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Virtual Teaching and Learning Platform for Caregivers of Children with Autism

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ABSTRACT

This paper aims to discuss the critical aspects and necessary elements of virtual teaching and learning (VTL) for children with autism. Given the challenges faced by parents and caregivers in supporting the education of children with autism, it becomes crucial to develop effective strategies and platforms that ensure their educational progress. While efforts have been made to provide equal educational opportunities for children with autism, there is a lack of research on digital learning specifically tailored to their needs, and limited availability of accessible learning software resources. Therefore, it is essential to conduct a review of the key features and essential components of VTL platforms that support caregivers, as well as examine the integration techniques to facilitate VTL. This study employs a literature review methodology, involving a systematic search and selection of relevant articles from academic databases, followed by an analysis and synthesis of the findings to explore the utilization of ICT technology in VTL for children with autism. In addition, this review aims to assist future researchers by presenting a proposed VTL platform, thereby contributing to the design and development of effective VTL platforms for this unique group of learners.

Keywords: autism, caregivers, VTL features, virtual teaching and learning, VTL platform

1 INTRODUCTION

The COVID-19 pandemic has disrupted education globally, resulting in a widespread shift to virtual learning. However, caregivers of children with autism face unique challenges in the virtual teaching and learning (VTL) environment. Children with autism require specialized support and structure, which can be difficult to provide virtually and may worsen their social, communication, and sensory difficulties. Caregivers are tasked with the challenging responsibility of supporting and educating their children with autism while juggling their own personal and professional obligations during the pandemic. The need for remote training options for caregivers of children with autism has become

increasingly apparent, yet there is limited research on the effectiveness of VTL platforms in this context.

The specific challenges faced by caregivers in the current VTL landscape can vary based on available resources, technical capabilities, and support systems. Caregivers often struggle to find accessible and tailored resources for children with autism, including comprehensive learning materials and specialized software platforms [1],[2]. To address these challenges, organizations and researchers are developing educational resources and online platforms that incorporate visual supports, sensory-friendly design, and individualized approaches to enhance engagement and learning outcomes. Technological obstacles, such as software navigation and hardware troubleshooting, further impede caregivers' ability to effectively utilize VTL. Providing individualized instruction and support for children with ASD becomes more complex in a virtual setting as caregivers lack direct guidance from educators and experts [3]. Therefore, conducting research on the key features of VTL platform for caregivers of children with autism is essential to meet their educational needs in a virtual environment. The findings of this research can suggest the development of effective VTL platforms that enhance the education and well-being of children with autism and their caregivers during VTL.

Research Question: What are the key features of VTL platforms in assisting children with autism?

Research Objective: To investigate and identify the key features of VTL platforms that effectively support children with autism.

2 LITERATURE REVIEW

This research paper conducted a literature review on VTL for children with autism. The review involved a systematic search using academic databases and specialized journals, employing specific criteria to select high-quality sources. The search terms used focused on ICT platforms and their effectiveness for VTL for children with autism. Inclusion criteria were applied to select articles published in peer-reviewed journals within the last 10 years. Duplicates were removed, and the remaining articles were screened based on titles and abstracts. Articles that didn't meet the inclusion criteria or were not relevant to the research topic were excluded. The selected articles were thoroughly examined and analyzed to identify common themes, important findings, and valuable insights related to the research question and objectives. The literature review encompassed both theoretical perspectives and empirical studies, providing a comprehensive understanding of the current knowledge in the field. The careful selection process aimed to include reputable sources, enhancing the validity of this research paper and forming the basis for analysis and recommendations.

2.1 Caregivers of Children with Autism

Autism, as defined by [4], encompasses a diverse range of conditions related to brain development. Individuals with Autism Spectrum Disorder (ASD) exhibit unique behaviors, interactions, communication styles, and learning patterns. Physical appearance alone may not distinguish them from others. ASD is characterized by two primary symptoms: repetitive and restrictive patterns of interests or behaviors, and persistent challenges in communication and social interaction.

Communication, imagination, and social interaction are particularly areas of difficulty for individuals with ASD [5]. Some people with ASD may be nonverbal, others may possess advanced conversational skills. Some individuals with ASD require significant support in daily activities, while others are more independent and capable of working [6],[7],[8]. The prevalence of autism in children has been steadily increasing. [9] report that ASD affects approximately one in every 100 children globally. In Malaysia, the number of diagnosed cases of ASD has been rising over the past decade, with 589 children under 18 receiving diagnoses in 2021, a 5% increase from the previous year. A Ministry of Health survey also found that one in every 625 Malay children between the ages of 18 and 26 months was identified as having ASD [6],[9],[10].

