# The Augmented Reality Pedagogy

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***Abstract*— AR allows teachers to assist pupils in grasping complex topics. Teachers may enrich classroom experiences, teach new skills, encourage student minds, and get students enthused about pursuing new academic interests by utilizing the engagement and experimentation that AR technology provide. The gamification of AR and the educational system has the potential to improve student attitudes. It promotes teamwork and capacities while making learning fascinating, entertaining, and simple. Furthermore, by infusing unrivalled engagement through a computer-generated environment, it presents extensive chances to make lessons less exhausting. Students participate in eLearning in a more enriched setting where they may observe how concepts are implemented.**

***Index Terms— Augmented Reality, Tracker, Vuforia, Database***

## I. INTRODUCTION

The AR experience is prospering as a key trend, with estimates that 2.4 billion Augmented Reality mobile users will exist by 2023. In 2015, however, there were barely 200 million users. It's a fantastic increase in numbers that can't be overlooked. Many of us are only familiar with Augmented Reality via smartphone games such as Pokémon Go and social media sites such as Snapchat. It may also be employed in educational settings as technology advances and new trends in Augmented Reality emerge.

Through AR-enabled smartphones, augmented reality augments the actual environment by adding digitalized items, such as 3D objects. By incorporating digital features, music, and other inputs, Augmented Reality enriches the actual world and performers. Virtual information may be placed in the user's immediate surroundings, which improves perception and interaction with the actual environment. [6] This fusion of digital data with the actual world is beneficial in a variety of ways. In the last three years, augmented reality has exploded in popularity. There are two key enabling platforms for augmented reality. AR apps, as well as mobile AR and AR headsets. These handheld devices have a special processing power of loading software mechanisms that could manage various functions.[9]

Smartphones, tablets, and other mobile devices play a key part in mobile AR. The market for tab mobile augmented reality was estimated to be valued $6.87 billion in 2020. It is predicted to increase to 26 billion US dollars in 2025, and then to 340 billion dollars by 2028.

There is always something new, advancement in technology. which is the future, when there's a new update it brings change in many fields.

Education system. when there's a new technology, know them through the medium of education. Education system is very important as it plays the major role in the development of any field. But there is a study about the method of education, how it is taught, how complex it is for students to understand. The result of those study and research say that students don't encourage the theory classes more as it is having less involvement of practical study. Many students-loose concentration of listening after 20 mins. To break all these complexities and put an end. The Augmented Reality can be used as a part of education.

AR aids learners' comprehension of difficult phenomena by delivering unique visual and interactive experiences that integrate actual and virtual information and aid in the communication of abstract concerns. Designers may use augmented reality to superimpose virtual visuals on real-world things. In contrast to the 2D images that is seen in every text book,may utilize augmented reality to provide 3D things from various perspectives, allowing us to interact with the item and share ideas,

ultimately turning learning into a collaborative experience.

Studies and research show that the impact of using AR technology in education has brought more interest towards education. The need of laboratory practical's in engineering (and other academic fields) for students to learn how to solve real-world issues is undeniable.[8] It helped many in understanding the concepts clearly. This clearly brings up education to a whole new level. The complexities of education broke down, made easy to understand concepts which helps students. It also helped them remember what they saw in AR easily compared to lines and lines of text describing the whole process.

Here it can be more specifically talk about at the medical schools. Basically, all have a habit of reading books, nowadays books are available as hard copy and soft copy (can call it e-books). So many concepts and diagrammatic explanations with a 2D image and flowcharts are also present in books. But it is hard and time-consuming process to understand from running paragraphs and 2D images. The AR books can be created using the existing 2D pictures on books and design an augmented reality model for that image. This offers a broad perspective on the educational AR experience because the pages provide ideal images for AR virtual tracking and even the young children knew how to read a book.

