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Virtual Reality and Its impact on Learning among Children

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Abstract: *Children are the most precious resource and asset of any nation. Thus, their educational environment should be planned and designed with an utmost care. In so fast- changing world, if we really wish to assist their learning, we should certainly consider the replacement of traditional ways of teaching with the new emerging technologies including Virtual Reality (VR). It provides a rich, interactive and engaging environment to the learners. The idea of facilitating self learning and scope of improvement in learning with the help of virtual reality technology sets the foundation of this research. This paper proposes the idea and discusses the comprehensive insight into benefits of this investment for education sector of our country.*

I. Introduction

Virtual Reality

VR is a an emerging technology that provides users with realistic interactive computer environments (Li et al., 2001). This is usually achieved by isolating the user from the sensorial signals of the real world, thus creating the immersion effect (Wexelblat, 1993). It provides high-quality three dimensional images of objects, interactivity with them, and increased telepresence (Klein, 2003 & Steuer, 1992).

Media Richness: It refers to high levels of representational quality and volume of content in a mediated environment. The degree of media richness is determined by the sensory depth and breadth of an interface (Steuer, 1992). Depth refers to the quality of information within each channel. Breadth, on the other hand, refers to the number of sensory dimensions simultaneously presented. VR increases sensory depth, especially in the visual sense, as it can transmit more detailed 3D images than 2D static images, particularly through zoom and rotation functions (Klein, 2003)

Interactivity: It refers to the degree to which users can manipulate the form and content of a mediated environment in real time (Steuer, 1992). It is achieved when users are provided with immediate feedback through their perceptions that a mediated environment is modified based on their input (Klein, 2003).

With the help of media richness and interactivity, VR also generates the feelings of telepresence (Biocca 1997; Klein 2003). It is a sense of "being there" in an environment by means of communication medium (Reeves and Nass, 1996 & Steuer, 1992). Based upon sensory stimuli conveyed by a VR interface, human beings can create a perceptual illusion of being present and highly engaged in a mediated environment, while they are in reality physically present in another place (Biocca, 1997).

Extensive applications of VR have moved to the mainstream of professional development, as managers, instructors, coaches and therapists. They have claimed increasing benefit from its immersive experiences. It is gaining growing interest not only among the mentioned areas but also also playing a critical role in the education sector. Educators and students alike are seeking an ever-expanding immersive landscape, where students engage with teachers and each other in transformative experiences through a wide spectrum of interactive resources. In this educational reality, VR has a definitive place of value. It is a productive enhancement to human interaction, bringing together people from around the world to engage and interact- regardless of social, economic or geographic disparities.

Learning

Learning by doing has been known as the most effective method of acquiring new skills. In psychology, it is the process by which a relatively lasting change in potential behavior occurs because of practice or experience. It is also a process of acquiring modifications in existing knowledge, skills, habits, or tendencies through experience, practice, or exercise. (Concise Encyclopedia)

'For more than 2000 years, philosophers, academics and educators have attempted to explain and define human learning. The Greek philosopher Aristotle (384–322) believed that learning develops through repetitive exercises. Confucius wrote around 450 BC: "Tell me, and I will forget. Show me, and I may remember. Involve me, and I will understand." Experiential learning was first introduced in 1984 by David A. Kolb. The concept of experiential learning includes all learning from a concrete experience, through reflective

observation, to abstract conceptualization, and finally, to testing in new situations and new experience. This can be illustrated as a cyclical pattern, the Experimental Learning Model (Kolb, 1984).

Later, Socrates (470–399) described learning as a process of remembering. He believed that all knowledge exists within the human soul before birth but, perhaps due to the trauma of birth, the soul forgets all it previously knew. Through a process of questioning and inquiry, termed Socratic dialogue, the soul recovers some aspects of knowledge. Consistent with Aristotelian philosophy, Locke believed that knowledge is acquired through experience, repetition, training and virtue. He emphasized the importance of enjoyable learning and insisted that teaching should begin in early childhood. Dewey shared with Montessori and Froebel the notion that education should be child-centered, active and interactive; and that education must involve the child's social world and community. Dewey emphasized the importance of experiential learning and the process of teachers and children learning together.' (Learning theories in childhood, Gray & MacBlain)

Sugata Mitra (2008), popularized the term SOLE (Self organized learning environments) in which he focused on the self learning capability of children. SOLE is a place where children can work in groups, access the internet and other software, follow up on a class activity or project or take them where their interest leads.

Several theories along with the actual preliminary results communicated in the specialized literature, form the major trends which highlights the possible effects of virtual reality on learning and cognitive processes. Broad categories of the learning theories under several paradigms mentioned below, have been reviewed as a part of the theoretical framework for this research.

