

# Augmented Reality and Virtual Reality in the field of Education

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**Abstract** - Innovation is the key for all the developments in India, it has also played a vital role in evolving the way education sector works. Augmented Reality has changed the way education is delivered to the masses using the rich media such as mobiles, laptops, tablets which help the students to access the information anywhere and anytime. It makes the learning process not only easy but also interesting developing high level of creativity, critical analysis and independent thinking in students. AR enables the covering of virtual information into the real environment in real time. Associative learning allows students to engross with other students leading in a higher motivation and deeper understanding.

Just like AR Virtual Reality has also played a vital role in upgrading the way education is imparted to students. Virtual Reality is further classified into two the first is Non Immersive which is a computer-based environment that can replicate the real or imagined worlds, second is Immersive which gives us the sensation of being present in a virtual world. Immersive is more user-friendly and economically accessible.

## 1. INTRODUCTION

Information gained by an individual is generally delivered through different media. However, the conventional 'verbal' education method is not always beneficial. With the growing technology there were many different digital ideas with which the market got a boom, the well know two different ideas using which the various applications were developed are Augmented Reality and Virtual Reality.

### 1.1 Augmented Reality

#### 1.1.1 What is A.R?

A technology that overlays a computerized image on to the real world in the user's view point, thus providing a composite view.

We propose four design specifications that need to be taken into consideration to successfully incorporate AR into classroom practice.

#### 1.1.2 Requirement of A.R

1. Flexible content that would help children learn in a better manner.
2. Guided exploration to maximize learning opportunity.
3. In limited time.
4. Taking care of the needs of institutions and curricular requirements.

## 1.2 VIRTUAL REALITY

### 1.2.1 What is V.R?

- Virtual reality is an interactive computer-generated experience taking place within a simulated environment. It incorporates mainly auditory and visual feedback, but may also allow other types of sensory feedback. This immersive environment can be similar to the real world or it can be fantastical.
- VR systems that include transmission of vibrations and other sensations to the user through a controller or other devices are known as haptic systems. This tactile information is generally known as force feedback in medical, video gaming, and military training applications.

### 1.2.2 Basic Principles

There are 3 basic principles

1. Immersion
2. Interaction
3. User involvement with the environment and narrative

These three principles play a great role in offering high potential in education by making learning more motivating and engaging for the students.

## 2. Potential of A.R and V.R in Education Sector

Now as we talk about the involvement of the new technologies like AR and VR we need to know the previous

works and potentials these technologies have when it comes to education sector.

### 2.1 Augmented Reality

Talking about AR potential it boosts up young student's minds through narrative technologies. Research studies can provide an abstract basis, as well as practical enlightenment, to current and future educational driving interest in strengthening the educational merits of augmented reality. The use of AR can provide users with access to rich and meaningful multimedia content that is contextually relevant and can be easily and immediately acted upon. AR allows its user to intuit the real world through a virtual coat. Numerous researchers have pointed out Augmented Reality as having immense caliber to enhance learning and teaching. The complicated software and numerous hardware devices used by Augmented Reality systems are also used by a number of other technologies.

The distinguishing ability of Augmented Reality is the uninterrupted fertilizing of virtual objects onto a real environment in a contextually relevant manner. Learning experience can be more meaningful when more senses are involved (sound, sight, touch, emotions, etc.).

### 2.2 Virtual Reality

Now talking about the potentials of VR regarding the transformation in education. VR can be used for simulation-based education, where students and learners can practice new skills in a replicated environment that enables rectification, iteration and non-dangerous failure and at the same time offers access to interaction with expensive or far-away environments. Initially for a couple of years myriad of competitors launched their own HMDs, making this new technology accessible to the public and for research and education purposes as well. In a 2016 report on technology in higher education the New Media Consortium predicted that VR technologies will be adopted in the higher education sector within 2-3 years. There was also a point of cost in the various VR as well as AR technologies but as time passed and new inventions were made with greater accessibility and lesser cost helping people to have a better use of the technology.

