

# ROLE OF AUGMENTED REALITY IN THE FIELD OF EDUCATION

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**Abstract** - Students will be able to comprehend and communicate more clearly with the help of the immersive technologies i.e. Virtual Reality (VR) and Augmented Reality (AR). Emerging technologies like VR and AR are notable examples because of their quick development, 3D and 4D techniques. These techniques replace the traditional method of teaching to the digital method of teaching. The aim of this technologies in the field of education to simulate the student and the teacher in the digital world and to enhance their skills. For product demonstration education, these VR and AR techniques are used. VR and AR designers must re-evaluate the fundamentals of interactions between humans and computers. In this paper AR technologies are used for the creation of educational aids and their implementation.

**Key Words:** Virtual Reality, Augmented Reality, Information and Communication Tool

## 1. INTRODUCTION

The concept of VR and AR in E-learning promotes interactivity. Through VR and AR, students would be better able to comprehend and communicate. It allows users to not only see what is being presented to them but also interact with it[1]. The use of AR encourages **self-directed learning**, creativity, and problem-solving, as learners can explore topics at their own pace and from multiple perspectives. Educators can also design innovative lesson plans that incorporate real-world scenarios, bridging the gap between theoretical knowledge and practical application.

In the long term, AR has the potential to become a standard tool in classrooms, contributing to the evolution of digital learning environments and paving the way for technologies such as the Metaverse, where education can be experienced in fully immersive virtual settings.

AR is increasingly being implemented in **college and school laboratories**, providing practical, hands-on experiences without the limitations of physical resources. This allows students to conduct experiments, observe phenomena, and interact with virtual equipment in a safe and controlled environment.

### 1.1 Virtual Reality (VR)

The technical content and artistic charm of VR tools to create the 360° videos inspire people to create the more and more interactive application. VR gives the feeling to the user of

being in the virtual environment. Students simulate themselves in that environment by wearing the VR tools like Boxes[2]:

### 1.2 Augmented Reality (AR)

Augmented Reality (AR) is a combination of technologies that overlays virtual information in a real-world environment in real-time. The technology of AR was first deployed in the aviation part for teaching aviators. In AR digital objects are placed in real environment [2].

## 2. Objectives

The main objective of the present paper is

- To implement these technologies in the field of education to foster experiential and autonomous learning in learners and also make the teacher skill oriented.
- To increase the motivation

## 3. Methodologies: Implementation of AR Tools and Techniques in Education

The methodology for integrating Augmented Reality (AR) in educational contexts involves selecting appropriate tools and applying effective AR techniques to enhance learning outcomes. The approach focuses on both content creation and interactive deployment, ensuring that students can engage meaningfully with educational material.

### 1. AR Tools Used

A variety of AR tools were utilized to develop interactive educational experiences:

- **Smartphone Apps:** Mobile AR applications were used to deliver interactive content directly to students' devices, providing accessibility and ease of use.
- **Unity AR:** Unity was employed for creating interactive 3D educational modules, such as virtual simulations and gamified learning experiences.
- **Adobe Aero:** This tool facilitated the creation of AR experiences without extensive programming, suitable for designing visually engaging lessons.

- **3D Viewer and MS Paint 3D:** These tools allowed for the creation and manipulation of 3D models to represent educational objects in AR environments.
- **AR Spark Studio & Blender:** Advanced AR design tools were applied to produce high-fidelity 3D objects and immersive simulations, particularly for subjects like anatomy, engineering, and physics.

## 2. AR Techniques Applied

The AR content was deployed using the following techniques:

- **Marker-Based AR:** Physical markers were used to trigger AR content, enabling students to view interactive models or information by scanning printed materials or objects.
- **Target Image-Based AR:** Specific images served as targets to initiate AR experiences, allowing flexible integration with textbooks, worksheets, or digital content.
- **3D Object-Based AR:** Interactive 3D objects were embedded in the learning environment, enabling students to explore complex structures and systems in an intuitive, hands-on manner.

## 3. Methodological Approach

1. **Content Creation:** Using the above tools, AR content was developed to align with curriculum objectives. 3D models, simulations, and interactive lessons were prepared for subjects where visualization enhances comprehension.
2. **Deployment:** The AR experiences were deployed using smartphones or AR-enabled devices in classroom and virtual settings. Marker-based and target image-based triggers were tested for accuracy and engagement.
3. **Evaluation:** Student interaction with AR modules was monitored to assess engagement, comprehension, and learning outcomes. Feedback was collected to refine AR content and optimize the learning methodology.

