved and successfully achieved the objectives established. However, further research is needed to guide future proposals. The service-learning program was beneficial for all parties involved, enhancing the physical activity levels and motor skills of children with ASD (Chiva-Bartoll et al., 2021).

A study compares two teaching methodologies: semi-guided tours in immersive virtual reality and viewing video renderings of 3D environments. The effectiveness of virtual reality for teaching is assessed through historical knowledge and urban layout questions. The understanding of undergraduate students is evaluated through questionnaires after viewing sessions. Video screenings received higher scores for historical ideas, while the virtual tour was the most effective method. Two user movements for controlling the virtual reality environment were tested: gamepad locomotion and room-scale movements combined with teleporting. The virtual tour was found to be more effective in acquiring spatial location of singular buildings, despite the lack of motion sickness effects (Checa & Bustillo, 2020).

Technology plays a fundamental role in the development of daily life activities, particularly in educational fields. Emerging technologies, particularly virtual reality (VR), are increasingly being implemented in classrooms to cater to the learning and cognitive preferences of autistic students. This systematic review aimed to analyze the application of VR in teaching and learning environments for autistic students from 1996 to 2021. The results showed that research primarily focused on emotional recognition and social skills development. Interactive and realistic activities within VR environments improved the acceptance of this tool for this specific population. Overall, VR plays a fundamental role in the development of autistic students' learning and development (Lorenzo et al., 2023).

The Covid-19 pandemic has highlighted the need for online learning for students with Autism Spectrum Disorder and Intellectual Disability (ASD and ID). To effectively utilize distance learning platforms and resources, teachers can teach students to use technological devices for virtual instruction without adult support. By using visual task analysis, least-to-most prompting, and reinforcement, teachers can facilitate skills needed for accessing evidence-based practices and meeting diverse learning goals. This approach helps students with ASD and ID to effectively utilize online content and resources (Cottrell et al., 2024).

The literature explains what ASD is and the disadvantages and problems due to ASD. Virtual learning and the advantages of VR are also discussed. The advantage of VR for ASD students is also mentioned. The current article explores the impact of virtual education on inclusive education for autistic learners, comparing the academic achievement of

children with ASD taught in virtual settings to those in regular classrooms, and offering recommendations for educators, parents, and policymakers.

3. Methods and methodology

The study utilizes the phenomenology design, a qualitative research approach, to analyze the experiences of primary school students with disabilities in virtual education activities post-COVID-19. The design aimed to understand how individuals perceive and explain phenomena, providing in-depth knowledge about their experiences and problem-solving strategies. The phenomenology design allowed for a comprehensive understanding of the students' perspectives and solutions.

The research involved 10 general education primary school teachers, selected through a purposeful sampling technique. Participants had to have at least one student with officially diagnosed disabilities in their class and voluntary participation. The researchers assigned each participant a code name T1, and information about them is provided in Table 1. The study aimed to understand the experiences of teachers with students with disabilities in their respective regions.

Table 1. Subject information for the research.

Teacher No	Teacher gender	Grade Level	Student Gender	Type of disability
T 1	Male	3	Male	Physical disability
T 2	Male	2	Female	Language and Learning impairment
T 3	Female	2	Female	Learning disability
T 4	Male	3	Male	Mild intellectual disability
T 5	Female	4	Male	Language impairment
T 6	Female	4	Female	Mild intellectual disability
T 7	Female	3	Female	Physical disability
T 8	Male	3	Male	Physical disability
T 9	Male	2	Female	Language and Learning impairment
T 10	Female	3	Male	Learning disability

This research utilized a semi-structured interview technique to gather data from participants, revealing their perspectives, experiences, and perceptions. The researchers planned the interview day and time and determined the data collection setting, which was in the meeting rooms of the schools where they worked. The interviews took between 28 and 35 minutes, were conducted in person, and the data was recorded using an audio recorder. The researchers obtained the necessary permissions for the research, ensuring that the data was collected with the knowledge of the participants. This method allowed for instant diversification and detailed data collection. The study aimed to provide a comprehensive understanding of the participants' perspectives and experiences.

The research involved content analysis, deciphering audio recordings, organizing data, checking transcript reliability, coding data, determining themes, and organizing codes and themes. In-vivo techniques were used to create codes, which were then used to form main and sub-themes in the context of interview questions. Four experts from the special education field provided opinions during the interview question development process. To ensure reliability, at least 30% of audio recordings were controlled by a researcher, resulting in 98% transcription reliability data. The inter-coder reliability data was also analyzed by one researcher and 30% by another, resulting in 90.17% inter-coder reliability data for the study. The study's reliability was further confirmed through the analysis of transcripts and intercoder reliability data.

