



**THEORETICAL ANALYSIS OF THE MODEL AND  
MECHANISMS OF THE USE OF "VIRTUAL REALITY"  
TECHNOLOGIES IN THE EDUCATIONAL PROCESS**

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<b>ABSTRACT</b>	<b>KEYWORDS</b>
Numerous research studies have been carried out to explore the effectiveness of incorporating virtual reality in education and training. This article highlights some of these studies and examines the rationale behind using virtual reality. The article discusses the pros and cons of using virtual reality and proposes guidelines for when to utilize it and when not to.	Virtual reality, virtual reality curricula, thinking, creativity, teaching methods and tools.

**INTRODUCTION**

The utilization of virtual reality technology in the field of education. The integration of virtual reality (VR) technology into education can be seen as a natural progression from previous computer-based learning methods, such as computer-assisted instruction (CAI) and computer-based training (CBT). Using computers as learning aids has a long history that dates to the early 1950s, with serious studies taking off in the early 1960s. Since the introduction of microcomputers or personal computers (PCs) in 1977, computers have become a widely recognized platform for offering various types of education. Alongside this trend, virtual reality - which can run on all types of computers - has also emerged as a viable option for education. Pantelidis' comprehensive bibliography (1991-2009) on virtual reality in education and training includes over 800 printed resources like reports and articles on this topic, dating back to 1989 - although it should be noted that this list is not exhaustive.

**Literature Analysis**

Studies have been conducted on how virtual reality can be applied to education. Since the 1980s, numerous investigations into the benefits and practicalities of virtual reality in education and training have taken place. The Handbook of Research for Educational Communications and Technology features a collection of detailed reviews by McLellan (1996, 2003) on the subject. These reviews trace the early use of virtual reality in flight simulators with head-mounted displays at Wright-Patterson Air Force Base in Ohio during the 1960s and 70s (1996, p. 458). During the 1990s, Youngblut (1998) conducted a thorough survey exploring the educational uses and research on virtual reality in kindergarten through grade 12. The survey showed virtual reality's unique capabilities and

its effectiveness in constructivist learning (1998, p. 93). The studies reviewed also demonstrated virtual reality's potential benefits to students with special needs (1998, p. 98). The role of the teacher in the process was reshaped into a more facilitative role (1998, p. 100). Students enjoyed using pre-built virtual reality applications and developing their own virtual environments (1998, p. 100). Overall, most teachers said they would utilize virtual reality technology if it were accessible, affordable, and easy to use by both students and teachers (1998, p. 101). According to Chen (2006), despite the recognition of virtual reality (VR) as an impressive learning tool, there remain several issues that require further investigation, including identifying appropriate theories or models to guide design and development, determining how the technology supports learning, assessing whether it can improve performance and understanding, and exploring ways to promote more effective learning with VR and its impact on learners with different aptitudes. Through her research, Chen developed feasible instructional design and development frameworks for VR-based learning environments (2006, p. 39). Salzman, Dede, Loftin, and Chen (1999) created a model that explains how VR can facilitate the mastery of complex concepts by aiding in complex conceptual learning while shaping the learning process and outcomes. Their study aimed to identify and evaluate immersive VR's features to promote learning of abstract concepts. Additionally, studies have shown that virtual environments can enhance learning and comprehension by offering a close pairing of symbolic and experiential information (Bowman, Hodges, Allison, & Wineman, 1998). Numerous studies have focused on how children and young learners learn and interact in a 3D environment. Researchers have examined how children and young learners behave in high-end projection environments, such as a CAVE, as well as interactive virtual environments like Virtual Playground. The use of virtual reality has been suggested as a means of grounding learning in experience, facilitating conceptual and higher-order learning in physics. The importance of 3D learning environments in facilitating spatial knowledge development has also been identified. A researcher investigated the potential of spatial and social technologies in a virtual learning environment through presence, proposing a model and hypotheses to enhance low- and high-level learning through spatial and social presence. The findings provide useful insights for educators designing VLEs to enhance learning.

## **Justifications for utilizing virtual reality in education and training**

The rationale for employing virtual reality is akin to that of employing a two-dimensional, computer-based training simulation (Pantelidis, 1993). Virtual reality can benefit learners of all educational levels and foster the pursuit of novel insights, inspiration, and enthusiasm. By offering a convincing sense of immersion, the student can engage with the learning content more deeply. The advantages of using virtual reality in education and training are primarily associated with its functionalities, according to Winn (1993) and his article named "A conceptual basis for educational applications of virtual reality."