- **Constructivism**

Experiential learning by Kolb (as mentioned above) and theory of constructivism by Bruner are highly compatible with certain characteristics of virtual learning technology such as media richness and interactivity, which states that knowledge is constructed through the physical interaction with the real world. This claims that the constructivist theory and experiential learning theory provides a valid and reliable basis for learning in virtual environments. Several educators have provided a theoretical framework for applying virtual reality in education keeping these theories in consideration (M. Bricken, 1991b; Bricken & Byrne, 1993; W. Bricken, 1990; Winn & Bricken, 1992)

- **Behaviourism**

Social learning theory by Bandura proposes three core concepts of modelled behaviour, reinforcement and reciprocal determinism. Modelled behaviour suggests that people can learn through observation; individuals, especially children, imitate or copy modeled behavior from personally observing others, the environment and the mass media. Virtual reality, along with its characteristics of media richness, interactivity and telepresence, provides a synthetic environment to the individuals for a suitable 3D interaction in the simulated world which in turns, as per the theory, enhances the learning process.

- **Cognitivism**

Attribution theory by Weiner B. is concerned with how individuals interpret events and how this relates to their behaviour. This school of thought highlights that knowledge acquisition is a mental activity that entails internal coding and structuring by the learner. The "goodness of fit" between the above mentioned paradigms and basic factors of virtual reality such as media richness, interactivity and telepresence (Fig 1) concludes that these theories laid the best foundation for learning in virtual environment.

Therefore, the use of this technology is justified not only because of its added value as an educational tool but mainly because it allows to test different situations without putting the setup and personnel in high risk situations.

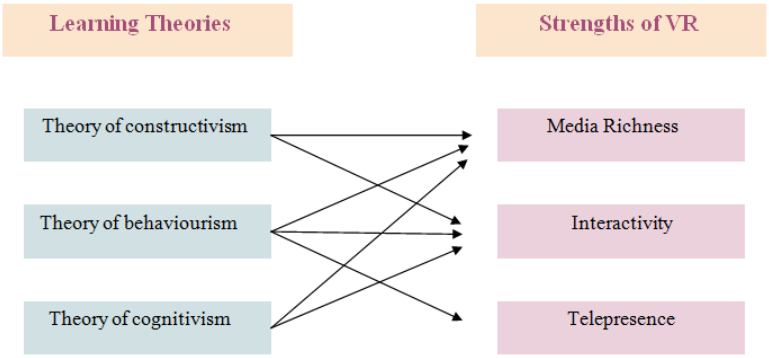

Fig 1. Interaction between learning theories and strengths of virtual reality

VR has incredible potential in education field. The reason for this very assertion is that it is the field where students require to understand the complex data, particularly in the study of sciences, as mentioned in "Why is science hard to learn" by Millar and VR makes that easier. Its style of presentation mimics the ways that we, as humans, have learned to interact with our physical world.

In earlier days, virtual reality- based learning was centered to the hard sciences — biology, anatomy, geology and astronomy — as the curricular focus and learning opportunities get notably enriched through interaction with dimensional objects, animals and environments. But these days, it has been regularly used to construct architectural models, recreate historic or natural sites and other spatial renderings. Instructors also have used VR technology to engage students in topics related to literature, history and economics by offering a deeply immersive sense of place and time, whether historic or evolving.

Thus, it enables recreation of environments and offer various possibilities to explain and illustrate complex issues (Experiential learning theory and virtual and augmented reality applications Authors: Jenni Hyppölä1, Héctor Martínez2 and Seppo Laukkanen2)

II. Literature Review

Chris Byrne in his report on "Virtual reality and Education" mentioned that "For right hemisphere dominant learner, meanings are much more self- centered, concrete, tied to visual and tactile symbols. They are not abstract from personal context and have meanings specific to certain contexts. They have difficulty using language to explicit meaning because meaning is embedded in their holistic experience and they probably stores meanings in pictures, impressions, without attaching verbal labels to them."

While left hemisphere dominant learners can use words with precision to communicate meaning. They attaches language to meaning in order to store them in memory. The literature suggests that information should also be presented in other styles along with the prefered one. Since it allows students to understand the material while expanding their way of thinking to include other processes. They potentially can relate their natural style with another style. VR provides us different modalities which therefore facilitates the learning process. Study showed the significant increase in academic achievement and more positive attitudes toward learning when students were taught in relation to their learning styles." (Henson and Borthwick, 1984).

