Augmented Reality

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Augmented Reality   Constructivist Learning   Learning Experience   Inquiry-Based Learning   Interactive Simulation

Situated Learning   Virtual Classroom

Augmented Reality (AR) is the integration of digital information, such as images, videos, or 3D models, into the real-world environment, providing an enhanced perception of reality (Yuen, 2011). By overlaying digital information onto the real world, AR enhances the learning experience and provides students with interactive and immersive educational content (Bower et al., 2014). This article explores the concept of AR and its significance in motivating learners, simplifying complex concepts, and creating a dynamic and inclusive learning environment. Additionally, theories that support the integration of AR in educational technology are discussed, followed by myths related to AR and a glimpse into the future of AR in EdTech.

Augmented reality (AR) has a rich history dating back to the 1960s, with its origins in computer graphics and virtual reality research. In 1968, Ivan Sutherland developed the first head-mounted display, laying the groundwork for AR devices. In 1992, Tom Caudell coined the term "augmented reality" to describe a digital display system used in aircraft assembly. However, it was not until the late 20th century that AR gained momentum. The development of smartphones, improvement in processing and rendering, improved cameras, and other advanced computing capabilities in the 2000s enabled widespread AR adoption. Notable milestones include the launch of ARToolKit in 1999 and the release of Pokémon Go in 2016, which popularized AR among consumers. Since then, AR has been steadily advancing and finding its way into various industries, including education (Aggarwal & Singhal, 2019; Caudell & Mizell, 1992). Today, AR is typically experienced through devices like smartphones, tablets, or wearable devices that use cameras, haptics, and sensors to detect the user's surroundings and display relevant digital information (Hosch, 2023).

Benefits in Education

By bridging common gaps between concepts and the physical world, AR can enable learners to explore complex concepts in a hands-on manner, increasing their motivation to learn (Billinghurst & Duenser, 2012). AR can also offer

dynamic and interactive learning experiences that actively involve students in the educational process. Through gamification elements and interactive simulations, AR allows passive learners to become active participants, resulting in higher engagement levels (Ainajdi, 2022). Catering to diverse learning needs, AR can also support differentiated learning by offering customizable content and adaptive learning experiences (Kaufmann & Schmalstieg, 2003), including providing new strategies for teaching students with special needs, such as autism (Berenguer, 2020).

Augmented Reality (AR) has also shown potential in enhancing different pedagogical approaches (Shelton, 2020), including the following:

- **Constructivist Pedagogy.** AR can be used to encourage deep engagement with tasks, concepts, and resources through information overlays (Kerawalla et al., 2006).
- **Situated Learning.** AR can help integrate educational experiences within real-world environments, bridging the gap between classrooms and reality (Chen & Tsai, 2012; Dede, 2009).
- **Game-based Learning.** AR can be used for immersive digital narratives, providing authentic resources, feedback systems, and practice in transferring skills to real-life applications (Dunleavy et al., 2009; Klopfer & Squire, 2008).
- **Inquiry-based Learning and Problem-based Learning.** AR can offer contextually relevant information and virtual models for analysis and exploration within the context of solving problems in the external world (Johnson et al., 2010).

Myths and Disambiguation

Augmented Reality (AR) is often wrongly associated with Virtual Reality (VR). However, AR stands as distinct from VR by overlaying virtual content onto the real world, seamlessly blending physical and digital worlds together, in an attempt to enhance the real world, while VR replaces the real world with immersion into an artificial environment (Parekh et al., 2020). Educators must grasp this fundamental difference to make informed decisions when integrating AR into the learning process, as each approach provides unique benefits and challenges (Nur Fitria, 2023).

In addition to understanding the distinction between AR and VR, it's also essential to grasp the differences between Extended Reality (XR) and Mixed Reality (MR). XR serves as an umbrella term encompassing various immersive technologies, including AR, VR, and MR (Alnagrat et al., 2022). While AR overlays digital elements on the real world, MR goes a step further by merging digital and physical environments interactively. MR introduces a spectrum ranging from the real world with minimal digital elements at one end to the virtual world with minor real-world components on the other end (Rauschnabel et al., 2022). Recognizing these distinctions is crucial as each of these technologies has unique affordances and applications, particularly in the field of education.

