Augmented Reality and the potential for Education

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ABSTRACT

Advances in technology enable the use of innovative learning tools for education which can influence students to learn actively and can motivate them, leading to an effective process of learning. The rapid evolution of technology over the last decade has changed the face of education, especially when technology combined with adequate pedagogical foundations and has yielded new ways to develop applications for improving the quality of teaching and learning experiences. Augmented Reality (AR) is one such technology that offers a new way to educate so as to help learners in developing critical capacity and deeper understanding of the concepts. This paper provides an information of Augmented Reality and exemplify the potentials for education.

Key Words: Augmented Reality (AR), Technology, Education

INTRODUCTION

In recent years, technology enhanced learning (TEL) research has increasingly focussed on emergent technologies such as augmented reality, mobile learning, serious games for improving the experiences and satisfaction of the users in the enriched multimodal learning environments.

AR is a booming technology that attracts more and more attention from HCI (Human Computer Interaction) researchers and designers. This allows for the creation of meaningful educational experiences that are grounded in a substantive subject area of knowledge and focus

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on the intellectual and emotional development of the viewer. From these latest perspectives, AR learning environments have the potential to offer both educational and entertainment value.

Visualising the invisible has been one of the most fascinating phenomenon for humans during the history. Modern technologies like Augmented Reality (AR) are often used to enrich the experience and display otherwise hidden phenomena particularly in science education. The long tradition of learning by doing started by John Dewey more than 100 years ago was brought into the most modern information technology context.

Understanding the Augmented Reality

The ability to overlay or superimpose computer graphics (digital data) into the real world is commonly called Augmented Reality (AR). Augmented Reality is the integration of computer generated digital content and the real world in real-time. Augmented Reality (AR) is live direct or indirect view of a physical real world environment whose elements are augmented (or supplemented) by computer generated sensory input such as sound, video, graphics or GPS data (Wikipedia). It is related to a more general concept called mediated reality, in which a view of reality is modified (possibly even diminished rather than augmented) by a computer. As a result, the technology functions by enhancing one's current perception of reality.In simpler terms Augmented Reality is a combination of a real scene viewed by a user and a virtual scene generated by a computer that augments the scene with additional information.in layman's language, it is a

technology that adds something that augments reality and is a technology in our hands.

According to Azuma (1997), Augmented Reality (AR) must have three characteristics (1) combining the real and virtual worlds (2) having real time interaction with the user (3) is being registered in a 3D space.

Unlike virtual reality, which creates a totally artificial environment, augmented reality uses the existing environment and overlays new information on top of it. An augmented reality technology creates a combined view for the user. This composite view consists of real scene viewed and a computer-generated scene with additional information about the object or a place. In an AR interface, the user views the world through a handheld or head mounted display (HMD) that is either see-through or overlays graphics on video of the surrounding environment.

The term Augmented Reality was coined by Boeing researcher Thomas Caudell in 1990, to describe how the head-mounted displays(HMD) that electricians used when assembling complicated wiring harnesses worked. One of the first commercial applications of AR technology was the yellow "first down" line that began appearing in televised football games sometime in 1998.

Methodologies on which AR works

Augmented Reality works on two methodologies:

- ***Marker-Based***: Markers based AR works on software recognize in a specific pattern, like a symbol or

barcode. In this, when a camera points on an object, it creates a digital image on the screen.

- ***Location-Based***: Location-based app utilizes the capability of a specific device to record the object's position in the globe. It is then provided data about the object that is appropriate to the location. We can use location-based AR to find our way around in an unknown city, recalling where we have parked our car, finding the name of stores, places, mountains, stars in the sky or anything anywhere.

Augmented Reality (AR) content can be accessed by scanning or viewing a marker or trigger image with a mobile device that creates a subsequent action. This action can be a video, another image, 3D Animations, Games, QR code, or whatever you want it to be.In AR, there is an intimate relationship between virtual and physical objects.

Augmented reality apps are written in special 3D programs that allow the developer to tie animation or contextual digital information in the computer program to an augmented reality "marker" in the real world. When a computing device's AR app or browser plug-in receives digital information from a known marker, it begins to execute the marker's code and layer the correct image or images.

AR applications for smart phones typically include global positioning system (GPS) to pinpoint the user's location and its compass to detect device orientation. Sophisticated AR programs used by the military for training may include machine vision, object recognition and gesture recognition. Augmented reality apps connected to content can create

mind-blowing learning experiences and endless learning possibilities. These type of learning experiences really speak to the needs of visual learners.

AUGMENTED REALITY IN EDUCATION

Augmented Reality (AR) is a way to bring a new dimension to learning and is a disruptive innovation (which means something that generates a very important change). By unlocking the everyday world, one can dig deeper and engage learners in a new and interesting way.AR technology is not a new issue. It has been used in fields such as military, medicine, engineering, designing, robotics, manufacturing, psychological treatments etc. AR can be applied for learning, entertainment, or edutainment by enhancing a user's perception of interaction with the real world. It is an example of technology that can make classroom learning more transformational and engaging and has the potential to revolutionize education.

