THE USE OF VIRTUAL REALITY AND AUGMENTED REALITY IN EDUCATION

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Abstract: Virtual Reality and Augmented Reality has been used over two decades, the active usage of them, however, started in the last ten years. Since the creation and widespread usage of virtual techniques, availability of these techniques increased and students are offered to use low-cost techniques in classrooms. This paper reviews when and by whom introduced Virtual Reality and Augmented Reality, discusses in which sphere they can be used, defined which benefits they have and mainly how their usage at Eastern countries' point of view.

Keywords: Augmented Reality, Virtual Reality, Experiential Learning, Personalized Learning, Virtual Expeditions, Anatomy and Biology, STEM Education(science, technology, engineering and mathematics), Visualization, Interactive Learning and Virtual Prototyping.

Introduction

Augmented Reality and Virtual Reality can be traced back to 1838 when Charles Wheatstone, Professor of Experimental Philosophy at King's, developed the stereoscope, which presented an image to each eye to create a 3D image. From this point onward, curiosities to conduct early researches and experiments in virtual environment began. In 1968 Ivan Sutherland, acknowledged as a "father of computer graphics" and his team created one of the first AR(augmented reality) systems called the "Sword of Democles" and this system superimposed wireframe models for user's real world perspective. Practical applications and widespread use of AR and VR(virtual reality), however, have gained momentum in recent years not from several decades due to advancement in technologies. Nick Babich affirms that, in the the age of digital devices, we have the chance to develop better learning processes through technology. In this case, VR is a natural step to achieving evolution and high quality in elementary and higher education (Vection technologies,2023).

Virtual reality and augmented reality are immersive learning technologies since they transform the technology and interactive learning experiences for students, that they help student to imagine futher and to get knowledge much clearly about the topic. So now these devices are more affordable and widely available use in educational fields. Initial paragraphs of this article will started explanations about what are augmented reality and virtual reality, then what benefits they give to learners if they

use them and in what way they are used and concluded about their applications in Eastern countries.

An explanation of virtual reality and augmented reality

Virtual reality is a simulated 3D environment that enables users to explore and interact with a virtual surrounding in a way that approximates reality, as it is perceived through the users' senses(Robert Sheldon,TechTarget,2022). Specifically, VR system works by computer hardware and software, and this is the opportunity for individuals to see the environment by the help of special devices of VR system, the most commonly used devices in VR systems are Head-Mounted Display(HMD) and goggles. The HMD functions as a helmet covering the eyes to deliver virtual reality experiences, while goggles are employed for specific applications like 360-degree videos, mobile VR experiences, or entry-level VR.

In 2024, Adam Hayes (Economic Sociologist, Assistant Professor of Sociology and Anthropology, The Hebrew University of Jerusalem) explained that augmented reality (AR) was an enhanced version of the real physical world that was achieved through the use of digital visual elements, sound, or other sensory stimuli and delivered via technology. This technology allows to users to integrate the virtual objects, animations and information into the surroundings in real-time and users get the unique opportunities for enhancing their experiences, obtaining additional information and improving visualizations.

Advantages and examples of Virtual Reality in Education

Virtual Reality presents several advantages in the field of education, offering distinctive prospects for students and enhancing their experience. Here some of them are provided:

- Enhanced Immersion: VR allows immersive environment that include learners in realistic and interactive simulations, enhancing their grasp of complex concepts.
- Experiential Learning: VR offers to users to experience hands-on learning in virtual settings that may be impractical, dangerous or expensive in the real world.
- Personalized Learning: VR helps to students to get the knowledge according to their own style and learning pace and providing customized learning experiences.
- Engagement and Motivation: VR capture learners' attention by its immersive nature and increase their motivation and interest in learning.

Applications of how VR is being used in education contains:

1.Virtual Expeditions: Through VR, students can embark on virtual journeys, visiting historical monuments, natural landscapes globally, or various museums without leaving the classroom.

2.Anatomy and Biology: in this sphere students study human anatomy, biology, and medical procedures in a realistic and interactive way and enhancing their experiences about complex biological systems.