According to the recent developments in cognitive theory relevant to human learning and the research conducted at the Human Interface Technology Laboratory at the University of Washington, virtual reality offers very different kinds of experience to students who are using it, as compared to those who are not. Study suggests that psychological processes that become active in immersive VR are very similar to the psychological processes that operate when people construct knowledge through interaction with objects and events in the real world. Such a convergence of learning processes with experiences permitted by technology is relatively rare and requires that we rigorously examine both the psychological and the technological sides of the equation.

Several studies were conducted to illustrate the utility of using virtual environment to transform social interaction via behavior and context, with the goal to improve learning in digital environments.

It has been observed that learners feel more psychologically present in a virtual simulation than in other types of traditional learning venues (Kafai, 2006; Kafai, Franke, Ching, & Shih, 1998).

Researchers also demonstrate that when students actually experience learning material in an interactive video game context, they learn in unique manners (Barab et al., 2005). Similarly, for functional studies, students can feel themselves in a virtual body (Lanier, 2001) and thus increase the scope of understanding and learning. To the extent that VR can simulate the real world, it allows students to learn while they are situated in the context, where what they learn is to be applied. The case has been made that situated learning is both more relevant and successful than learning out of context (Brown, Collins & Duguid, 1989; Lave & Wenger, 1991).

Sugata Mitra (2010) performed various experiments in the rural areas of India where he mounted the computers with internet facilities and realized that children, even if not provided with teachers or coaches, possess the self learning capability. Unlike in case of the textbooks, which highly demands prior knowledge about the symbols, virtual technology provides us the opportunity to have a direct 3D interaction and a synthetic experience of the concept without involving the usage of symbols.

Finally, it has been suggested that by using virtual technology to bring together large groups of students in the same virtual class (Dede, Nelson, Ketelhut, Clarke, & Bowman, 2004), students may collaboratively experience course material in a way not possible from lectures, movies, or interactive problem-solving tasks.

All these results highlight the arguments which support the unique ability of virtual environment to alter the social dynamics of learning via transformed social interaction.

Objective

To understand the concept and impact of introducing virtual reality on education among children

III. Methodology

Secondary data:

Exploratory Research- Several research papers, research manuals and journals were reviewed to understand and identify the needs of implementing virtual reality technology in the education sector of our country.

Proposed recommendation

Extensive research on virtual reality and its importance in learning encourages us to propose its implication to the education sector. The alignment of various strengths of VR with several theories support the evidence that it would facilitate the learning process among children. Practically, Since it provides the 3D interactive synthetic environment which brings the sense of telepresence, it would clarify different concepts to the learners and would promote the learning of several skills. Thus, it would provide them the higher quality of education. As per the Self learning theory, VR would not only save a lot of our human resources in form of teachers and coaches but would also expand the learning capabilities of individuals.

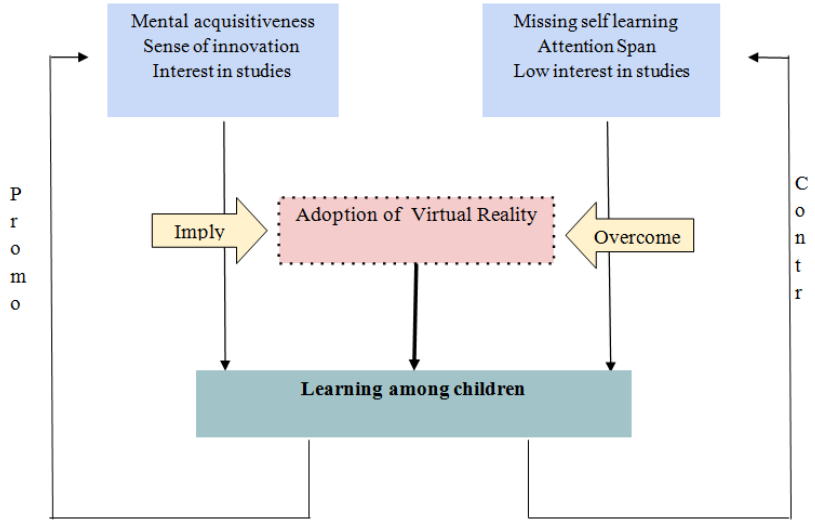

Fig 2. Conceptual Framework

IV. Conclusion

The current study provides useful guidelines for implementing VR interfaces. If we are willing to enhance the education system of our country, adoption of this particular technology would structure the foundation and thus, overall socio-economic facet of any individual. Several ways have been documented on how VR is sufficiently effective and assists learning in innovative manner by providing visualization and understanding of abstract concepts. If turned out in practice, it would promote current educational thinking that students are better able to master, retain, and generalize new knowledge when they are actively involved in constructing that knowledge in a hands on learning environment.

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