Virtual reality is particularly advantageous in education and training due to the unique capabilities it possesses, as outlined by Winn (1993) in his article "A conceptual basis for educational applications of virtual reality." Firstly, immersive VR offers students non-symbolic first-person experiences intended to aid their understanding of the subject matter. These experiences cannot be replicated using any other method in formal education. Secondly, the majority of our daily interactions involve non-symbolic first-person experiences, whereas traditional schools focus on third-person symbolic experiences. Thirdly, the constructivist theory is the most applicable when developing educational VR

applications. Fourthly, the combination of knowledge construction theories and VR technology permits an enhancement in learning, such as through the manipulation of the size of objects in virtual worlds, the transduction of ordinarily imperceptible sources of information, and the representation of abstract concepts that are difficult to depict. Winn concludes that VR is the most effective and perhaps the only feasible means by which students can learn through non-symbolic first-person experiences. This is especially important for students who struggle with mastering symbol systems, despite being capable of grasping the core ideas of a discipline, and can provide a pathway to academic success for such students.

Pantelidis (1995) outlines several benefits of utilizing virtual reality in education, which include its ability to provide novel forms of visualization that leverage the strengths of visual representations. It also offers an alternative method for delivering materials, and in some cases, it can more accurately depict certain features, processes, and events, allowing for close-up examination of objects and observation from a distance. Virtual reality stimulates and motivates students to participate actively and collaborate, particularly in the case of collaborative virtual reality using text input. Moreover, it enables students to undertake virtual experiences at their own pace and enables disabled individuals to participate in learning environments that would otherwise be inaccessible. Language barriers are overcome through VR with text access, which enables communication with students from different cultures and allows the students to assume the role of a person from another culture. Mantovani (2001) echoes these advantages and adds that virtual reality also offers adaptability, the possibility of tailoring learning experiences to the learners' needs and characteristics, and a means of evaluation through easy monitoring, recall, and recording of sessions in a virtual environment.

## **Benefits of utilizing virtual reality**

The benefits of utilizing VR for educational purposes bear resemblance to those of computer or interactive simulations, particularly three-dimensional simulations, which have been employed in computer-based instruction for several years. The benefits of utilizing computer-based simulations are well recognized, with researchers attributing success to the students' empowerment, exclusive instructional capabilities, support for novel instructional approaches, cognitive skill development, and attitudinal development. While acknowledging that simulations are simply representations of real-life situations, they can still enhance the real-life experience by providing authentic and relevant environments, tapping into users' emotions through pressure situations that push them to act, offering a sense of unrestrained choices, and allowing for replayability. The simulations enable students to explore new domains, make predictions, design experiments, and interpret results, Steinberg argued. Virtual reality has a significant advantage in teaching objectives due to its high level of motivation. In a study conducted by Mikropoulos, Chalkidis, Katsikis, and Emvalotis (1998), which explored education students' attitudes towards virtual reality as a tool in the educational process and virtual learning environments in particular disciplines, the results showed that students had a positive attitude towards using virtual reality in education. Virtual reality captivates students' attention and has been shown in numerous studies to be exciting and challenging, as it enables students to interact with a three-dimensional environment and create their own 3D worlds.

Additionally, virtual reality can accurately depict features, processes, and other aspects that other methods cannot convey. It allows for extremely close examination of an object, providing new insights into it from various perspectives. For instance, students can go inside and explore the various

components of a molecule once it has been modeled in VR. This technology also permits the evaluation of an object from a distance, revealing the whole rather than just a fragment. Inhabitants of a neighborhood, for instance, can gain a new perspective on the interconnectedness of buildings, streets, and open spaces through a VR model.

Virtual reality can revolutionize how learners engage with subject matter. Unlike traditional methods, VR necessitates interaction and encourages active participation rather than passivity. Participants are rewarded for interacting with the virtual environment, which motivates them to continue. Through modeling the real world, VR provides an opportunity for learners to make unexpected discoveries and obtain fresh perspectives on this material. It is also particularly useful for people with disabilities, providing them with the ability to participate in lab experiments and immersive activities that would not have been possible otherwise.