## 3. APPLICATIONS

### 3.1 Augmented Reality

#### 1. Augmented reality in the classroom

These help the teacher explain a subject, provide a visual representation of the material, and help students test out their knowledge in practice.

### 2. Distance learning

Students can learn even outside the classroom, Online or distance learning can be easier and more efficient with AR-aided educational materials.

### 3. Marketing in education

There is huge potential in AR technologies for marketing and advertising, even in the education field. A number of universities in the USA are already using AR tours to increase enrollment and help new students find their way around campus.

### 3.2 Virtual Reality

#### 1. Field Trips

These technologies enable students to virtually visit locations that they aren't able to physically visit.

#### 2. Training

Virtual reality gives students the opportunity to experience the activities they are learning.

#### 3. Design

Perhaps one of the best early uses of virtual reality is in architecture – being able to visit and explore a building before any construction actually begins is a huge step forward for this field.

## 4. BACKGROUND

### 4.1 Augmented Reality

Augmented Reality has the capability to capture and influence student to inspect material from a various perspectives, it has been shown to be useful for teaching subject that students could not experience hand-on in the real world. It illustrates the spatial relationships and the interrelation of elements within a 3D space while providing the capability for seamless relationship between the real and virtual worlds. As educational technology developers move towards a view of learning conditions colonize with a blend of hardware and software applications. The focus of our attention as researchers is in the nature of the potential and limitations offered by AR technology to both learning and teaching teams. Due to the strict syllabus and time constraint both the teachers as well as the pupils are not able to explore the complex things of a subject.

AR applications can be helpful here, we need to know the basic principles of AR to develop AR tool. An empirical study held with 133 children aged 9 –

10 years and their teachers from 5 schools in London, a collation of the statements used by teachers engaged in teaching about the moon, earth and sun using either AR or more traditional methods.

Our analysis uses 2 data sources:

- Video recordings of teaching sessions
- Audio recordings of interviews with teachers.

We demonstrate that teachers are cheerful about the merits of AR for subjects that include things like earth, sun and moon. Applications need more interactivity and variable so as to enable users to control more dimensions of the digital enhancements.

#### 4.2 Virtual Reality

One of the challenges in working with media is that developers and education providers are approached with a fast moving target in terms of information capabilities.

These people are telecommunicating to assess the potential, create instructional materials and implement a school- based infrastructure for today's technologies

People's understanding of what computers can do has changed drastically as the size and cost of these devices has decreased while their power has grown.

First, computers were seen as number machines, then data processing, now we live in the age of tools that manipulate information.

There is a need to provide life-time education for all beings and to have a flexible workplace. VR has been proposed as a major technological advance that has caliber to support such education.

Most importantly it allows students to visualize concepts, to observe events at basic level.

Designers and evaluators of immersive VR systems have many ideas regarding how VR can promote learning but concern is which of the VR's features provide better understanding or how to customize

these features affordances for different learning environments. Other factors such as the concepts to be learned, learning experience, and individual characteristics all play a role in shaping the learning process and outcome.

#### 5. Augmented Reality in Education Sector

Education can be imparted through many ways, as students can avail education through interaction with teachers, and through non interactive media such as E-books and videos. The non-interactive media like digital media has widely changed education sector in the last half century, providing students with learning using the various educational games. In the initial stage Digital learning experiences have only been accessible in classrooms using desktop computers and interactive whiteboards, and more recently, learning experiences are accessible through portable devices such as smart phones and tablets.

Furthermore, the manner of association with learning experiences is changing, now, students can use their whole body to link with educational content that looks to exist in the physical world, as earlier students do not use only the keyboards and mice to associate with on-screen content. It is feasible because augmented reality brings virtual computing into user's physical environment and let the user to use their whole body to link with the virtual content.

