

Modern Learning Method Using Augmented Reality in Education System

MUHAMMAD SADIQ ALI KHAN¹, MUHAMMAD NASEEM²

^{1,2}University of Karachi, Department of Computer Science,
University Road, Karachi, Sindh 75270, Pakistan
msakhan@uok.edu.pk
mnaseem105@gmail.com

ABSTRACT

The method of interfacing computer using keyboard and mouse is the oldest method. Augmented reality provides us a new vision to interface the computer with home, education, office, super market, home decoration, designing, construction, and gardening. In this research we are focusing on that augmented reality providing enhanced method to learn article. It is used to educate students effectively. Many computer based learning programs are design to educate student, but all of them are working in the virtual environment. But in our research, we use augmented reality that replaces the real world with a simulated on. We design a survey which was filled by variety of students that has were from different education levels. We also compare oldest methods of development with new development technology.

Keywords: *Computer based learning, modern learning, Augmented reality, Education system.*

1. Introduction

Our live style and work have transformed after the evolution of the computer. Nowadays the computer plays a vital role in our life styles and working domains. One of the best examples of computer is its use at home, variety of tasks that can be performed by the computer like home budget, entertainment (games, movies), and information regarding News, cooking receipts, gardening, life style etc. and telecommunication. The applications are limitless.

Augmented Reality (AR) is a deviation of Virtual Environments (VE). VE technologies completely drive a user inside an artificial environment. While the user may not be able to see all the objects/happening in the real world, the user is enabled to find out the how the desired objects perform in the real world. In contrast, AR allows the user to see the desired objects in the real world. Therefore, AR is add-on reality over a VE.

In the current scenario, we desire to exploit 2-Dimensional media in education. But actually we live in 3-dimensional world. Creating a new type of educational system, essentially consists of AR technology with the education content, which open the new direction of learning pattern or method that is a more attractive platform for students in real life. This attractive platform is the combining aspects from social computing, physical computing with ubiquitous computing. Therefore, it offers the unique combination of physical and virtual worlds, with continuous and embedded user control over the learning platform [8].

During the last two decades, researchers have been busy in building information model (BIM), to improve the quality of the documentation. Various field of works are targeted by BIM, and it becomes an intrinsic feature of the design process within the construction industry, which has examined how it can be integrated into real-time communication on-site. Some research provides the framework that integrates BIM with AR so as to enable the physical context of each construction activity or task to be visualized in real-time. For enhancing the given framework, the researcher suggested that AR should be ubiquitous and thus operate in conjunction with tracking and sensing technologies such as laser pointing, GPS sensors, motion sensor and radio frequency identification (RFID)[9].

The set of interacting policies, process and technologies generate a methodology to manage the educational life cycle. BIM is a set of interacting policies, processes and technologies. It generates a methodology to manage the

educational system from starting to ending in the digital format. It makes explicit the interdependency that exists between educational materials through a technological blend. It also provides the shared knowledge resource for information about the facility for a student or user to use and maintain throughout his education life cycle.

2. Augmented Reality

Our live style and work are transferred to Augmented reality that is a field of research which combines the real world with the virtual environment. Fundamentally, it is an environment where user inspects the real world over the virtual tools with a number of digital information like object description, images or 3D model. Initially AR environments have been typically applied by gaming entertainment. They have marvelously impacted us in every domain of life like medical, military, education, training, construction, surveying, engineering, mechanical, environmental, maintenances, robotic etc. It also has a capability that has been enabled by technology for marker-based to marker-less. It means you can link virtual media that are associated with real environment and context awareness methods can provide the ability to be used in the augmented reality system.

Currently many technologies allow users to interact with a computer like a touch screen or motion sensor, but in the past mouse or keyboard were used. This technology has great potential for educational outcomes. Psychological factors are the key feature in the design of AR system. Therefore, we must understand this factor, which is fruitful for educational interest in understanding the AR system. In this project we analyze the literature in a physical and a contextual environment. We use these as key elements for analyzing the potential benefits and design considerations of AR technology as applied to learning. Varieties of developing software are used for constructing an AR system for education, but some of the tools are more time consuming than others.

