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Augmented Reality and Mixed Reality in Education

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Abstract

Augmented Reality (AR) and Mixed Reality (MR) are indispensable for the learning process in this e-world. It enhances the understanding of the contents, improves learning spatial structure and function as well as learning language associations. AR and MR play a major role in long-term memory retention in learning the ideas and concepts. Learners' motivation is highly intensified by the combination of the real and virtual world. These digital elements provide improved physical task performance and collaborations in Education. This paper focuses on giving insightful thought about AR and MR technology in a digital environment.

Keywords

Augmented Reality (AR), Mixed Reality (MR), Digital Environment, Technology

Introduction

Advancement in Technology creates the most live environment for learners in all the fields. The new trends in technology significantly increase the range and refine the feasible learning and teaching activities. Taking a break from the mundane, assume the role of Augmented Reality (AR), wrap the bright shades of Mixed Reality (MR) and let go of the shackles in learning experiences of the real world. AR & MR wave to flow without a hitch to care and cherish every visual brought out of the real world. It makes people realize that this quality, we often restrict and reserve is an actual power of technology. Augmented Reality is an interactive experience in which digital information is infused into the user's perspective of the real world by technology. This environment can be accessed by head-mounted or hand-held AR technology, as well as a computer display, special eyeglasses, gaming devices, or even a smartphone.

"Mixed reality" takes this technology a step further by fusing the physical and virtual worlds in ways that allow them to interact. While AR effectively builds a virtual overlay on top of the real environment, MR focuses on integrating virtual objects and input into the physical

world. As a result, MR immerses the user in immersive learning. An architect, for example, could be able to “test drive” a building that has yet to be built, utilising MR technology to “walk” through its rooms and even take a “tour” of its HVAC system. Virtual reality (VR), a close cousin of MR, is described as immersing a user in a completely simulated environment. XR, or extended reality, is a phrase used to group AR, MR, and VR together.

Need for Augmented and Mixed Reality in Education

During this perpetual time of technology, this paper highlights the applications of Augmented Reality (AR) and Mixed Reality (MR) in Education. In the Immersive Learning Landscape, AR/MR applications, such as AR gears and glasses, and sensors, are creating technologies that make use of technological developments in software and hardware for both mobile and non-mobile devices.AR is implied in the fields of advertising, retail, navigation, maintenance & repair, manufacturing. In recent years, they have been creating greater impact among educational researchers and practitioners and they are intended to implement these technologies in their fields as well. AR and MR plays a major role in the fields of Holographic devices, immersive devices, communication, education, and manufacturing. AR/MR technologies have the potential to usher in a new era in education by transforming how individuals of all ages learn new skills and interact with one another and their surroundings. Implementing augmented reality in education at an early stage can benefit the industry while also assisting students in achieving their academic objectives. Despite the growing interest in AR/MR devices as learning tools, the number of primary research studies on their integration into educational environments is still limited.

Augmented reality provides students with new and fascinating learning opportunities, mostly because it allows them to view things that are not feasible in real life. Dinosaurs can be brought into the classroom, 3D history models can be explored, and human anatomy can be closely examined. While incorporating AR into a distance learning setting may be more difficult, it is possible with adequate student and learner collaboration. Augmented Reality can teach us a lot of things that would be impossible to teach in normal life, which is why it is such an important technology.

General Benefits of AR/MR Technology

- Increased productivity
- Interesting engaging content
- Long-term knowledge retention
- Quality work
- Streamlined Work processes
- Early detection of flaws
- Cost saving
- Real time Inspection
- Cross-geographic Collaboration
- Enhanced decision making
- Virtual work

- No physical training stuff
- Interactive Learning material
- Rise-free exploration

Augmented Reality and Mixed Reality in Education

Teachers can use augmented reality to present virtual examples of ideas and incorporate gaming aspects to supplement textbook material. This helps the students to increase the span of attention and improves the retention of concepts in memory longer than usual. For the eyes glistening with the quest to learn more about the new abode of technology in the wee hours of learning, AR & MR plays an important role in Education. AR is revolutionising education making learning immersive and more engaging.

- AR/MR integration pedagogical paradigms, learning theories, and educational techniques
- Real-time monitoring and assessment of students
- Groups of augmented teachers and students
- Educators' professional development programmes for using AR/MR devices in the classroom
- Augmented reality (AR) and mixed reality (MR) learning environments and educational applications design and development
- Game-based AR/MR learning settings
- Formal (K-12), informal (vocational education, work-based learning), and non-formal (vocational education, work-based learning) AR/MR learning settings and domains; open and distance education
- Copyright and fair use of educational augmented reality and mixed reality apps
- Learner mobility and transitions across formal, non-formal, and informal learning contexts are made possible
- Issues with AR/MR learning experience testing, assessment, and quality
- User acceptability of augmented reality and mixed reality learning apps (teachers, students, and parents)
- Issues with AR/MR for teaching and learning in terms of infrastructure, administration, and organisation
- Concerns about privacy and security in relation to AR/MR in education

