

# Virtual Reality Game in Education: An Pragmatic

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## Abstract

Virtual Reality is becoming a recent trend on entertaining world, also reached greater elevations in Science, Technology, Engineering and Management. Virtual Reality (VR) technologies have been widely applied over all educational settings for years and proved that integrating education over visual modalities is becoming more impactful these days. An experimental study over the impact of using virtual reality games on education is analyzed and compared with the spatial presence in this article. Study proves that virtual reality based experiments creates more impact when it is brought through visual and auditory modalities. And it also proves that VR is more immersive and engaging compared to all other educational system parameters. Low cost VR headsets such as Google Cardboard, Samsung VR Gear and so on, have made it more accessible in the society which provides the feeling of being psychologically occupied in a virtual environment tend to bring out more technology in the environment. Thus, an important inference for design is that to bring out more visual modalities for educational contents.

**Keywords:** Virtual Reality, Education system, Gaming

## I. INTRODUCTION

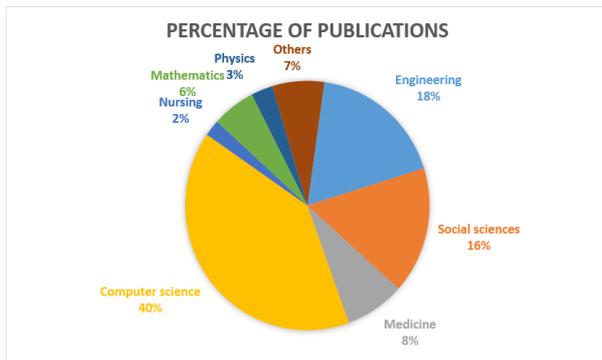
Science, Technology, Engineering and Management collectively called as STEM [1] domains have been highly influenced by recent technologies in creating, engaging and productive learning environment. Virtual Reality (VR) plays a major role in bringing the engagement from students on educational environment particularly in bringing the conceptual knowledge about the scientific enquiry [2]. A 3D environment with a user experience of telepresence which is being treated like a real world, a computer simulation method called virtual reality. It is widely classified throughout many applications in this world. One of such application as through education, where scientific concepts, pictorial representation and much more brings attention towards students. Educational games play a very power role in classroom management which also

increases the student motivation and engagement while learning. To be more precise, games which are to be involved in classrooms need to be usable and likeable by the majority of the students, or else there won't be any fact employing gaming aspects in education.

## II. LITERATURE SURVEY

This paper surveys the methods, potentials and implications of Virtual reality over education and compared with all other popular domains such as immersive Virtual reality on education, Head mounted display education system and Video game based education [3]. First method of Immersive VR [4] based education populated more over CAVE based education [5]. And Head Mounted display education [6] concentrated more on Oculus Rift based education which doesn't cover much of the applications but focuses mostly

towards the entertainment industry[7]. Based upon the database like Google Scholar, Scopus and Web of knowledge, an in-depth survey which examined the number of papers



**Fig 1 Virtual Reality based publication analysis**

published towards the Virtual reality are discussed further more in this article. Fig 1 illustrated the percentage of publications carried out in the field of immersive Virtual reality over different subject areas and the analysis shows more concentration towards Computer science subject area [8].

### III. MOTIVATION

From the articles it came to a clear idea about VR, which gives a feel of liveliness and making it real and popular among different subject areas. Creating a huge impact over the education stream become popular with this Virtual reality. Following parameters adds special mention in terms of VR over education

- Ethic Problems – Specially in the Medicine field for Surgeries and illustrates the operation process
- Limitation over Dangerous situations – On training for army, navy officials over fire, rain and hurdles with a simulation
- Physical Unacceptability – Travelling to space and detail on the elements through virtual live feel environment
- Time travel – To bring periodic experience virtually

### IV. VIDEO GAMES& RESULTS

Video games gave a negative feel of wasting time for the kids, entertainment for the Adults for generic public and media. Some even perceive that it results in addiction and bring violence behavior to the kids, and sometimes it does affects the health conditions of the player[9] or even changes the attitude of the player. It has been classified as following

#### A. Serious Games

Serious games are nothing but with a purpose based games. It states also that rather than providing entertainment, it also educates the one who plays the serious games [8]. Most of the serious game addressed article results that the game brings more attention, as well it makes the player attains knowledge acquisition [3] and understanding with better outcomes

#### B. Health Based Games

Among the serious games, certain kind of games are produced in focus towards medical health care benefit. Some of such games includes creating awareness about health illness [7], attaining knowledge and to support patient rehabilitation. Main focus was laid on bringing physical activities on patients. Effectiveness of such games were taken into research [10] and the studies found that positive effects and outcomes are generated through these kind of games.