Caregivers of children with autism play a vital role in providing primary care and support for children with ASD. These caregivers can include family members, such as parents, grandparents, and siblings, as well as professionals like teachers and therapists. They have diverse responsibilities, including emotional and physical support, managing medical interventions, and advocating for their child's needs [11],[12].

2.2 Virtual Teaching and Learning

VTL have gained popularity, particularly during the COVID-19 pandemic. It involves using technology to facilitate remote education, offering flexibility and accessibility to students worldwide. However, challenges include maintaining engagement and addressing technology limitations. Students with autism may require additional support and adjustments due to their specific needs. and ICT has played a significant role in improving education for students with autism. ICT provides interactive and customizable learning experiences, offering clear boundaries, control, and attention-grabbing features. Technology enables students with special needs to access tasks that would otherwise be difficult for them [13],[14],[15],[16].

The learning process for students with autism has transitioned from non-interactive media like textbooks to more interactive digital learning experiences utilizing computers, tablets, and interactive whiteboards [15]. ICT offers numerous benefits in educating and supporting children with autism, including clear boundaries, limited stimuli, high levels of control, customization options, verbal and nonverbal possibilities, independence, and the ability to capture and maintain students' attention [16]. Technology plays a crucial role in the education of students with special needs by providing access to tasks that would otherwise be inaccessible. VTL provides the advantage of flexibility, allowing students to access educational content and participate in classes from anywhere in the world, as long as they have an internet connection. This means that individuals with disabilities who may have been unable to attend traditional face-to-face classes can still benefit from education.

2.3 Technology Used in Teaching and Learning

Technology in education can be customized to cater to the specific requirements of students, including those with ASD. ICT can be employed to develop therapeutic tools that assist individuals with ASD in various areas. Effective teaching and communication can be facilitated through online classes and interactive platforms, with recommendations provided for designing instructional materials and supporting caregivers. The utilization of virtual reality, gamification, and other software can enhance the teaching process for students with ASD. The article emphasizes the importance of employing specialized techniques and designs to maintain the focus of students with ASD during virtual learning.

Table 1: Technology Used in Teaching and Learning

Technology	Description
Web-based Applications	Software programs that operate on the internet or web browser, allowing remote access without downloads. They can be used for VTL for autism, providing structured learning environments and interactive tools. Examples include apps evaluated for quality by [17] and Suoniamo, an app for visual music learning by [18].
Mobile Apps	Mobile applications designed for individuals with ASD, available on platforms like Google Play and the App Store. They assist caregivers and children with communication, language development, and specific needs. Examples include MyTalkTools, AutisMate, Endless Reader, and Proloquo2Go. These apps can support communication, reading fluency, and participation in class discussions [19].
Virtual Reality	Technology that provides a simulated environment customized to suit the needs of individuals with ASD. VR therapy can help individuals overcome social fears through exposure to simulated social situations. It has been used in virtual learning environments to improve learning experiences, flexibility, and immersion for autistic students [20],[21],[22],[23].
Augmented Reality	Technology that overlays digital information onto the real world in real-time. AR can offer relevant and interesting experiences for autistic children and aid in English vocabulary learning (AReal-Vocab). It is suitable for supporting the development of children with special needs and providing interactive visual support in education [24],[25].
Gamification	The use of game design principles and mechanics to enhance engagement, motivation, and learning in non-game contexts. Gamification creates engaging learning environments, promotes learning, and solves problems. It has shown benefits in developing motor, behavioral, and communication skills for children with special needs, including autism [26],[27],[28],[29].

3 METHODOLOGY

This study employed a literature review methodology to investigate VTL for children with autism. The approach involved searching and selecting relevant articles from academic databases, such as Scopus, Google Scholar, and ERIC. The search strategy utilized keywords related to VTL, children with autism, and ICT platforms. Articles published in English within the last 10 years were considered.

The screening process involved assessing the relevance of articles based on their titles and abstracts. Full texts of potentially relevant articles were examined to determine their inclusion in the literature review. Key information, including main findings, methodologies, and theoretical perspectives, was

extracted from the selected articles. This data extraction process provided insight into how ICT platforms are used to support VTL for caregivers of children with autism. The findings and information were synthesized and analyzed to identify common themes and patterns, offering a comprehensive overview of the current knowledge on the use of ICT platforms in VTL for children with autism.