2.1 Augmented Reality in Education

Augmented Reality technology is not a new issue. It has been used in fields such as military, medicine, engineering design, robotic, telerobotic, manufacturing, maintenance and repair applications; consumer design, psychological treatments, etc. Displaying information by using virtual things that the user cannot directly detect through the senses can enable a person to interact with the real world in ways never possible before. We can change the position, shape, and/or other graphical features of virtual objects with interaction techniques augmented

through reality supports. Using our fingers or motions of hand-held devices such as shaking and tilting them, we have an ability to manipulate virtual objects, as well as physical objects in the real world

2.2 Collaborative Knowledge Construction

Computer supported collaborative learning environment was widely adopted by the learner. It changes the learning behavior, and provides collaborative processes and learning outcomes. After some decades, researcher found new methods for improvement in learning process. This improvement can occur after the use of the virtualization tools in the domain of collaborating learning.[6] The term "Collaborative knowledge construction" is usually used in making inquiries to illustrate learners. (e.g., [5], [3]). Presently, the main goal of the researcher is to explore the discussion processes which are helpful for learning achievement and outcomes.

2.3 AR Book Research

Reading storybooks is the best method to educate the student, but now it is the oldest method for learning but the results are not at the desired level. Many of the researchers devote their effort to explore the new method which built a marvelous enhancement in the learning process, which enhances the result of the student. Computer technologies are changing the learning process in the most cost effective manner. A paper book is converted into electronic book and distributions of the book are a lot quicker than making coffee. However, traditional paper books are not likely to be superseded by electronic books due to their tangibility, which enables people to physically possess and touch them. So, researcher taking advantage of this weakness into a fruitful and energetic learning procedure, which create an opening to enhance user's learning skill beyond the electronic book version.

It creates a relationship between physical environment and virtual environment using augmented reality (AR) book. In this method, the pages of paper books are superimposed by computer generated graphics or information, which can be viewed by the technologies by augmented reality system.

A lot of research regarding the educational application of AR books has evaluated the usability of AR systems [10]. The fruitful result received by student in term of easy to use, effectiveness and satisfaction with AR book system. Students have also demonstrated positive thoughts toward the use of AR books [1].

2.4 AR Picture Book

The purpose of the AR picture book is to introduce the imaginative work. It is a combination of virtual environment over the real environment. The target audience or learner is not only a technical person, but it is interesting for a non-technical person as well as for children, because an AR picture book is to introduce the virtual information overlaid on the page. The virtual information isn't merely incorporating the 3D model of the object, but it also has subtitle about the object that is displayed over the augmented reality system.

This art work is more attractive and informative than other systems. An augmented reality system with the picture book is helpful for looking at different perspectives of the 3D object. Figure 1 demonstrates the usage of the AR picture book.



Figure 1: Augmented Reality Book

2.5 Picture book reading for student

Picture books are very beneficial for preschool children. Picture book reading is the best method for childrens' language development; it also enhances the artistic thinking [2]. Book, student and teacher are three main interactive components. During the picture book reading process, the teacher's reading behaviors such as pointing to picture, labeling the commenting on a picture, or asking questions about the story and picture. AR allows a user to view the real world through AR system where the virtual object is superimposed over the real world object. Also labelled as supplement real-world perception and interaction, it allows users to view a real environment augmented with computer generated 3D objects [7].

