IJFANS INTERNATIONAL JOURNAL OF FOOD AND NUTRITIONAL SCIENCES

ISSN PRINT 2319 1775 Online 2320 7876

Research paper UGC CARE Listed (Group -I) Journal Volume 11, Iss 12, Dec 2022

AUGMENTED REALITY, VIRTUAL REALITY, MIXED REALITY: AN OVERVIEW

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Abstract
Digital technology is already increasingly being used in educational settings. Higher education is currently being pushed into the experiential sphere by the influences of augmented reality (AR) and virtual reality (VR). Technology has been a huge help in transforming education away from the rote memorization and chalk-talk of the past. Teachers are increasingly acting as learning facilitators while students now have access to a great amount of data and learning materials. The demands of the pupils have informed how education has been tailored. Online lessons are being developed by teachers to fill in specific knowledge gaps and to improve comprehension of some subjects that require more intensive learning interventions. To top it off, simulation-based learning results are being optimized using augmented and virtual reality technology. The use of augmented reality (AR), virtual reality (VR), and mixed reality (MR) technology to redefine traditional workspaces and create hybrids of virtual and physical realities are having a growing impact on education and training. While VR technology transforms the reality experience into a virtual environment with the aid of a VR head-mounted display, AR technology allows the augmented components to be superimposed into the real world in order to improve user experience. Real-time interaction between physical and digital items is made possible by MR technology, which combines the real and virtual worlds to create new environments and visualizations. The use of AR, VR, and MR technologies enables users to fully immerse themselves in computer-generated environments while combining the benefits of the real and virtual worlds to create an artificial reality. Researchers are investigating the learning potential of VR, AR, and MR in their studies. The use of augmented reality, virtual reality, and mixed reality in education is discussed in this article.

Keywords: Augmented Reality (AR), Virtual Reality (VR), and Mixed Reality (MR), Education

The emergence of the new meta universe is imminent. The physical world will be shattered by VR and AR, which will be replaced by a 3D/immersive real-life interactive environment that will enable users to interact with things and people from all over the world in the comfort of their own homes. The top uses of AR/VR technology in 2021 included teleportation, 3D data visualization, and manipulation. The potential of AR and VR is not just changing the entertainment industry; it is also having an impact on a number of other sectors, including the military, sports medicine, and education. Learning has evolved to be a lot more interactive than it was in the past. In contrast to virtual reality (VR), augmented reality (AR) offers a better perspective of a real image. They do assist in illuminating complicated ideas that students could not learn through simple illustrations or even from hands-on activities in a lab. VR can be quite useful. Since the introduction of Virtual Reality (VR) and Augmented Reality (AR) in the classroom, learning has changed significantly. The development of learning using VR and AR is accelerated by the surge in demand for experiential learning.

Augmented Reality (AR)

IJFANS International Journal of Food And Nutritional Sciences
Official Publication of International Association of Food and Nutrition Scientists

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The real-time integration of digital information with the environment of the user is known as augmented reality (AR). Users of augmented reality (AR) encounter a real-world environment with created perceptual information superimposed on top of it, as opposed to virtual reality (VR), which produces a completely artificial environment. Using augmented reality, users can receive more information or have natural environments aesthetically altered in some way. The main advantage of augmented reality (AR) is that it successfully combines digital and three-dimensional (3D) elements with how people perceive the real world. AR has several applications, from entertainment to aiding in decision-making. Through a device like a smartphone or glasses, augmented reality (AR) provides the user with visual elements, sound, and other sensory information. In order to provide a seamless experience where digital information modifies the user's view of the actual environment, this information is layered onto the device. A part of the natural world might be hidden or added to by the superimposed information (Gillis,2022).

How is augmented reality implemented?

Figure 1 Source: AR in education — Jasoren

There are many ways to provide augmented reality, including through smartphones, tablets, and eyewear. Additionally, contact lens-delivered AR is being developed. Hardware elements like a processor, sensors, a display, and input devices are needed for the technology. This hardware is often already present in mobile devices, including sensors like cameras, accelerometers, GPS, and solid-state compasses. This makes AR more approachable for regular people. For instance, a GPS can be used to determine the user's location and its compass can be used to determine the direction of the device. Machine vision, object identification, and gesture recognition are potentially possible features of sophisticated augmented reality training programmes utilised by the military. Because AR can be computationally demanding, data processing can be offloaded to another machine if a device is underpowered. In order to connect animation or contextual digital information in the computer programme to an augmented reality marker in the real world, augmented reality apps are written in specialised 3D programs (Figure 1). When a computing device's AR app or browser plugin receives digital information from a known marker, it proceeds to run the marker's code and layer the correct image or images (Gillis,2022, Sinha S.,2021).

Instances of Augmented Reality

The following list includes examples of AR:

- Target app: See it in Your Space, a function of the Target retail app, allows users to snap a photo of a room in their house and virtually view an object, such as a chair or a picture on the wall, to see how it will look there.