Augmented reality experiences can take a diverse forms, there are many possible rewards which augmented reality technology can bring to students lives, like improved leisure through complete body interaction, advancing education through interactive visualizations, reestablishment and skill building through physical changes.

AR applications based on smart phone allow users to travel through their environment while looking at augmented world through a mobile device, but mobile device restricts the user's power to physically link with the augmented space. Webcam-based AR applications make use of a computer camera to capture a physical space and display an augmentation on a screen, such as a desktop monitor or well projector, allowing the user to use

their hands to easily manipulate the augmented content. In webcam AR applications they utilize large space like classroom, allowing the user to use their entire body to control a virtual experience and view outcomes on a different screen but the difference between these and AR experiences is that in the AR experience virtual content is placed in the physical space surrounding the user. Finally, HMD AR applications require users to wear specialized goggles, which have an internal display and attached video camera; these allow the user to have a personal view on the augmented space and to be able to use their hands to easily change the AR experience.

## 6. Virtual Reality in Education Sector

Education Sector's working has also changed its way of imparting education to students using the VR technologies.

VR has been made on three different search levels:

1. Immersive Virtual Reality Education
2. Oculus Rift Education
3. Head Mounted Display Education

There are two groups in this one focusing on **adult vocational training** in all areas in which the real conditions may not be employed for practice due to lack of access to it or because it is highly dangerous for example environment to teach the US army soldiers, VR based experiments made in training situations for supply chain workers using different devices and the other for high **school and university education**, we found solutions that use a HMD, e.g. a system to help teachers in class management, a 3D interactive virtual chemistry lab. In some universities, the traditional projector got replaced with HMDs enhancing interest and control of the students over the lesson. An intelligent learning environment has been developed and implemented in various subjects of a Computer Science degree.

VR has been widely used at very different levels. To begin with the nurse education in a collaborative immersive system, medical training in a virtual hospital, a surgical education system that uses a HMD, simulated caries removal exercise dental students it is also used for educational purposes and

for rehabilitation purposes on the patients directly. Presence is the feeling of being in a surrounding which is virtual and it most distinguishes VR from 3D on a screen.

### Immersion:

Virtual Environment can simulate objects and actions that appear in the real world. It has been noticed that the removal of interface between computer and user is important condition for immersion in VR. The user "wears the computer" and gets "inside" the data, outcome of which is that participants can interact with the virtual world.

Immersive VR allows students to interact with the world using "natural semantics" of the world. This means the students can link with the objects and can experience phenomena in the virtual world which is more natural than those normally employed when interacting with computers.

### Interaction:

It is suggested that interaction is an essential requirement of learning than immersion for some kinds of tasks. Educational technologists have always given importance to the fact that students must have an interactive environment for better learning.

### Engaging:

In VR the Virtual Environment is very engaging for students the reason for this is VR and its association in children's minds with computer and video games, it also empowers the students who can control the computer to carry out their complex and sophisticated ways. It also allows the students to understand concepts and principles that are hard to understand by just theory and without virtualization which is intrinsically motivating.

## ACKNOWLEDGEMENT

As we have discussed about the effect AR and VR are putting on education and are aware how it affects the students mind set and learning abilities we can still say that augmented reality has the potential to replace the Internet in terms of size and application. But it is noted in the educational domain, practice of technology is by no means a

guarantee of success. Also we need to note that, poor use of emerging technology can result in less productive learning outcomes. The challenge for educators is to tackle the power of Augmented Reality in ways that contribute to the growth of students, which means allowing the development of student's higher order thinking capabilities.

Also as we talk about the Virtual Reality it is important to understand that researchers begin to identify and solve the issues related to VR now so as to use it the best possible way for the benefit of all students in the future. As the technology matures, VR will have the capability to be an extremely powerful medium. But with every technology it must be kept in mind that VR is a tool to be used as a medium with other methods of instruction.

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## BIOGRAPHIES

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