The augmented reality books are digital versions of the images, pops-up in which a 3D version of the diagram rises off the page and shows the clear diagrammatic explanation. (The virtual content will provide all the details related to the 3D diagram). In some case it also supports audio. This looks fun and magical to kindergartens. They will enjoy and will also gain interest towards the subject. The additional interactivity to connect with the reader can be provided through augmented reality book. Language learning may be successfully supported by technology, and proper learning tactics and approaches can further improve learning performance.[7]

This interactivity can be bigger advantage to a reader who studies sophisticated diagrams. For an example a medical student who studies about the neurology will get a good idea through augmented reality. So many augmented reality books available, but should design a book related to our syllabus. This will support the students in a better way**.** Playful youngsters focus more on the screen pictures and become more immersed, therefore becoming less strategic.[2] AR intervention generally improved in all cases of students of their cognitive and practical understanding [3].

The timeline right now is a line in a place, where the age group from 2 use smartphones. Which actually means the world runs with the help of that device in many aspects. Already having many applications that involve the technology of Augmented Reality. For example; if in need to buy a furniture, there is an AR application which helps us to customize and view it in real world through our smartphone camera. The AR is used in maps, construction of model building, face filters, and more. AR games provide a unique experience apart from the normal games and they also merge into the daily lives of student, creating a way to think differently about their communities and themselves.[5]. AR systems that are implemented in libraries are more effective than traditional librarian training in improving the learning performance of learners with field-dependent cognitive styles, especially for learning content related to application and comprehension. [10].

Every day activities are slowly moving towards the concept of augmented reality. But the AR application for education has not yet got so good. By using the technology of augmented reality, can create a beautiful and better educational application for study purposes. The augmented reality applications should be introduced by government for the purpose of education.

## II. EXISITING SOLUTIONS

Xinxingxia, Frank Yunqing Guan, Yiyu Cai, and Nadia MagenatThalmann wrote a study in which they addressed how optical see-through near-eye display (NED) technologies for augmented reality (AR) had made tremendous progress recently thanks to investments from both academia and industry. Despite the fact that different AR NED solutions have been successfully marketed and even put into applications, current AR NED technologies still face hurdles (e.g., limited eye-box, fixed focus, bulky form factors). In this study, have provided a brief introduction of major AR NED technologies before focusing on state-of-the-art research activities to address each of the main AR NED technologies' significant difficulties.

Adrian S Johnson and Yu Sun of the University of South Florida conducted a survey on the effects of augmented reality in hospitals on people. Teachers from grades K-12 were shown augmented reality to assess SARP's potential in the classroom. All of the professors agreed or strongly agreed that the method will be more interesting in class than a textbook. "Capturing attention," "high levels of on-task conduct," and "enhanced degree of interest" were among the descriptive replies. "It appears reasonably straightforward to use and in student-cl student-centered, allowing the student to participate in their learning rather than listening to a teacher lecture on the topic," one expert said.

Marco Aurelins Galvao of the Federal University of Sao Paulo's Institute of Science and Technology wrote a study about the development of three distinct Augmented Reality-based applications for health education. There are also some illustrations of current development prototypes, as well as suggestions for future work. And anticipate that these apps will assist in bringing health education to students' homes at all educational levels, as well as reducing some issues associated with anatomy instruction at college, such as the expense of procuring corpses and the scarcity of qualified specialists.

Chia-Wen Tsai (Department of Information Management, Ming Chuan University, Taipei, Taiwan), Pei-Di Shen (Graduate School of Education, Ming Chuan University, Taipei, Taiwan), and Ya-Ting Fan (Department of Information Management, Ming Chuan University, Taoyuan, Taiwan) have published a paper on the subject. From 2003 to 2012, the authors analyzed empirical augmented reality (AR) and online education research, as well as those focused on building or developing AR to assist students learn, that were published in SSCI, SCI-EXPANDED, and A&HCI journals. The number of AR and online education studies has expanded dramatically since 2009, according to the authors of this study. According to this analysis, writers from Spain, Romania, Taiwan, and Germany had the most articles on AR and online education between 2003 and 2006.From 2003 to 2012, writers from Spain, Romania, Taiwan, and Germany have the most publications on AR and online education, according to this review. Furthermore, the majority of empirical AR and online education investigations were conducted at universities and in computer science courses, according to the analysis of these selected publications. In addition, the quantitative research method was applied more frequently in the papers that were reviewed .The relevance of AR in allowing mobile consumer experiences is emphasized. [4]

This review's findings and analysis could lead to new directions and insights for future AR and online education research.