3. STEM Education: students are provided interactive simulations for conducting experiments, learning coding, or exploring physical principles in science, technology, engineering, and mathematics(STEM) applications.

4. Language Learning: for creating in real-life situations and conversations VR language learning apps are used.

Overall, by leveraging cutting-edge computer graphics, motion sensors, and display technologies, VR enables users to immerse themselves in vividly realistic simulations of real or imaginary worlds(Abdullah M.Al-Ansi, Mohammed Jaboob, Askar Garad&Ahmed Al-Ansi,2023).

Benefits and applications of Augmented Reality

Augmented Reality brings numerous advantages and practical uses to education, allowing new ways to enrich learning experiences and engage learners actively. Here are some benefits and examples of AR in the education sphere:

1. Enhanced Engagement: AR technology capture learner's attitude to make studying more engaging and memorable through interactive and immersive experiences.
2. Improved Visualization: AR presents the grasp of complex concepts and data through interactive visualizations, helping in better comprehension and memory retention.
3. Interactive learning: AR provides hands-on learning experiences by overlaying digital content onto real-world settings, enabling students to interact with virtual objects and scenarios in a tangible manner.
4. Real-World Relevance: AR bridges theoretical knowledge with practical applications by simulating real-world scenarios and problem-solving tasks in a virtual environment.

Applications:

- Interactive Textbooks: AR enhances traditional textbooks by adding multimedia content like 3D models, videos, and interactive quizzes, making study materials more engaging and interactive.
- Augmented Reality Labs: AR Labs offer opportunities to conduct practical experiments in a controlled virtual setting.
- Historical and Culture Exploration: AR apps allow students to explore historical sites, artifacts, and cultural heritage interactively, bring history and culture alive in the classroom.
- Virtual Prototyping: In engineering and design education, AR is used to create virtual prototypes and simulations that enable students to visualize and test their designs before implementation.

In summary, Augmented Reality in education simplifies a variety of advantages,

from increasing engagement to real-world relevance, and is utilized across different educational fields, revolutionizing the learning process and student interaction with educational content.

Application to Teaching at East Point

Eastern countries, such as China, Japan, South Korea, and Singapore, have been actively incorporating augmented reality (AR) and virtual reality (VR) into their educational systems. These countries have experienced how VR and AR transform traditional educational methods and enhance learning outcomes. Here are a couple of examples are given:

1. China: Zhigeng Pan has been actively involved in researching Virtual Reality and its educational applications since the early 2000s. Since 2016, VR is being started to utilize to create immersive learning experiences in subjects like history, science, and art. Educational institutions are adopting VR for virtual field trips, interactive simulations, and language learning modules. Chinese companies, additionally, have developed AR applications for educational purposes, including interactive textbooks and language learning tools.

2. Japan: In the late 1990s and early 2000s, Hirokazu Kato developed the ARTooKit, an open-source tracking library for Augmented Reality. Another Japanese researcher specializing in AR-based educational applications, Yasuaki Kakehi, also created the new method with the help of Augmented Reality in the mid-2000s. Both of them play the crucial role for creating virtual environment in Japanese classrooms.

To sum up, as Nikhil Pereira mentioned that the use of virtual reality(VR) and augmented reality(AR) in the educational sector was on the rise now more than ever.

Conclusion

Augmented reality and virtual reality, however, was recognized to the public in the early decades of 1800, the widely usage of them started around 2000s. “The implementation of virtual reality and augmented reality in educational settings is a process that is ongoing. It requires collaboration among educators, technology providers, and policymakers in order to address the challenges that are posed by new technologies and make the most of the opportunities they present to improve the teaching and learning experiences of students” mentioned by Veena Tewari Nandi(University of Technology and Applied Sciences (UTAS), K.K.Bajaj(RNB Global University) and Amitabh Mishra(University of Technology and Applied Sciences). They aid learners to enhance their experiences, learning skills, practical studies and language learning through engagement, interactive method, virtual labs, and virtual setting. In practice, around 2000s like Z.Pan, H.Kato and Y.Kakehi researchers informed about some clear ways of AR and VR methods in Eastern Countries educational system.

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