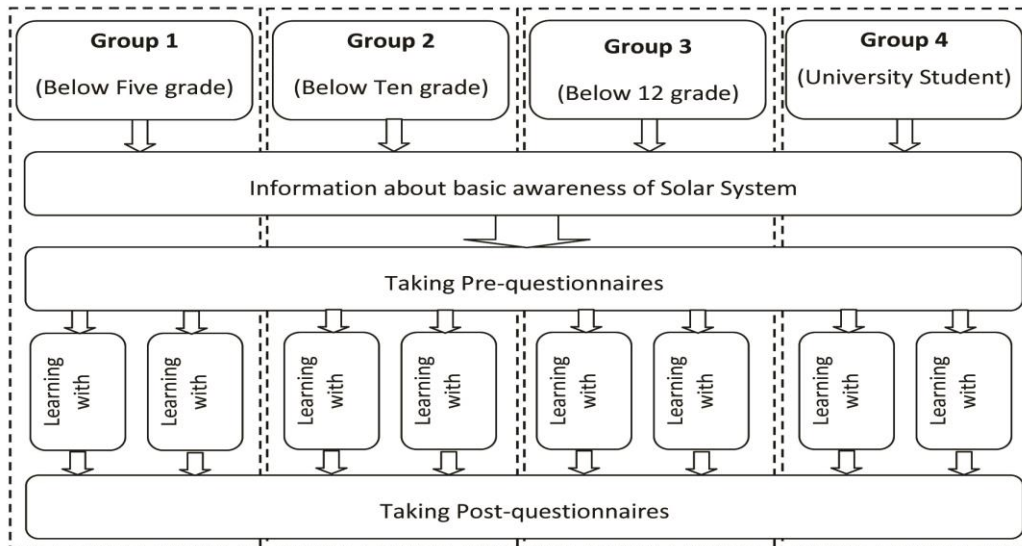


Figure 2: Experiment Design Flow.

3. Experiment Design

To identify the pros and cross of the system, we design a survey which was completed by a cross-section of students from different education levels. For getting a meaningful result, the survey consists of two phases. In the first phase, we collect information about the recent education system in which we are using book or other chart / poster to teach the student but in the second phase we use modern AR picture book with AR system. We aimed to investigate the effects of the both phases on the students learning achievement and motivation, also helping to identify the cognitive load and their degree of technology acceptance.

3.1 Participants

The participants in the survey play an important role to identify the helpfulness of the survey. The educational level of the participant reflects the edifying output about new or old system. Therefore, we conducted survey on the four groups of education level and each level consisted of 30 students. These groups were: below grade five of an elementary school, below grade ten, below 12 grade and university student.

3.2 Research Method

The research method included the questionnaire for measuring the students learning motivation, cognitive load and technology usage. We designed two training sessions to educate the student. In the first session we used poster and book to teach the solar system and in the second session we acquired augmented education system. In this method, trainer taught the student using AR book with AR system, place AR book in front of AR system, it demonstrated the animated video over the monitor. The training aimed to evaluate the students' knowledge, using questionnaire for measuring the students' learning. These questionnaires were design by experienced teachers

3.3 Experiment Procedures

Figure 2 shows the procedure of the experiment. Four groups of students having different education level were selected for this experiment. In the beginning of the experiment, an experienced teacher provided the basic information of solar system to students and collected the response through questionnaires. After that we are provided detailed information of solar system to students using the older teaching system as well as AR system and took responses through questionnaires. The detailed information of the solar system consisted of the number of planets, moving path, size of planet etc.

4. Analysis of Learning Achievement

"Knowledge is implicitly constructed in the mind of the learners and that knowledge and capability cannot be directly measured"[4]. The aim of this survey is designed to identify the opinions of a large community of learners from the whole country. Therefore, the method to gather the information is an anonymous electronic survey. The questionnaires contained questions related to the use of new method of training using AR. A survey was carried out for the cognitive outcomes to determine whether participants learned more by AR system or a traditional learning system.

Table 1: Teaching Solar system using Poster / Book

Level of Difficulties	Below 5 Students	Below 10 Students	Below 12 Students	University Student	Avg. Percentage
Extremely Easy	2%	9%	7%	4%	6%
Very Easy	21%	15%	19%	23%	20%
Slightly Easy	30%	22%	28%	41%	30%
Moderately Easy	38%	46%	42%	30%	39%
None of them	8%	8%	3%	1%	5%

Table 1 shows the result of 'How to Educate Elementary Student about the Solar System' through the book or playing cards. As shown in table the average percentage of "Moderately Easy" is 39% and 30% for university student. This reason for the mismatch was the educational background spread, but in case of "Below 5 Students" is approximately equal to the average value. Therefore, the majority of students agreed, teaching of Solar System using poster or book is not so easy. On the other hand some students are agreed with these learning methods.

Table 2: Acquiring new knowledge using AR System.

Acquiring New Knowledge	Below 5 Students	Below 10 Students	Below 12 Students	University Student	Avg. Percentage
Strongly Agree	15%	45%	52%	33%	36%
Agree	24%	30%	33%	59%	37%
Not Agree	43%	14%	14%	5%	19%
None of them	18%	11%	1%	3%	8%

Table 2 shows the result of the Solar system is helpful to acquiring new knowledge or ideas using AR system. Every group is strongly agreed on acquiring new knowledge or idea.

