

ENHANCING PRIMARY EDUCATION WITH VIRTUAL REALITY: CHALLENGES AND OPPORTUNITIES

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Abstract

This theoretical review aims to explore the considerable potential of Virtual Reality (VR) in primary education, with a specific focus on its transformative impact on early learning. The aim is to conduct an in-depth analysis of the challenges faced in primary education and the role of VR technology in addressing these challenges. By examining the educational landscape, this paper seeks to elucidate how VR technology can substantially enhance the learning experience for young students. Through a meticulous evaluation of the theoretical framework and existing literature, it underscores the promising opportunities and complexities that arise from the integration of VR in primary education. This review primarily serves as a foundational resource for educators, researchers, and policymakers interested in leveraging VR's capabilities to enhance the educational journey of digital-native primary school students.

Keywords: *virtual reality, pedagogical tool, learning, primary education, enhancement;*

Introduction

Today's society is rapidly evolving, and in this era, developments and changes in the field of education have become a subject of great interest. Primary education, a crucial stage in the developmental and learning process of children, is no exception. As educators and decision-makers strive to address the ever-evolving needs of students born in the digital age, Virtual Reality (VR) emerges as a revolutionary tool with the potential to fundamentally reshape the landscape of primary education.

The integration of VR technology into primary education brings forth a multitude of challenges and opportunities that are both captivating and transformative. This article embarks

on a journey to explore the dynamic interplay between VR and primary education, delving into the promises it holds and the hurdles it presents to educators in their instructional activities.

As we navigate through the challenges and opportunities that VR brings, we set course for a more engaging, interactive education aligned with the needs of digitally native students. This article reflects on the potential of VR to enhance primary education while acknowledging the complexity that accompanies this innovative leap. It serves as a guide for educators, decision-makers, and all stakeholders in the effort to harness the power of VR for the betterment of primary education (Li, 2022).

Characteristics and Needs of Digital Natives

The contemporary society is witnessing the emergence of a generation of children and youth commonly referred to as "digital natives." These digital natives have grown up in an era characterized by digital technology, where electronic devices, the internet, and the virtual environment have become an integral part of their lives. This context has shaped the way these young individuals learn, communicate, and interact with the world around them, resulting in distinct characteristics and learning needs.

One of the key characteristics of digital natives is their adaptability to technology. Growing up with electronic devices, these school-age children have developed a natural familiarity with computers, smartphones, tablets, and other digital gadgets (Prensky, 2001). Using these devices has become second nature to them, and technology has become a fundamental tool in their daily lives.

This adaptability to technology translates into an increased information processing speed. School-age digital natives are accustomed to swiftly navigating through various sources of information, finding answers to questions, and accomplishing tasks using technology. This ability is a crucial characteristic that must be considered in the teaching and learning process (Oblinger & Oblinger, 2005).

However, another distinctive characteristic of digital natives is the diminished capacity for sustained concentration and patience for activities that require extended time and attention. This can be observed in their reduced ability to engage with lengthy narratives or activities involving waiting. School-age digital natives have grown up in a culture of rapidity and constant change, influencing their attention span.

Regarding learning preferences, school-age digital natives tend to lean towards visual content over written texts (Tapscott, 1998). They are drawn to images, videos, graphics, and

interactive elements. This preference provides opportunities for more visual and interactive learning, but it can also pose challenges in terms of appreciating traditional reading and written texts.

Another significant aspect is the ability to multitask and process information simultaneously. School-age digital natives are accustomed to rapidly switching between different activities and sources of information. This skill can be leveraged in the educational process but requires adapting teaching methods to stimulate and maintain their interest.

Teachers must take these characteristics into account and provide the right environment and resources to support the development of school-age digital natives. By adapting teaching methods to meet the specific needs of these young learners, teachers can become more effective and engaging, opening up new opportunities for this ever-evolving generation.