4. Results and discussions

The research analyzed the conduct of virtual education activities by primary school teachers, student participation, inclusion and follow-up processes, homework monitoring, teacher-parent cooperation, and solution suggestions. Three main themes (Fig.1 to Fig. 3) and 15 sub-themes were identified, focusing on the process of incorporating students, monitoring their activities and homework, and fostering cooperation between teachers and parents.

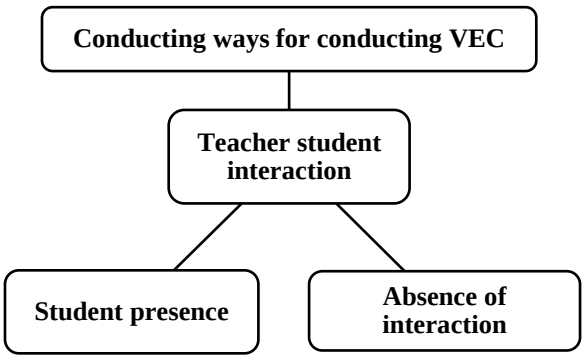

Fig. 1. Conducting Ways for Virtual Education Course (theme 1).

Teachers initially communicated with parents about the process and provided guidance through phone calls, teaching courses over EBA and Zoom platforms, and asking for their support. They also tried different applications to teach courses, such as opening a Zoom broadcast for five days, providing virtual course activities for students with disabilities, and offering virtual support training. Teachers also sent course activities through different platforms like WhatsApp, asking families to send videos to receive feedback on their teaching methods. They also used different education sites to reflect their teaching methods. In-person training was divided into two groups, with one group receiving in-person training for two days, and the other group receiving virtual learning. This practice allowed for a more flexible approach to teaching and support for students with and without disabilities.

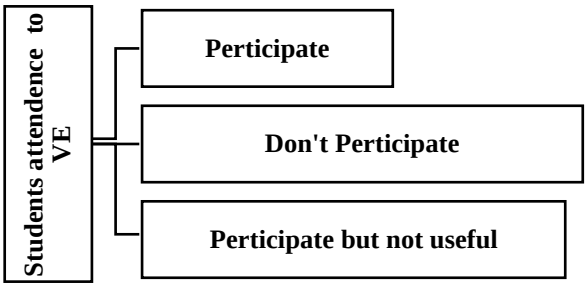

Fig. 2. Student Attendance to Virtual Courses (theme 2).

Teachers' opinions on the participation status of students with disabilities in virtual courses vary shown in Fig. 2. The majority of teachers reported that their students with disabilities participated in virtual classes at a high rate, with codes of "high participation rate, ability to participate in independent lessons, regular attendance" being reached. However, some teachers reported that students with disabilities could not attend classes at all, due to factors such as illiteracy, phone and internet problems, and family illiteracy. Some students attended only the basic courses, while others attended classes on Zoom due to their own difficulties.

Reasons for not participating in virtual classes include giving importance to education received in the rehabilitation center, internet connection/hardware problems, family not following the student, attending only the basic courses, and the illiteracy of the family. For example, a student who could attend special education in a rehabilitation center did not believe in the benefits of virtual education. Despite these challenges, some students attended core courses, such as traffic, human rights, painting, body, and music.

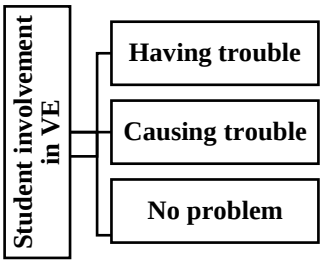

Fig. 3. Students involved in Virtual Education Course Activities (theme 3).

Fig. 3 shows that Students are involved in Virtual Education Course Activities. Teachers have different opinions on the challenges faced by students with disabilities in following virtual course activities and homework. Some students with disabilities do not want to watch EBA TV, as the interaction is low and there is less entertaining content. Teachers believe that students need more one-on-one interaction and that EBA TV has become meaningless. Causes of trouble include parents' inability to use technology, being illiterate, and facing internet connection problems. Parents struggle to print their homework and cannot support their students and teachers. In-person education is only possible during in-person periods, and students with disabilities often struggle with forgetting.

On the other hand, some teachers believe that students with disabilities do not have problems following virtual course activities and homework. They believe that homework follow-up is fully ensured, subjects are completed, and students with disabilities receive high grades in exams. However, some teachers believe that their families try to support their students and share their studies and assignments with them.