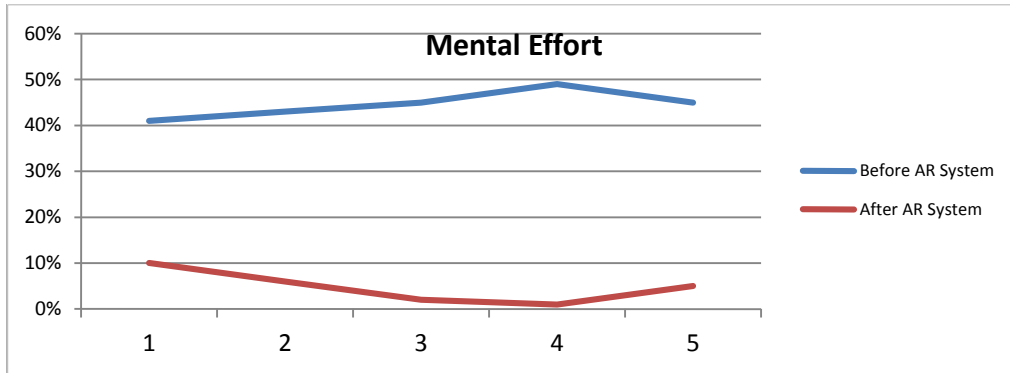


Figure 3: Mental effort required to teach Solar System.

Figure 3 shows the result of the way of instruction or learning content presentation caused a lot of mental effort with and without using AR system. Every group strongly agreed on mental stress levels. Lots of effort is required to explain the solar system using poster or book. Before using an AR system, the mean values and standard deviation value, 0.000985874 and 0.03139 for metal effort are required for learning. After using AR system, every group strongly disagreed on lot of mental effort was required, the mean values and standard deviation value, 0.00136516 and 0.036948072 for lot of metal effort required for learning.

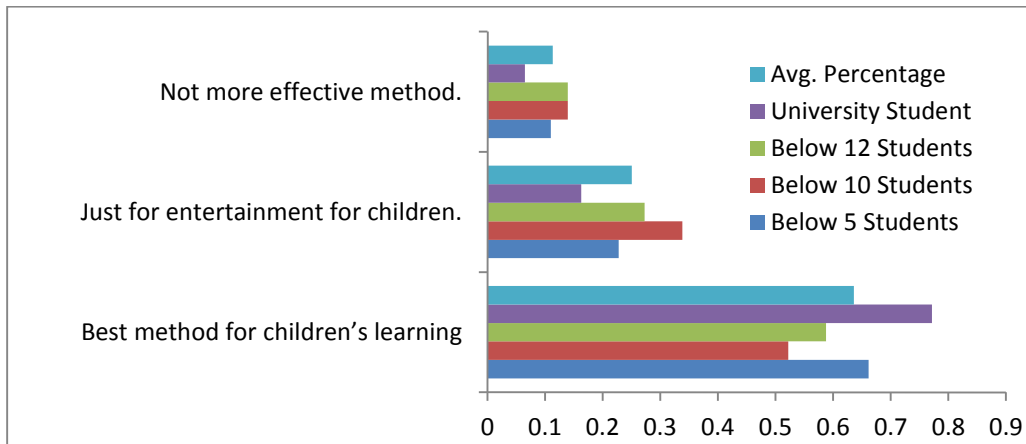


Figure 4: Adoption of the augmented reality book in our elementary education system.

Figure 4 shows the adoption of the augmented reality book in our elementary education system. Every group is strongly agree on AR system is best method for children's education development.

5. Discussion and Conclusion

In this research, an augmented reality system used in elementary school was presented. From the experimental results, augmented reality system cannot improve the students learning achievement but it can also decrease their cognitive load. Different levels of educational groups indicate the effectiveness of using AR system. Some participants in this research discovered apparently lower learning motivation and poor learning performance as compared to those who learned with the conventional system, because they thought that the AR system is an entertainment event or program instead of learning. Such negative experience was visible in students who come from lower education levels.

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