Elizabeth FitzGerald (Institute of Educational Technology, The Open University, Milton Keynes, UK), yet all. Have put a paper on Augmented Reality and Mobile Learning: The State of the Art. The authors of this research look at the state of the art in mobile learning augmented reality (AR). Previous work in the field of mobile learning has incorporated AR as part of a larger toolset, but nothing has been done to explore the phenomena in depth or to assess its potential for learning in a balanced way, recognizing both good and negative elements. The authors want to give a practical description of augmented reality and look at how it might be used in outdoor settings for situational learning. The authors divide it into categories based on essential features (device/technology, style of interaction/learning design, kind of media, personal or shared experiences, portable or static experiences, and learning activities/outcomes).Augmented reality is a technology that combines virtual reality with reality. In recent years, the rapid development of augmented reality technology has aroused people's high attention. This paper first expounds the research and progress of augmented reality at home and abroad. Secondly, it introduces the key technologies, development tools and application of augmented reality in some fields.

Donna Russell (Walden University, USA) has put a paper on Implementing Augmented Reality into Immersive Virtual Learning Environments presents current research on how to incorporate revolutionary new technology into a variety of educational contexts. This book looks at the why, what, and how of incorporating augmented reality into immersive virtual learning technologies in a variety of educational settings, including nursing, sports coaching, language teaching, and more. This book is ideal for teachers, school administrators, teacher educators, practitioners, IT specialists, educational software developers, researchers, academicians, and

students interested in integrating augmented reality in educational programs. It highlights the benefits of virtual reality, its role in remote learning, the logistics of simulation, and branches of it such as gamification.

Results show improvements in viewer-participants' experiences in terms of cognitive and edutainment aspects. Relying on a commercial video game, the VR-enhanced environment stimulated emotions and increased engagement in viewer-participants while helping them enjoy learning. The experimental context of this research can only approximate the full real-world experience that a museum visitor would have. However, the experimental context does provide the basic elements that a viewer would expect and associate with an exhibition, such as, objects for examination, labels, and didactic supports. Results from this research can encourage further investigations of hybrid space in other environments relying on various media types.

## III. PROPOSED FRAMEWORK

Augmented reality is an interactive technology that augments 3D objects in real-time. The development of Augmented Reality technology has emerged into supreme field. Augmented Reality can be in the field of education. Students can learn the science topics more efficiently and visually. This makes students to learn concepts more in real time and in an interactive method. Users can visualize 3-Dimensional objects, so it increases the chance of interaction among students. Here Marker based tracking method is used.

Figure-1: blend model of brain

When a 2-D image is tracked, the app starts to identify the traces of the image, the app analyses the similarities. After the similarities are matched, a 3-D model of that specific image is shown through the app. The shown 3-D model can simulate in real-time. For an instance let's create a scenario, in a biology class a teacher is explaining a human heart with a poster of it. When the teacher uses the AR application, they just scan it and as a result the user gets an exact real time simulation of a 3-Dimensional model of a human heart, which is so real and lively. It provides students a heuristic approach towards learning. Users can visualize 3-dimensional objects, so that they can enhance the perception and interaction of users with the real world. 3-D models can be made for the organs, cells etc. The 3-D objects can be modeled as large as they are in real life, it makes the experience feel so real.

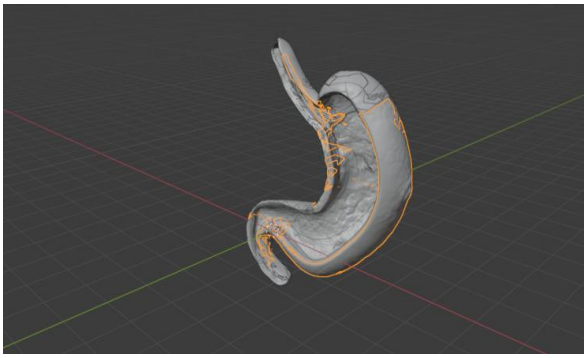

Figure-2: Blend model of kidney without the textures

A 3-D modeled heart. The heart has real textures and colors. When the 2-D image of the heart is moved the 3-D heart tracks the image and it sticks around with the image. The heart can be seen in different angles too as It can be rotated. This in terms provides a great augmented experience thus making learning more interactive and efficient.