From the survey/ interview, there are some challenges for students with ASD to understand the concept of Virtual Learning. These were discussed and summarized as mentioned;

Challenges and Limitations:

Virtual classrooms provide several benefits that help to promote inclusive education. But like any other system, it has significant drawbacks that must be overcome to improve the efficiency with which virtual lessons are taught to kids with autism in particular.

- **Technological Barrier**: All families have concerns about technology access, including the price of the gadget, availability, and connectivity. Technical obstacles can be attributed to several issues in the implementation and upkeep of virtual classes. Certain tasks, including troubleshooting, cybersecurity, or other difficult software and system improvements, could occur seldom or constantly. Potential obstacles may lessen the

benefits of virtual learning, especially for students from low-income homes.

- **Research Gaps**: Comprehensive research is still desperately needed to help understand how virtual learning affects kids with ASD. The dearth of large samples, extended observation periods, and well-defined methodologies and techniques provide further challenges for modern studies. To create such a knowledge foundation and provide the empirical data required to improve virtual education for kids with ASD, these gaps must be filled.

- **Ethical Considerations**: Thus, while developing and implementing virtual learning environments, privacy, and permission become crucial, particularly when the learners are young. The programming and design of virtual classrooms must protect student data and forgo extraneous influences. It is also crucial to remember that when it comes to the use of technology in school, more serious ethical concerns like how much time children spend on their phones and their overall development should be brought up. Resolving these concerns is essential to maintaining the credibility of online learning.

Future Directions and Innovations:

Due to ongoing advancements in technology and instructional methodologies, virtual schooling for kids with autism is still relatively young and continuously growing. Opportunities to improve online education's efficacy and equitable access will arise from the growing focus on cutting-edge tools and common practices for improving remote learning.

- **Emerging Technologies:** Machine learning and artificial intelligence can be integrated into virtual classrooms, and it is anticipated that these technologies will improve learning processes for various learners in ways that specifically meet their requirements.
  To improve instruction for kids with autism, they can include elements that allow them to alter the information to be presented on their own, track performance, and even provide immediate help. Future developments that can be anticipated include virtual and augmented reality because of the development of a three-dimensional, natural learning environment.

- **Expanding Access and Inclusivity:** To make virtual classrooms more accessible to everybody, some strategies that need to be used are low-cost technological solutions and universal design principles. It is ensured that pupils are sufficiently reached when information is created in many languages and cultures. When we talk about virtual learning environments, we're talking about the features and interfaces of the technologies used in them that make it easy for students from different backgrounds to access and navigate them.

- **Collaboration and Interdisciplinary Approaches:** It is necessary to use facilitative measures, such as providing inexpensive technological support and using a universal approach to the creation of materials in multiple languages that are culturally sensitive and meet all learning needs, to make sure that virtual classrooms are more accessible to various populations. By incorporating accessibility into educational materials and technology, it is made sure that students with varying learning styles and abilities may interact with virtual classes in a way that is both strategic and comfortable for them.

5. Conclusion

The ASD is an unfortunate and lifetime disability for a child to grow up. COVID-19 has significantly impacted education, with over 1.5 billion students, millions of teachers, and education personnel affected worldwide. Measures such as quarantine and school closures have disrupted in-person education practices from preschool to higher education levels. The rapid spread of the pandemic has led to a shift towards virtual education, as access to a safe teaching process is crucial. In countries experiencing negative effects, in-person education has been suspended to reduce the spread of the virus, prompting the adoption of virtual education courses to mitigate the pandemic's impact. This shift toward virtual education is a significant step toward addressing the challenges posed by the pandemic. As a result of advancements in technology and modifications to educational regulations, virtual classrooms are now a useful tool for promoting inclusion for kids with ASD. This article examines the test results for kids with autism in traditional and virtual classes, highlighting the benefits and drawbacks of each environment. Virtual classrooms are suitable for the following reasons, according to a comparison of case studies and proven research findings: they may accommodate particular individual demands, boost accessibility, and offer a secure environment for the electronic classroom. Cost and accessibility continue to be major obstacles for a lot of families. The consequences of virtual learning on kids who have issues with autonomy and responsible technology use, on the other hand, remain unanswered research topics that must be addressed before virtual learning can be put into practice. Although there are still numerous issues with virtual classrooms and considerable work to be done, there are prospects to improve inclusive education. Even improved teaching and learning environments may be possible with AI technologies like machine learning, which are still in the early stages of development. This implies that improving the accessibility and inclusivity of virtual classrooms would greatly boost their efficacy. It will need more research, development, and collaboration with educators and allied sectors to improve the virtual

learning environment for kids with ASD. The educational systems might be deemed suitable for students if the present issues and difficulties are addressed and the novel prospects are welcomed.

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