## 4. Integration with Education

By combining the above tools and techniques, the methodology ensures that AR experiences are pedagogically effective and technologically feasible. This approach allows learners to visualize abstract concepts, interact with dynamic content, and engage in experiential learning that supports a deeper understanding of educational material.

**Table -1: AR Tools and Techniques in Education**

AR Tools and Techniques		
S.NO.	AR Tools	AR Techniques
1	Smartphone apps	Marker-Based AR
3	Unite AR	Target Image based
4	Adobe aero	Creation of 3D effects and images
5	Unity	3D Objects
6	3D Viwer	MS Paint 3D
7	AR SPARK STUDIO	Blender,MS paint 3D

## 5. Development of Target-Based Augmented Reality Cards for Educational Enhancement

To enhance student engagement and learning outcomes, a target-based Augmented Reality (AR) card was developed for botany education. This AR card was created using **UniteAR** [3] and **MS Paint 3D**, with supplementary modeling in **Blender** [4]. The AR card is designed to replace traditional teaching methods by providing an interactive and visually immersive learning experience.

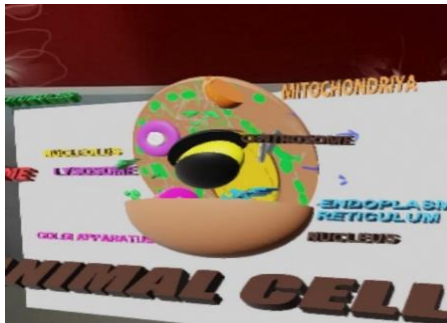
For implementation, teachers download the UniteAR app and scan the target-based image generated through MS Paint 3D and Blender. Additionally, a QR code [5] is created to facilitate easy access to the AR content. This methodology allows students to interact with educational material in a more engaging way, fostering interest in Information and Communication Technology (ICT) tools [6] and innovative learning techniques. Feedback from both students and educators indicates a high level of enthusiasm and effectiveness in using AR for educational purposes.



**Fig -1:** Target-Based AR Card Created Using MS Paint 3D and Blender



**Fig -2:** Generated QR Code for Accessing AR Educational Content



**Fig -3:** Interactive 3D Visualization of Botany Model via AR Card

Furthermore, UniteAR can be upgraded to include additional elements for longer-term interactive content, allowing for extended and enriched educational experiences.

### Future Scope

The role of Augmented Reality (AR) and Virtual Reality (VR) in education is vast and transformative. These technologies enable the design of comprehensive educational curricula in which both students and teachers can immerse themselves fully in the digital era. The concept of educational technology has gained prominence with the increasing integration of AR and VR in learning environments. The advent of these technologies provides educators and engineers with innovative tools to develop educational setups that facilitate learning at all levels. Looking ahead, the growth of AR and VR may contribute to the emergence of the Metaverse, creating virtual worlds where users can engage continuously in immersive educational experiences.

### 3. CONCLUSIONS

Rather than relying solely on word definitions or textbook images, this study demonstrates how Virtual Reality (VR) and Augmented Reality (AR) can be used to explore subjects and visualize concepts interactively. These technologies encourage students to engage in **self-paced, self-directed**

**learning** and acquire knowledge through **active participation** rather than passive observation. Moreover, VR and AR are increasingly being utilized in **school and college laboratories**, allowing students to conduct experiments, explore phenomena, and interact with virtual equipment in a safe and controlled environment. The paper highlights the diverse applications of VR and AR in education, showcasing how they enhance the connection between students and teachers and make learning more immersive, engaging, and effective.

### REFERENCES

- [1] Azuma, R.T., 1997. A survey of augmented reality. Presence: Teleoperators & Virtual Environments. Vol. 6, No. 4.
- [2] Anastassova, M., Souvestre, F., Gonzalez, E.A., Gutierrez, A.S., Benito, J.R.L. and Barak, M., 2014. Learner-centered evaluation of an augmented reality system for embedded engineering education. Annals of Computer Science and Information Systems. Vol. 4.
- [3] <https://app.unitear.com/>
- [4] Azuma, R., Baillet, Y., Behringer, R., Feiner, S., Julier, S. and MacIntyre, B., 2001. Recent advances in augmented reality. IEEE computer graphics and applications. Vol. 21.
- [5] <https://play.google.com/store/apps/details?id=com.ibosoninnov.unitear&hl=en&gl=US&pli=1>
- [6] H. Kaufmann, D. Schmalstieg: "Mathematics And Geometry Education With Collaborative Augmented Reality"; in: "Siggraph 2002 Conference Abstracts and Applications", ACM Press, 2002.