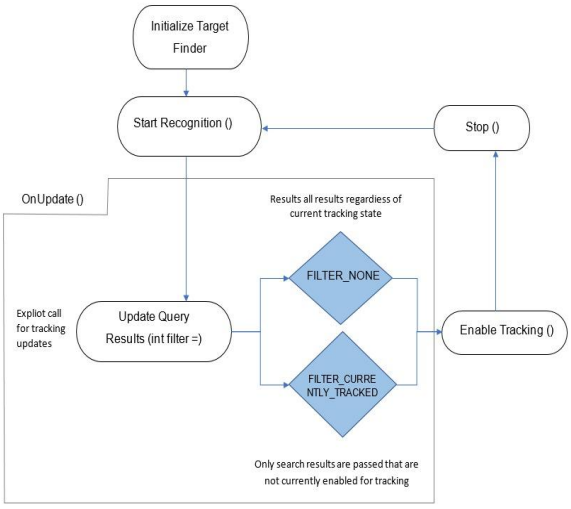


Figure-3: Target image workflow

The programming language used here is C#. The hardware requirement of this application are a phone's camera and IMU (Inertial Measurement Unit). The mobile phone must support AR Core services provided by Google. The development platform used here for developing our application is Unity, a game developing engine and has used the vuforia SDK, an SDK (Software Development Kit) for mobile devices that enables the creation Augmented Reality applications. First the target is set. i.e. our 2-D image and then the target is uploaded to the Vuforia's cloud database. The cloud Database SDK is used, an image recognition query is deployed to find a matching ID within the cloud database server. If a query result registers a match, it is counted as a recognition.

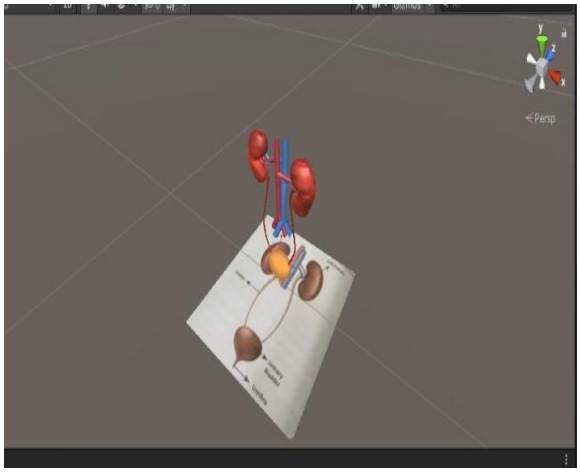

Figure-4: Target image and blend model

In detail, during the runtime of the app, the Cloud Recognition service is running and the Device Camera is enabled, each camera frame is analyzed for two properties. The first property is "scene change", which determines if the content of the camera's field of view has changed. The second property is the frame quality, which determines if an incoming camera frame is in-focus, exhibits no blurring and has sufficient lighting for recognition. If both conditions are met, then the web API service will trigger a query to the Cloud database. If there is a match, then this is triggered as a recognition, which in-turn increments the recognition count. Cloud Recognition is handled by the engine and though a Cloud image target observer.