The concept and characteristics of VR technology

VR is the use of computer technology to create the effect of an interactive three-dimensional world in which objects have spatial sensitivity (Bryson, 2013). In technical terms, VR is a three-dimensional artificial environment created by a computer and presented interactively to a person. In practicality, it refers to computer simulation of a three-dimensional virtual environment that replicates the physical appearance and phenomena of the real world. Users can explore this environment and, at the same time, interact with computer-simulated objects and people (avatars) (Burdea & Coiffet, 2003).

Virtual Reality (VR) technology has emerged as a game-changing tool in 21st-century education, offering an immersive and interactive learning experience that holds tremendous potential, particularly in primary education (Rogers, 2019).

Recent studies provide evidence that this type of immersion can benefit both the learning process and its outcomes. For instance, reading within a VR environment has been shown to enhance knowledge transfer (Baceviciute et al., 2021). Learning about historical events in a VR setting can increase engagement, empathy, presence, and knowledge mastery (Calvert & Abadia, 2020). On the other hand, Petersen et al. (2022) demonstrate that interactivity in VR can reduce cognitive load (Sweller et al., 2011) and that immersion leads to a heightened situational interest among children. In the linguistic domain, Lai and Chen (2021) argued that vocabulary enrichment in a VR gaming environment has shown significant improvements in recognition tests, with students expressing a desire to continue using VR tools

for vocabulary development. Similarly, Tai et al. (2020) reported that using the Mondly VR application significantly enhanced vocabulary development and retention. Lastly, there is some data indicating that the use of avatars in VR can reduce speaking anxiety (Horwitz, 2001) and encourage students to communicate more successfully (Melchor Couto, 2017; York et al., 2021).

The primary reasons for the growing popularity of virtual reality in education are its three-dimensional, engaging, imaginative, and interactive features, especially its ability to provide a lifelike experience (Hamilton, 2018). Blascovich and Bailenson (2011) emphasize that this technology allows us to interact with objects, entities, or events, creating a realism that cannot be achieved with traditional textbooks, models, or worksheets. This innovation helps children manage sensory overload, enhances their concentration, and, in the process, filters out the clutter and noise of the real world, which often overwhelms and hinders a child's development.

If you were to flip through a book with spring landscapes, would you have better memories than if you were to walk among colorful blooming trees, listening to the birds' songs? Experiences enhance and boost memory retention. This is the concept behind immersive learning, which involves learning in a simulated or artificial environment (Posteucă, 2015). The goal of immersive learning technology is to enhance people's ability to absorb information and accelerate their learning in an enjoyable and interactive environment. Immersive learning brings learning to life by engaging the senses.

Application advantages of VR technology in primary education

By creating, sharing, and actively participating in technology-mediated experiences from a very young age, children become accustomed to new and immersive learning environments. In the context of primary education, educators face a set of significant challenges when adapting to this shift. Virtual reality presents opportunities for learning that complement traditional teaching methods. It can enhance and enrich the learning experience (Wadhera, 2016).

Challenge 1: Traditional Teaching Methods Result in Elementary School Student Disengagement;

A widespread issue in education is that traditional teaching methods rely heavily on lectures, leading to elementary school students' diminished attention and lack of engagement in the learning process (Delialioglu, 2012).

Opportunity: Virtual Reality Enhances Children's Intrinsic Motivation through Individualized Learning;

VR data information processing model technology excels not only in providing children with a rich visual experience but also in tailoring the learning process to individual needs and interests. This technology, through the dynamic configuration of scenes, creates a unique learning environment that prompts children to actively explore and discover new knowledge. Moreover, virtual reality technology has the remarkable ability to adapt content and curricula based on children's responses, offering a fully personalized learning experience that maximizes their enthusiasm.