#### C. Persuasive Games

Persuasive games works on changing the behavior and attitude of the people which is also named as procedural rhetoric. It defines the visual based method to resolve procedural and interactive way to the players for changing their thinking process and opinions [10]. On a study diabetics related game improvised the youth behavior in taking vegetables and fruits. Developing a game which changes the behavioral science for diet and physical activity became a challenging a task for the researchers[5].

#### D. Virtual Reality Games

Virtual Reality works as a simulation technique which brings an experience for the user in bringing virtual environment with senses like visual, auditory and haptic [11]. VR attempts to feel the presence within a 3D virtual world generated by a computer, which can be used in different kind of application such as Entertainment, Education etc. In HMD (Head Mounted Display)[12], the user wears a display device which shows the images of 3D world in a way the covers a players visual field [6]. Several research studies proves that it is possible to use

the VR medium as an affective medium, which is capable of bringing the interaction and emotion with the contents presented.

#### V. METHODOLOGY

This article covers the technologies that are involved in Virtual reality based education system. The use of Video games and VR as persuasive technology for education system provides a huge number of advantages over traditional techniques. A survey has been constituted to get the inferences about the VR and its applications from generic people.

<i>Inferences</i>	<i>Age (6 -9 Yr)</i>	<i>Age (10- 14 Yr)</i>	<i>Age (14-25 Yr)</i>
<b>Attention</b>	87%	90%	72%
<b>Presence</b>	85%	77%	49%
<b>Enjoyment</b>	80%	75%	44%
<b>Science knowledge</b>	65%	78%	80%
<b>Auditory knowledge</b>	90%	85%	80%
<b>Visual Knowledge</b>	<b>97%</b>	<b>92%</b>	<b>90%</b>

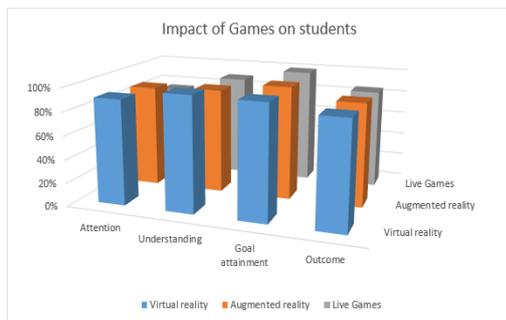
**Table 1 – Survey on Science based Virtual Reality Game**

<i>Inferences</i>	<i>Age (6 -9 Yr)</i>	<i>Age (10- 14 Yr)</i>	<i>Age (14-25 Yr)</i>
<b>Attention</b>	91%	96%	90%
<b>Presence</b>	99%	99%	85%
<b>Enjoyment</b>	96%	99%	86%
<b>Science knowledge</b>	92%	96%	89%
<b>Auditory knowledge</b>	96%	96%	96%
<b>Visual Knowledge</b>	<b>98%</b>	<b>93%</b>	<b>91%</b>

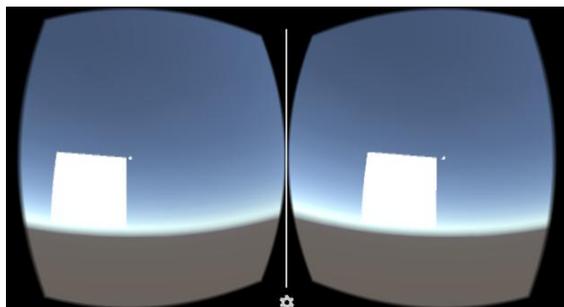
**Table 2 – Survey on Sports based Virtual Reality Game**

Analysis over Virtual reality has been carried out through game for different age sectors. Science based games [2] were tested with the three age sectors such as of age group from six years to 9 years , age group of ten years to fourteen year to a set of group and a age sector of fourteen years to twenty five years in another group. Three set of games with the same concept illustrations were portrayed to the student groups, with a time limit to the students and collected the results in real time game, augmented reality (AR) [13][14] based and virtual reality based.

Throughout the analysis, same student group was allowed to take part in same concept of live game, augmented reality game as well as virtual reality game. Findings are noted down and illustrated in Table 1 and 2. Comparison of the Science based game[15] over real time live game, AR based game and VR based game are resulted in Fig 2. which illustrates the Virtual reality based games works better for the student group in conveying a concept, gets more attention, goal attainment indication and higher outcome level achievement.



**Fig 2 Impact on VR games with AR and Live games**



**Fig 3 Virtual reality view in 3D environment**

## VI. CONCLUSION

Cost effective and portable VR technologies provided by mobile phones based applications provide incredible potential for education. There were lot of advantages and disadvantages over the usage of virtual reality games on education, where VR is a prototype which needs a modification according to the concept in the gameplay. Content knowledge in all the aspects of concept and there should be a balancing criteria on gaming part and the content knowledge. Based upon the survey collected, it has a very clear strategy of using VR over education system is powerful in delivering the content with a visual and auditory mode. Future research can be carried on comparison with other technologies in bringing a stronger educational system.

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