In line with the constructivist theory of learning, an augmented content moves from a teacher-centred content to a learner centred where student constructs new information based upon their previous knowledge. Students use their interactions with new environments to create meaning.

Eric, Mark, Graham and Barbara (2004) integrated five examples of AR in teaching in their research to illustrate the advantages of AR in teaching. The advantages include:(1) learners like this kind of instructional material; (2) as far as the courses about spatial concept relations are concerned, AR materials can help learners to clarify relative conceptions;(3) AR materials can better demonstrate knowledge about time concepts than

traditional teaching materials;(4) virtual objects produced by the AR learning system are presented as 3D objects and learners can interact directly with these virtual objects;(5) referring to the concept of constructivism ,AR model can allow learners to change their native knowledge, independently.

The beauty of Augmented Reality is that the learning experiences can be as easy or as complex as we want. We can create our own, or download the numerous already-made apps connected to various content. But what's even more enticing is that students can easily create these experiences on their own in a matter of minutes. Using the ***Aurasma App*** and Aurasma Studio created by software company Autonomy in 2011, we can create our own "Auras" (or AR experiences), and use them to engage students in creative ways. For example, enliven up our school's art show, or make math come alive through videos of students solving math problems--perhaps students can trigger an Aura by pointing their smartphone at a particular equation. We could even attach a trigger image to a Google Form to request time with the school counsellor, or make a class picture image on your teacher website trigger a virtual tour of a classroom.

The options for using AR are endless, and so here a few awesome Augmented Reality apps and resources being used in classrooms to provide engaging content and interactions for students:

- **Popar Toys:** This catalog of AR resources changes the way children read books, look at posters, or complete puzzles. (Basically, everything is an

animated picture!) Students enjoy their interactive books on Planets, Bugs, Dinosaurs, Safari, and Sea Life, or perhaps the interactive charts on Human Anatomy, Periodic Tables, World Maps, The Solar System and US Presidents.

- **Daqri:** One of the leading augmented reality developers, Daqri is the creator of Daqri Studio--a truly creative tool for designing our own Augmented Reality projects. Science teachers can check out Anatomy 4D (which allows us to view 3-D images of the human body, and heart) and Elements 4D (which enhances a chemistry classroom by bringing the periodic table to life).

There several other AR apps available for both android/ios that one explore online including various video demos how it really works to get more clearer concept of it.

It may seem to be little surprising but in present scenario around 71 percent of people aged between 16 to 24 years old possess smart phone. So why aren't teachers using AR technology for engaging their students; I think they should. Augmented reality helps teachers to add digital contents with lot of information as well as geographic locations about a place or object. Digital information appears on the screen when we *scan any object or place using our tablet*, phone or smart devices with AR technology. This digital information is gathered from 3D models, various website, video, etc.

However, Shelton (2002) estimated that AR has not been adopted into academic settings due to lack of awareness of needs for AR in academic settings.

So wouldn't it be wonderful if our mobile phone sees and recognizes the world as we do. Like walking and seeing the object and able to recognize information about the object in the same way our brain does. Such things may seem like to us as science fiction but now this is actually possible with Augmented Reality.

REASONS FOR USING AUGMENTED REALITY IN EDUCATION

- **Eye-Catching Presentations-** By integrating augmented reality into our lectures, we'll capture the attention of our audience. For instance, a teacher in dentistry integrates Augment into his lessons to show 3D models of teeth and how the human jaw works.
- **Interactive Lessons-** Let your audience participate! By viewing augmented models, the students can gain a better understanding of the concepts they are studying. This is a fun way to engage students and reinforce concepts they've seen during class lectures.
- **Portable And Less Expensive Learning Materials-** Prototypes, physical models, and detailed illustrations and posters are all extremely expensive. More often than not, schools do not have enough money to buy all the supplementary learning materials they would like. Further, these learning materials get worn down, lose their relevance, and get misplaced over time. With Augment, we do not have to invest in physical materials. Students can access models from any device at any time. Whether they are at home or in the classroom, our students can study and interact with the course materials.

- **Higher Retention**-With a simple scan, students can access augmented models representing anything from a part of the human anatomy to a famous monument to a molecule. Also, students can access websites directly from the Augment's app. For example after scanning a photo linked with a 3D model of the Eiffel tower and viewing the augmented Eiffel tower, students can go directly to a web page with more information on the famous monument. This experience creates a complete learning cycle. Our students will retain more knowledge for a longer period.
- **Foster Intellectual Curiosity**- Incorporating Augment into our lessons will make our students excited about learning. Introducing augmented reality to our students, will enable them to discover unknown passions and inspire their future endeavors.

CONCLUSION

As information technologies transform, educators have always looked to adopt new technologies into their classroom to enhance student learning experience. AR is one of the growing technologies that have a great pedagogical potential. Due to advances in the development of pedagogical concepts, applications and technology, and a simultaneous decline in hardware costs, the use of small scale or mobile immersive augmented reality systems could become feasible for educational institutions within this decade and it is just a matter of understanding how to effectively exploit its potential in the field of education so that the process of teaching and

learning will be improved. However for learning, in educational technology field, there is a big need for instructional designers, who can design learning activities for augmented reality.

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