With its interactive and captivating features, VR offers a novel way of learning for children, providing novel and powerful experiences they may not have encountered before (Lau and Lee, 2015). These experiences include authentic learning activities that are embedded in real-world contexts. Specifically, VR can uniquely contextualize learning in simulated or imagined environments, delivering cognitive, social, and affective benefits (Mystakidis et al., 2021). Various classroom experiences hold differing levels of presence: image-based reading, passive video-watching, participation in theatrical performances, and the most interactive, embodying actors and objects in VR (Aylett and Louchart, 2003). By immersing elementary school students in a multi-sensory, authentic experience, VR breathes life into educational content. For example, students have the opportunity to navigate inside the human body as a red blood cell using the Body VR application or to be transported to Mars through Google Expeditions. The ability to simulate an environment and enhance the learner's sense of presence is one of VR's most significant opportunities for creating more engaging educational experiences. This approach not only stimulates children's subjective initiative but also fosters a desire for self-driven exploration. The transition from passive to active learning is pivotal in nurturing a dynamic educational experience."

Challenge 2: Providing Authentic, Highly Relevant Learning Contexts is Difficult

When knowledge is isolated from its context, it often leaves many children struggling to see its relevance in their lives. There's a disconnection between the content they learn and its authentic application in the "real world." Gee (2009) describes this as an education lacking "situated" learning (p. 38). Properly implemented learning allows students to grasp concepts while seeing their broader applicability, instead of merely memorizing isolated facts.

Opportunity: Virtual Reality Provides Authentic Experiences Impacting the Student's Identity;

A virtual classroom can be more than just seats, desks, children, and an educator. Children can learn by interacting with their content through virtual field trips. Immersive VR can transport students to another country or historical period, allowing them to experience the sights and sounds of that community. Virtual field trips offer children a more accessible way to learn about the world (Bailey & Bailenson, 2017). This creates powerful learning opportunities for experiencing historical contexts, scientific environments, and significant moments for each child. Equally important is the opportunity to impact the students' identities—for example, providing experiences that inspire them in their career choices. There are already virtual field trips that allow children to experience a day in the life of a professional or learn from a mentor. For example, Google Expeditions contains experiences where users can "shadow" a scientist or professional in their laboratory or office (O'Brien, 2016).

Challenge 3: Teaching 21st century skills in a traditional classroom setting is difficult;

A third issue in education is that today's workforce increasingly demands 21st-century skills, such as creativity, empathy, critical thinking, and technological literacy. However, these types of skills are challenging to teach. This is particularly due to the fact that, although technology is present in many educational institutions, educators often resist using and integrating it into the instructional process, either because they lack the necessary knowledge or exhibit resistance to change (Smith & Hu, 2013).

Opportunity: Virtual Reality Provides a New Perspective and Empathy;

VR excels in offering opportunities for gaining a new perspective, empathy, and the ability to visualize complex patterns. For instance, when students were given the opportunity to assume the role of an elderly person, their empathy towards the older generations significantly increased (Bailenson et al., 2008). Chris Milk (2016), one of the most prominent directors of 360° films, argues that VR makes anyone, anywhere feel familiar. In his VR film, "Clouds Over Sidra," Milk creates a compelling experience where the viewer is transported to a refugee camp in Jordan. He uses this environment to generate empathy with the subject by immersing the viewer in a realistic experience of becoming a refugee. Another powerful VR experience of this nature is the simulation "Outcasted." In "Outcasted," the player gets to experience real stories about how people become homeless. VR builds empathy as the player begins to experience the social rejection many homeless people face (Priestman, 2015). One of

the most compelling arguments for VR as a learning tool is its ability to instill empathy in students and provide them with new perspectives (Bailenson et al., 2008). This opportunity is particularly crucial in a divisive era where understanding others' viewpoints can be essential for finding solutions and ways to compromise.

Conclusions

Literature in the field of education showcases a multitude of opportunities that Virtual Reality (VR) brings to the world of primary education. From transforming learning environments to enhancing student engagement, VR's potential is undeniable. The application of VR technology holds the promise of revolutionizing the educational landscape for school-age children.

Virtual reality empowers educators to bridge the gap between traditional teaching and the expectations of digital-native students. As we move forward in the age of experiential learning, embracing VR is not just an opportunity but a necessity to provide school-age children with a holistic and engaging education that prepares them for a digital future.

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