4 PROPOSED PLATFORM FOR VIRTUAL TEACHING AND LEARNING

There have been several research studies that have proposed solutions related to the issues discussed in the literature review. One preliminary study conducted by [2] examined the perspectives of teachers in autism centers. The study found that all participating teachers agreed that having a VTL platform would allow them to creatively develop learning modules, and parents/guardians would have faster access to autism-related information. Regarding communication, almost all teachers agreed that the VTL platform could facilitate more effective communication between teachers and parents/guardians during a pandemic. These findings strongly indicate that the implementation of a VTL platform is well-received by the participants, underscoring its significance in enhancing the virtual learning experience for children with autism.

4.1 Key Elements of VTL Platform

The design of the elements proposed for a VTL platform customized for children with ASD, as shown in Figure 1, should be carefully considered. By integrating these elements into the platform, it is expected that children with ASD will benefit from a personalized and meaningful learning experience that caters to their specific needs.

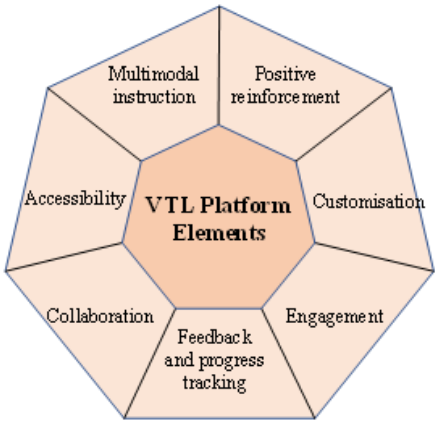

Figure 1: Key elements of VTL Platform [13]

The proposed elements of a VTL platform for children with ASD are described in Table 2. In conclusion, the design and implementation of a comprehensive VTL platform specifically tailored for children with ASD have the potential to transform their learning experience, ensuring they receive the individualized support and resources necessary for academic and social success.

Table 2: Elements of VTL platform

Elements	Description
Accessibility	The VTL platform and its tools should prioritize accessibility, ensuring that children with various abilities and disabilities can effectively utilize them. It is crucial to incorporate accessibility features like text-to-speech, closed captioning, and audio descriptions to support children with diverse needs.
Customisation	The VTL platform should offer customization options to cater to the unique needs of each child with ASD. This may involve adjusting the pace and complexity of instruction, providing visual aids, and accommodating sensory preferences.
Multimodal instruction	The VTL platform should employ multimodal instruction, utilizing various modes such as visual, auditory, and kinesthetic, to effectively address the diverse learning needs of children with ASD.
Engagement	The design of the VTL platform should prioritize actively engaging children with ASD in the learning process. Interactive and multimedia materials, including videos, games, and simulations, can be incorporated to enhance engagement and sustain attention.
Collaboration	The VTL platform should offer avenues for collaboration and communication among teachers, parents, and children with ASD. Online forums, chat rooms, and video conferencing can be utilized to facilitate collaboration and foster social interaction.
Feedback and progress tracking	The VTL platform should incorporate features that enable feedback and progress tracking. Teachers and parents should have the ability to monitor the child's progress and provide feedback to facilitate learning and development.
Positive reinforcement	The VTL platform should incorporate positive reinforcement strategies to motivate and encourage children with ASD. This can involve implementing rewards and offering praise to recognize their accomplishments and successful completion of tasks and goals.

4.2 Proposed VTL Platform

Figure 2 shows an overview of the proposed platform for VTL, which aims to integrate the findings and efforts of previous researchers in improving special education during online learning. The platform incorporates mobile learning, web-based learning, and the VTL environment. Additionally, the design of the knowledge representation was inspired by [30], showcasing the architecture of an

eLearning system. The proposed approach presents a high-level architecture consisting of four layers.