ISSN PRINT 2319 1775 Online 2320 7876

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- Apple Measure App: Users can choose two or more places in their environment and use the Measure app for Apple iOS to measure the distance between them, acting like a tape measure.
- Snapchat. Snapchat filters use augmented reality to apply a filter or mask on a user's Snap or image.
- Pokémon Go The mobile augmented reality game Pokemon Go uses the player's Geolocation to locate Pokemon critters in their immediate vicinity that can be caught.
- Google Glass. Google's first commercial foray towards a glasses-based augmented reality technology is Google Glass. Users may operate this tiny wearable computer hands-free. Google is also developing a new set of glasses for 2022 that will overlay a real-time transcription or translation of what someone else is saying in text.
- US Army. Tactical Augmented Reality is an eyewear that the U.S. Army employs for AR (TAR). TAR attaches to the soldier's helmet and helps identify where another soldier is located(Gillis,2022).

Education Using Augmented Reality

Since AR allows teachers to integrate gaming elements to textbook material and provide virtual instances of topics, it can make learning in the classroom more engaging and remarkable. Students will be able to learn more quickly and remember material as a result.

Visuals are not easily forgotten by the human memory. Users can examine 3D dinosaurs by scanning through a collection of flashcards that are part of an augmented reality (AR) software called "Dinosaur 4D+." Students can use the app's rotating, zooming, and other functions while watching the behaviour of dinosaurs. Additionally, the application offers basic details about each dinosaur. Another interesting application of augmented reality in education is the "Element 4D" AR software, which makes learning chemistry enjoyable.

Figure 2: Source: ThinkMobiles: Use of Augmented Reality in Education

By simply placing two paper cubes in a particular element block, the application allows users to determine the atomic weight, chemical elements, reaction between two chemicals, and their names. Google Expeditions, which allows users to view 3D objects in the classroom (Figure 2) including volcanoes, hurricanes, and even DNA, is another lauded example of AR/VR in education. This programme offers more than 100 augmented reality explorations, covering topics like the moon landing and the development of technology (Sinha, S,2021).

Virtual Reality

Virtual reality can play a significant role in education and training since it is so immersive, even though it was originally developed for the video game industry with a strong focus on gaming (it gives way to immersive learning). You can enter a 360-degree video environment or a 3D immersive world that has been constructed (Figure 3) (Lopez, 2016).

How does VR operate?

The closest equivalent of the stereoscopic sightseeing impression is virtual reality today. It needs a mounted device where the experience is stored or processed, as well as a set of lenses inside a viewport on a

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headset.assroom including volcanoes, hurricanes, and even DNA, is another lauded example of AR/VR in education. This programme offers more than 100 augmented reality explorations, covering topics like the moon landing and the development of technology.

Figure 3 Source: Software Testing Help

The spectrum of VR capabilities vary depending on the device and type of headgear utilised, ranging from simple observation to total immersion. The user can interact with 3D objects in space, within the experience, using a remote control in sync with the installed headgear, whether for VR games or virtual interfaces and apps (Lopez, 2016).

Mixed Reality

The goal of mixed reality, which combines VR with AR, is to provide the best of both worlds. For instance, it projects images on top of our surroundings while using a headset similar to virtual reality and viewing via a transparent viewport or glass. The extremely participatory nature of MR and the lifelike portrayal of the projection it adds to our surroundings are what set it apart. We may interact with the immersive content utilising organic body and finger gestures as opposed to just using remote controls or phone screens.

In terms of augmented reality technology, Apple and Google undoubtedly take the lead, although Microsoft (HoloLens) and the heavily backed Magic Leap are more popular nowadays.

Microsoft HoloLens

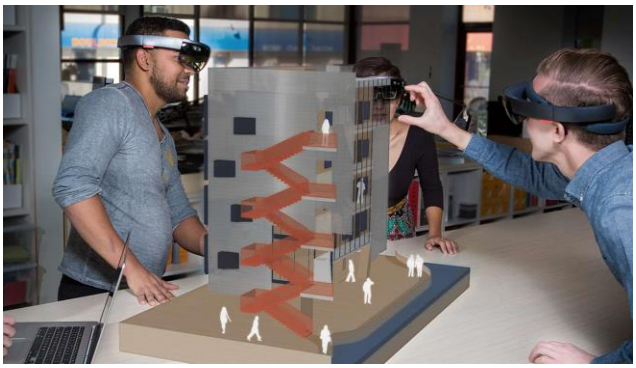

Figure 4. Source: Geospatial World, SketchUp Viewer for Microsoft HoloLens .....

Despite Google Glass's commercial failure, Microsoft didn't hesitate to experiment with their own "holographic computer" in the MR game. HoloLens' main functionality "enables you to engage with your digital content and interact with holograms in the world around you" is where the name "HoloLens" originates.