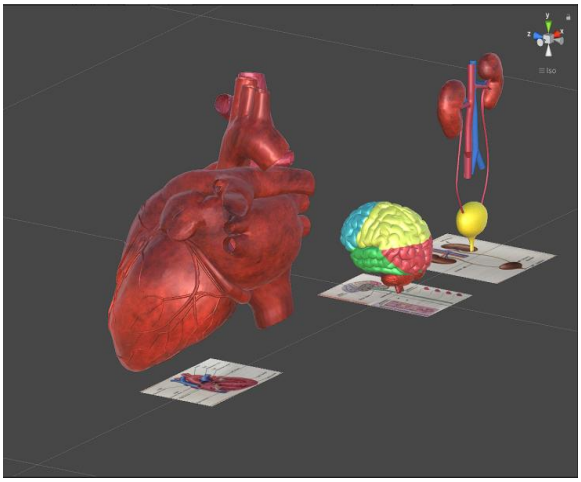

Figure-5: models with textures

## IV. RECOMMENDED IDEOLOGY

The medical business has benefited greatly from AR; yet, its most inventive applications have arisen as a result of the widespread use of mobile technology. In the subject of healthcare education, AR is thought to be particularly useful. A healthcare professional, for example, may quickly install software or an application on his smartphone. Such a tool or application might have a comprehensive list of medical measurements from which healthcare practitioners can choose. The initial screen will show where the tracking patterns should be located in the sick person's body when the healthcare professional selects one of the measurements from the list. The training model will commence when the patterns have been applied.

The training application will display a 3D animated simulation that will demonstrate when, when, and how to conduct the different moves. The user may also change the simulation's point of view by moving the mobile phone forwards or backwards using the animation. In addition, he has the ability to show additional no-tics at certain times during the measurements.

Augmented reality is a skill that has been around for a long time. Because augmented reality is still in its early stages, the number of potential apps is limitless. A large number of augmented reality (AR) products have been exhibited in various forms and distributed all over the world. The layering of information in 3D space generates whole new world

experiences and helps the greater transition of computing from the desktop to mobile devices, while also creating fresh perspectives on information access and learning opportunities. Despite the fact that augmented reality is widely employed in the consumer sector, such as in social engagement, entertainment, and marketing, new applications emerge every day.

In the topic of AR in medical education, the systematic study discussed in this article reveals some notable discoveries. One of the goals of this review was to make sure that the most recent research in this subject was included, and 11 of the 21 publications assessed were published in 2019 or 2020. This indicates that this field of study is quite current and of growing interest to the medical community. Some of the findings of this study confirm those of prior studies, such as the inclination to concentrate on anatomy and surgery. However, the selected publications include a variety of other disciplines, and it's possible that investing more in novel methods to medical teaching utilizing AR in areas other than anatomy and surgery might be a fruitful field of future study. And also highlight the wide range of AR tools that emerge in the research, from low-cost tablet-based AR visualization to complicated multi-component AR simulators that use a variety of technologies, such as Smart Glasses, headsets, and other projection technologies. In terms of our affordances study, have found that studies that did not address any of the main affordances identified in the literature as being particularly important to medical education had poor learning results. Studies that took use of one or more of these affordances, notably A5, which aids contextual learning, had favorable results. As a result, it is proposed that paying special attention to the affordances of AR while building medical education systems may be beneficial.

## V. CONCLUSION

To conclude that the Augmented Reality will bring a change in the field of education. Expecting a better result after our first test of implementation. The idea works better in creating the graphical and 3-Dimensional diagram, this will make students easy to visualize and understand the concept behind .It is well known that AR has introduced new methods of submitting data. The health-care industry would be restructured in order to be displayed in a mobile AR format. AR may transmit such health-related data in its most extreme visual form. Because smartphones are equipped with sensors and cameras, AR has become quite popular. Such sensors allow for the delivery of accurate context information to environment-aware scenarios, allowing clinicians to collect data, demonstrate, and identify measures and procedures.

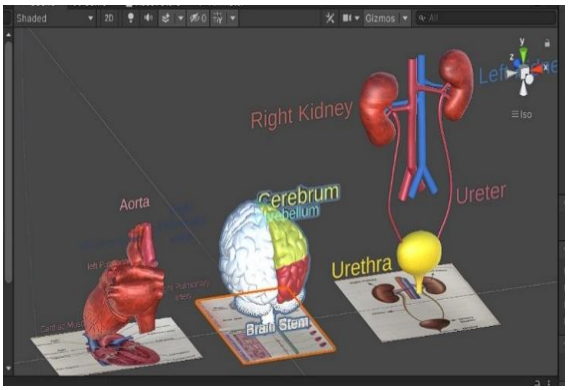


Figure-6: augmented model with names

Doctors can also easily maintain control over sick people who require continual critical care, such as by tracking temperature and heartbeats, among other things. The AR can be used to submit this information.

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