Another prevalent misconception is that AR is limited to gaming. Although it gained popularity in gaming initially, AR's potential extends to education, healthcare, retail, everyday tasks, and more (Parekh et al., 2020). Many AR applications do not incorporate any game mechanics but rather provide user-friendly ways to allow learners or users more broadly to quickly access information and to make sense of or to more deeply understand the world around them (Boardman et al., 2019).

Future Progress

The future of AR may involve exploring methods for implementing touchless hand interactions in real time, leveraging machine learning agents, and integrating remote learning components into AR applications designed for educational purposes. In parallel, the recurrent mentions of artificial intelligence, virtual reality, and augmented reality in comparison to other modalities persist as processing and graphical rendering capabilities steadily become more compact and cost-effective through the utilization of headsets, smartphones, and haptic devices. This underlines the continued likelihood of sustained attention directed towards these technologies (Kimmons & Rosenberg, 2022).

AR experiences will become more seamless and immersive with expectations including improved AR hardware, such as lightweight and affordable smart glasses, making AR more accessible to learners. Additionally, advancements in artificial intelligence and machine learning will enhance AR's ability to personalize educational content and make sense of real-world objects (e.g., faces, locations).

Moreover, collaborative AR experiences will enable individuals from different locations to interact and learn remotely, fostering increased global collaboration and cultural exchange. As AR applications expand, we may witness the further development of virtual classrooms, where learners can more easily gather in shared virtual spaces and engage in collaborative learning activities.

In conclusion, Augmented Reality (AR) has the potential to significantly influence education by providing more immersive, interactive, and connected learning experiences. It can motivate learners, simplify complex concepts, cater to diverse learning needs, and create dynamic learning environments. By supporting constructivist, situated, games-based, and inquiry-based pedagogies (Shelton, 2020), AR holds promise for enhancing student engagement and understanding. However, it is crucial for educators and policymakers to address challenges such as cost, content quality, privacy, ethics, and accessibility to ensure that AR contributes to a more inclusive and effective educational landscape.

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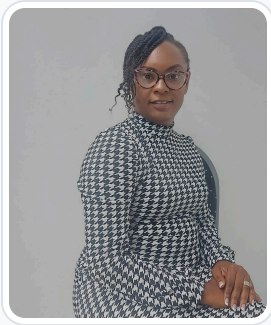
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For more than a decade, Mrs. Taneisha McLean Francis has possessed an unwavering ardor for education and training, holding several prestigious positions and garnering numerous qualifications in this field. As a Training Officer for almost seven years with the Jamaica Customs Agency, she has displayed an exceptional ability to train and coordinate training sessions for approximately fifteen hundred staff members across Jamaica, which emerged from her own experience providing on-the-job training as a Customs Officer on the ports for over thirteen years. She also designs engaging online self-paced courses that offer staff members the chance to engage in personalized training and development sessions. These sessions effectively empower them to enhance their individual roles and functions. In addition to her remarkable work as a Training Officer, Mrs. McLean Francis has also served as a lecturer at the University of the Commonwealth Caribbean (UCC) for a decade and the Caribbean Maritime University (CMU) for four years, imparting her extensive knowledge in Marketing Courses and Port Operations Air and Sea Course, respectively. She is also a distinguished Instructional Designer and has lent her expertise to a new initiative, UCC Global. Mrs. McLean Francis holds a Bachelor of Science Degree in Management Studies from the esteemed University of the West Indies, as well as a Post −Graduate Diploma in Education and Training from the prestigious Vocational Training Development Institute (VTDI), and a Master of Science Degree in Curriculum Development from the University of the West Indies (UWI), which showcases her remarkable academic achievements in the field of Education and Training.

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