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Magic Leap

Figure 5. Source: The New York Times,Real-Life Illness in a Virtual World

Mixed Reality /Merged Reality

Mixed reality struggles to define its future because of the hazy lines separating it from its counterparts VR and AR. Similar to VR, MR launches the experience through a headgear. However, mixed reality technology differs from standard VR equipment since it uses affixed translucent glasses, like Google Glass, that allow us to remain rooted in the real world while the virtual reality is combined with it. Similar to AR, MR superimposes digital simulations and content over what we would ordinarily view. However, unlike augmented reality (AR), mixed reality experiences allow you to physically engage with the simulation. Additionally, you may interact with the environment using your body and remote controls in addition to your phone's screen (Tall, T).

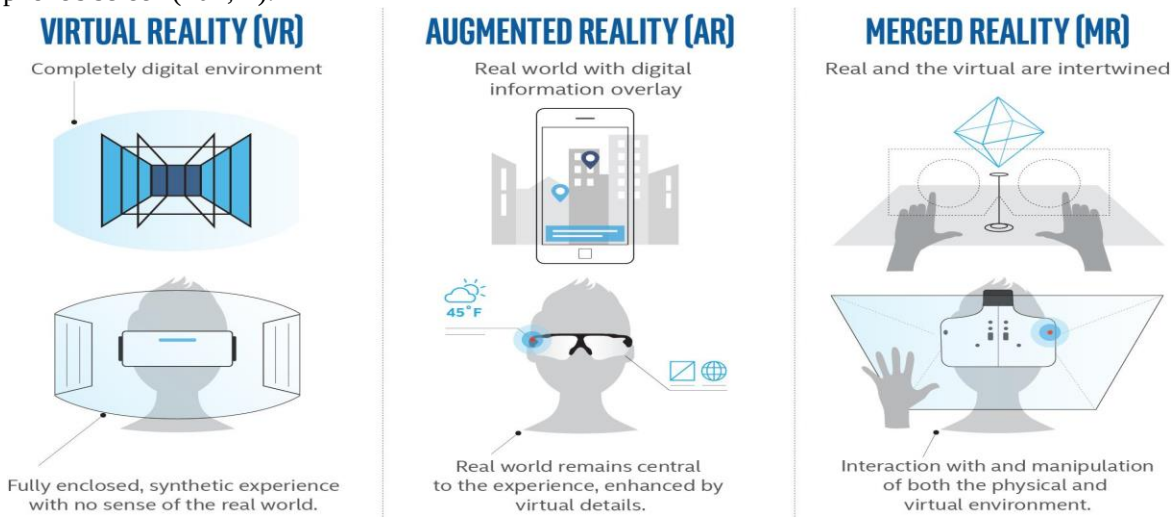

Figure 6 Source: Applied Art & Technology, VR, AR or MR

Future of Mixed, Virtual, and Augmented Reality

If we take into account the widespread appeal of the Pokemon Go phenomenon, AR has demonstrated a higher adoption rate. Today, all you need for augmented reality is a smartphone with a modern operating system, a good camera, and an AR app — there is no entry fee, and the entire world is ones canvas. Virtual reality appears to have a problem reaching a wider audience, despite having a longer history than AR or MR. This is primarily due to the expensive cost of purchasing a good VR headset, the physical discomfort from continuous use, and the lack of actual use cases for the technology. Mixed reality is the ideal fusion of the actual,

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augmented, and virtual worlds. Applications are limitless, according to Joerg Tewes. He considers how engineers and designers could be able to physically control 3D models. In contrast to using screens or keyboards, "mixed reality enables users to interact directly with their thoughts," he continues. With the advent of digital technology and immersive 3D media, the world is about to see unprecedented growth. It's a rare chance for designers, engineers, and businesses to get involved in the transformation (Tall, T).

Although often expensive, integrating augmented reality into student learning can be helpful. By providing immersive learning experiences, extended reality technologies like AR and VR have changed the education sector. The basic purpose of augmented reality integration is to combine digital and real-world information. Users can view the real world while concurrently interacting with virtual items because to this technology. VR, on the other hand, uses entirely digital imagery for real-time immersive simulations. With the advent of VR, MR, and AR technologies, books and lectures are now more interactive, immersive, and engaging. Additionally, they are now a workable way to focus and pay attention to students.

References

1. Gillis, Alexander S (2022), Augmented Reality (AR) https://www.techtarget.com/whatis/definition/augmented-reality-AR
2. Sinha, Shweta (2021) e-learning industry, https://elearningindustry.com/augmented-reality-in-education-staggering-insight-into-future
3. Lopez, Leticia Lafuete (2016), Virtual Reality and Augmented Reality in Education https://elearningindustry.com/virtual-reality-augmented-reality-education
4. Immersion VR, VR for Education https://immersionvr.co.uk/about-360vr/vr-for-education/
5. MR in your Classroom https://www.microsoft.com/en-us/education/mixed-reality#:~:text=Mixed%20Reality%20breaks%20through%20emotional,out%2Dof%2Dreach%20experiences.
6. Tall, Tidjane, Augmented Reality vs Virtual Reality vs Mixed Reality: An introductory Guide https://www.toptal.com/designeers/ui/augmented-reality-vs-virtual-reality-vs-mixed-reality