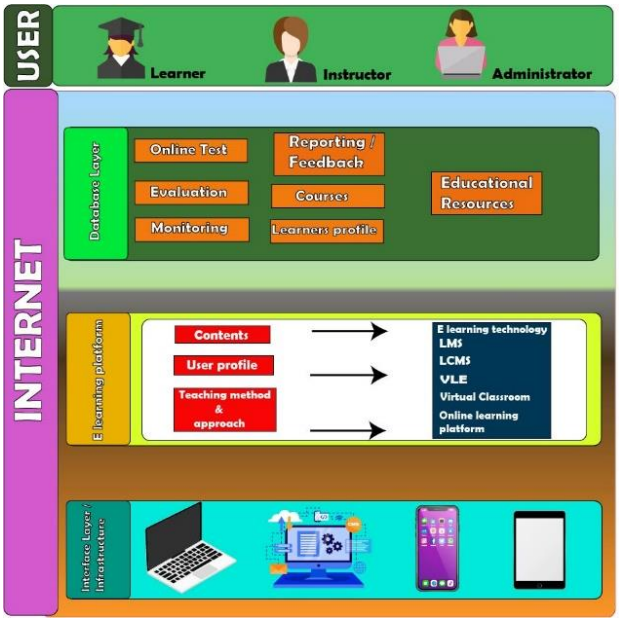

Figure 2: Proposed VTL Platform

The infrastructure layer forms the foundation of the platform, utilizing device components and abstracting specific hardware resources to provide flexibility and accessibility for all users, including those with sensory impairments and disabilities. The e-learning platform layer encompasses the data and functionalities of the running platform, including content, user profiles, and teaching methods. It offers various technologies and tools to enhance the effectiveness and reliability of online learning systems. This layer includes a platform for teaching and learning, incorporating educational technologies such as learning management systems (LMS), content management systems (CMS), virtual learning environments (VLE), and virtual classrooms, specifically designed to support caregivers in teaching and assisting children with autism during virtual learning.

The platform prioritizes user-friendliness and provides interactive activities and exercises to engage children and maintain their motivation. The information synthesized in this layer includes user data, learner profiles, and performance data, allowing for personalization and adaptation of teaching methods based on individual needs. The database layer stores all the platform's information and data, such as tests, evaluation and monitoring data, courses, and feedback, which can be utilized for generating reports and future analysis. The platform incorporates collaborative features to facilitate communication and cooperation among caregivers, teachers, and therapists, while providing real-time feedback for caregivers to track the progress of children and make necessary adjustments in teaching methods.

The user layer represents the individuals interacting with the platform, including administrators, teachers or tutors, and students. The online learning platform serves as a system for communication, information storage, and processing, encompassing people, software, and technology. By effectively integrating these layers, the e-learning platform aims to create an inclusive and supportive VTL

environment, emphasizing access, customization, interactivity, collaboration, data management, and evidence-based content. Table 3 provides a summary description of each layer.

Table 3: Description of each layer

Layer	Description
Infrastructure Layer	- Constructs the initial layer using hardware components of devices. - Abstracts certain hardware resources for user flexibility. - Determines device requirements for accessibility to children with sensory impairments and disabilities.
E learning platform Layer	- Contains core functionalities of the platform. - Includes data on content, user profiles, and teaching methods. - Offers technologies and tools for online learning professionals. - Customizable to cater to unique learning needs and preferences of each child.
Database Layer	- Stores all platform information and data. - Includes online tests, evaluation and monitoring data, courses, and feedback. - Generates reports for future reference.
User Layer	- Represents individuals who interact with the platform. - Includes administrators, teachers or tutors, and students. - Serves as a system for communication, information storage, and processing for these actors.

5 CONCLUSION AND RECOMMENDATIONS

In conclusion, this study highlights the key features and benefits of a proposed VTL platform for caregivers of children with autism. Caregivers play a critical role in supporting the educational journey of children with autism, and the VTL platform can assist them in overcoming various challenges. The proposed platform offers access to specialized resources tailored to the unique needs of children with autism, addressing their specific requirements. User-friendly interfaces and intuitive design minimize technological barriers, ensuring effective implementation.

The platform provides individualized support and personalized teaching methods, enabling caregivers to customize the learning experience for each child. To ensure success, comprehensive training and guidance are necessary to equip caregivers with the necessary knowledge and skills to effectively utilize ICT technology. Collaboration with experts in the field of autism and special education enhances the development of the VTL platform, aligning it with the latest research and best practices.

Further research is needed to explore specific VTL components for caregivers and develop targeted strategies. By recognizing and addressing these components, the VTL platform can become inclusive, effective, and supportive, empowering caregivers and enhancing educational experiences and outcomes for children with autism in VTL environments.

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