Applications of AR and MR technologies

Categories of AR & MR	AR & MR in Various Fields	Applications
Guidance and Collaboration	Automotive, construction, aerospace & defence, industrial products, oil & gas, healthcare providers, power & utilities, technology	Helps the worker to visualise the tasks such as maintenance, repair or assembly. It improves productivity, reduces risks, streamlined work processes, cross-geographic collaboration
Immersive Learning	Higher education, health care providers, consumer products and industrial products	Provides improved therapeutic outcomes, reduced risks, cost savings, strong retention of material
Enhanced Consumed Experience	Media & entertainment, automotive, banking & securities, healthcare providers, industrial products, travel, hospitality and services	Enables better customer engagement, increased sales, enhanced brand positioning, increased marketing opportunities
Design and Analysis	Aerospace and defence, industrial products, automotive, construction, real estate, technology	Employs new methods to analyse data and generate insights, cost savings, increased efficiency, early detection of design flaws

Advantages of AR/MR in Education

- Instead of holding chemicals in hand, it helps the students perform the experiments in the safer environment.
- Simulated development cycles in which space, season, and other aspects are taken into account allow students to learn about plants and their relationships with their environments.
- By merging digital goods into the "real world," augmented reality (AR) promotes interactivity and engagement.
- Cost friendly makes these apps do not limit the students in learning in the classroom.
- It helps in understanding the abstract, spatial geometric concepts through virtual 3D objects.
- It allows students to focus on curriculum subjects while spending less time learning how to use new technology.

- AR enhances the ability of student's retention and acquisition of information and skills.
- Instead of traditional view, this technology presents information in two-dimensional method.
- AR intensifies students' knowledge in various areas such as
    - Working with numbers
    - Reading
    - Real-life environments & scenarios
    - Spatial concepts
    - Content creation
    - Playing
- It helps in communicate and collaborate in the learning process.
- It stimulates interest and discussion in different subject areas.

Some of the App's of AR/MR in Education

S. No.	AR Applications	Uses
1	SkyView	• People can use SkyView to identify stars, constellations, planets, and even satellites by pointing their mobile device upward. • It allows pupils to explore the universe through the use of augmented reality night sky overlays.
2	Froggipedia	• Instead of dissecting the frogs in the biology lab which is very disgusting and awful for us as well as frogs, through Froggipedia, the students can explore the internal organs of frogs with AR technology.
3	Microsoft Holo Lens	• Medical students and professionals can use MR reality to learn about the human body. • Students can learn about anatomy by flowing through the bloodstream, isolating parts, enlarging them, and even walking inside those components of the human body using Microsoft Holo Lens, which also aids in learning how to treat medical disorders.
4	Google Expeditions	• Instead of the most expensive expeditions such as touring Base camps, work stations, industries, Louvre etc., Google Expeditions can provide highly immersive trips.
5	Virtual Speech	• It uses immersive, realistic virtual reality simulations to aid improve public speaking skills.
6	Mondly	• It helps learning languages by having real conversations

S. No.	AR Applications	Uses
7	ARKit	• It gives users AR experiences with the help of amazing 3D graphics and vertical tracking • It gives non-interrupted AR experiences • It provides greater immersive opportunities by incorporating real- world objects into the AR experiences
8	Vuzix Blade smart glasses	• The Glasses use GPS to provide directions and snap images. • It's utilised for virtual gaming, face recognition, and holographic displays. • They are lightweight and have wave-guide technology.
9	Quiver	• Quiver includes a set of colouring pages that allow youngsters to spin a globe in mid-air and make cells explode off the paper. • This app allows students to engage with three-dimensional figures in addition to the visuals in their textbooks.
10	Elements 4D	• This programme aids in the creation of lesson plans for students in elementary, middle, and high school. • Educators can print out the triggered images and assemble blocks for an AR experience.
11	Blippar	• Blippar helps in transforming the child's reading experience by making them to think intensely and approach in a new way.
12	Arloon Plants	• Through Arloon trigger, the students can observe the plant growth and movement. • It also provides some foundational science concepts regarding plants growth.
13	Aurasma	• Recently with scannable technology, QR Codes and AR is used to share student work. • Users of Aurasma can upload trigger images of their choice and add videos to make their very own AR experience.
14	Math Alive	• Teachers and students place the trigger card under a camera to practise counting and basic numeracy skills.

Conclusion

In education, augmented reality allows students to access more interactive and appealing material with more interesting content in the form of videos, images, animations, and other media that can capture the attention of the student at all academic levels, resulting in increased knowledge and retention. Using augmented reality to pique people's interest in the education industry might be a game-changer for both academics and students, allowing them to expand their knowledge while avoiding the tedious aspects of the existing educational system. By incorporating augmented reality into education, academics may contribute to the progress of the industry as a whole, achieving higher results with greater potential while attracting new students to their educational institutions. One important reason is that accepting responsibility for projects increases a student's sense of responsibility and engagement with the material. AR bridges the gap between textbook information and learning content developed by educators.

AR is becoming more cost-efficient, accessible, effective, and vital, notably in equipping schoolchildren with the skills and information needed to collaborate with others and advance in future employment. Designing open-ended classes that allow children to pursue their own interests will be a crucial aspect in increasing their effectiveness and confidence in these areas. Embracing the AR & MR technology in all the fields especially in Education, accepting and flaunting its necessity is beyond the imagination and they have the power and responsibility to the channel. Augmented Reality and Mixed Reality in Education should be encouraged for experiencing vibrant hues, exciting times of real-world experience in the learning process. AR/MR enhances learning is for all and deals with the issues of equity, accessibility, and diversity.

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