VR allows learners to progress at their speed, allowing them to decide when and how to interact with the virtual learning environment. Unlike traditional classes, it offers a much broader time frame. This approach aligns with the constructivist method, allowing for immersive learning-by-doing experiences. Additionally, workers can become acquainted with new technologies by using a simulation of a new process or equipment, enabling them to train more effectively.

Finally, VR can be applied to distance education to teach subjects that were previously impossible to teach remotely.

## **When to use and when not to use virtual reality**

There are situations where virtual reality can be beneficial and other scenarios where it is not appropriate. It is important to consider the unique aspects of using VR before incorporating it into a learning or training environment. For example, VR can be advantageous in situations where physical access to the real environment or equipment is impossible or unsafe. Additionally, VR can simulate complex or dangerous scenarios in a controlled environment for training purposes. However, VR should not be used as a substitute for all learning experiences, as there are still benefits to traditional face-to-face interaction with real-world elements. Additionally, the cost of VR technology and development should be considered, as it may not be feasible for all situations.

Not all instructional objectives can be achieved through the use of virtual reality (VR). It is crucial to evaluate the appropriateness of VR before incorporating it into a teaching or training environment. Pantelidis (1996) offered some guidelines on when to use VR and when not to use it in education. VR can be used when simulating a real-life situation or environment is necessary, or when it is dangerous, inconvenient, or impossible to use the real thing for teaching or training purposes. VR can also be considered if it is as effective as the real thing or if interacting with a model is more motivating. It can help create a shared learning experience, or when information visualization is needed to be more easily understood. Additionally, VR can make manual dexterity or physical movements more feasible for learners, and can perpetuate interest and fun. It can provide opportunities for disabled learners and prevent expensive mistakes and environmental damage. However, VR should not be used under certain circumstances. For instance, when the real object cannot be substituted, or when interaction with real people is crucial. VR can also be physically or emotionally harmful and could result in misinterpreting the virtual environment for reality. Finally, the cost of VR technology may be prohibitive when considering the learning outcomes.

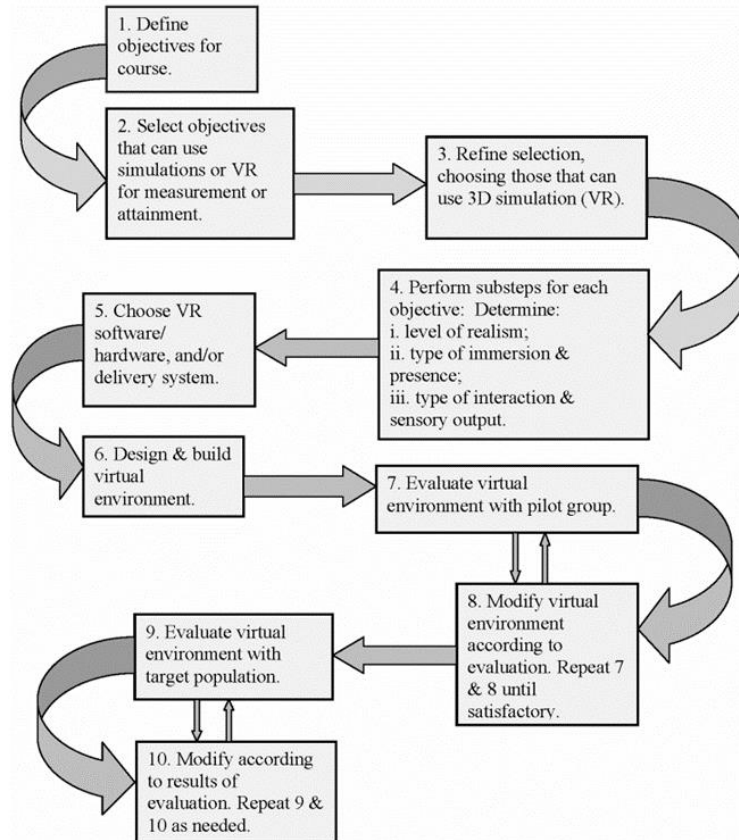


Figure 1. Model for determining when to use virtual reality in education and training courses. Copyright 1997, 2009 by Veronica Sexauer Pantelidis.

### Conclusion

The use of virtual reality in education and training has been supported by research on its educational applications and the use of simulations. There are numerous advantages to using VR, but educators and trainers need to determine when it is appropriate to use it. Models can assist in this determination and contribute to the exploration of ways to integrate VR into educational and training programs.

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