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# A VARIETY OF VIRTUAL REALITY IMPLEMENTATIONS FORCREATIVE LEARNING AND 5 WAYS TO IMPLEMENT VIRTUAL REALITY IN THE LEARNING PROCESS

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**Abstract.** Prior studies on the use of digital prototyping and virtual reality (VR) in designing as well as evaluating new products have shown that VR reduces both development time and costs whilst augmenting student motivation and creativity. The current study demonstrates that VR and 3D prototyping in the context of project-based learning (PBL) promote effective communication, increase problem solving skills, and enhance learning outcomes. VR and digital prototyping have been extensively used in industries for the purpose of product design and usability evaluation. In the context of engineering education, many research studies have attempted to explore the effect of VR on teamwork, engagement, retention, and motivation. In this paper, VR is used in conjunction with PBL in self-directed approach to design and implement a product using 3D software whilst also using virtual reality immersive CAVE display to evaluate their design. The hypothesis is that the use of VR with a project-based-learning approach to facilitate the attainment of desirable goals in the engineering design project, improved achievement of course learning outcomes and promoted effective communication. According to the research findings, VR approach significantly affected the distribution of cumulative project grades. Students' project grades improved, particularly the implementation component. In addition, the course outcomes related to project design were better achieved in VR approach. The communication and problem-solving skills were improved in the VR approach as compared to traditional approach.

**Keywords:** modeling types, 3D model, VR and AR, education, Science, engineering, distance learning.

**Introduction**. Virtual reality (BP) (lat. Virtus - potential, possible; lat. Realis - real, existing) - the world created by technical means on any substrate and transmitted to the subject through his usual sensations of the material world: sight, hearing, smell, and others. Also abnormal reality, imperfect, not meeting certain criteria of truth. The concept of artificial reality was first introduced by Myron Krueger in the late 1960s. In 1989, Yaron Lanier introduced the more popular now virtual reality. In the fantastic subgenre literature, cyberpunk, virtual reality is a way for a person to communicate with "cyberspace" —a kind of medium of interaction between people and machines created in computer networks.

The first virtual reality system was the Aspen Movie Map, created at the Massachusetts Institute of Technology in 1977. This computer program simulated a walk through the city of Aspen, Colorado, giving the opportunity to choose between different ways to display the terrain. Summer and winter options were based on real photos. Currently, virtual reality technologies are widely used in various areas of human activity: design and design, mining, military technology, construction, simulators and simulators, marketing and advertising, the entertainment industry, etc. The market volume of virtual reality technologies is estimated at 15 billion dollars a year.[1]

Moreover, the possibilities provided by Virtual Reality (VR) Technology, combined with the complex intrinsic properties of architectural pedagogy, place this technology under architecture researchers' constant watch. With its experiential nature, VR technology can improve architectural students' learning. Although the study of VR applications for educational purposes is not new, this is rarely studied in the light of emerging learning theories in architectural education. In response, an educational application called LADUVR ("Learning Architectural Details Using Virtual Reality Technology") has been designed by the authors to show how VR would address the current shortcomings of architecture learning systems.

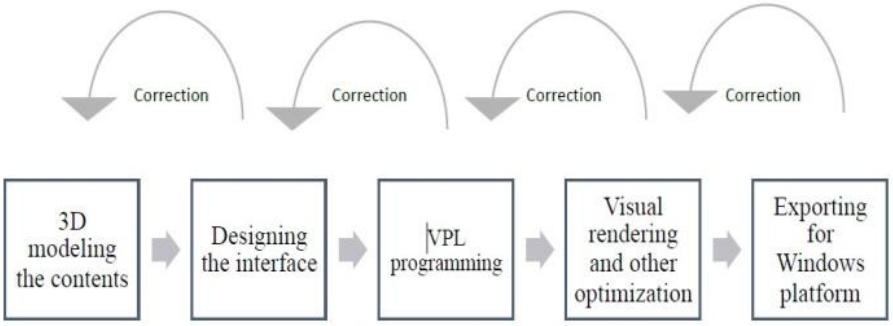


Figure *1*. –The process of making LADUVR.[2] Main part. Applications for VR and AR in Education Medical Education

Numerous surgery trainers and simulators employ virtual reality, including laparoscopy (Huber et al., 2015), temporal bone surgery (Fang et al., 2014), and even dental training (Steinberg et al., 2007). Some of these VR applications give haptic (i.e. tactile) feedback and they all allow students to practice their skills in a safe environment and without the expense of practicing on human or animal cadavers. Furthermore, virtual reality has been used to help medical students visualize anatomy in 3D, providing a much greater sense of context and scale than the cutaway diagrams and pictures common to anatomy textbooks (Satava, 1995; Falah et al.,2014).

Science.

Early uses of virtual reality in science education focused on visualizing chemical reactions(Bell and Fogler, 1998) or learning about molecules by assembling them in a virtual environment (Byrne, 1996). More recent uses include marker-based augmented reality to visualize the process of respiration and human meiosis (Weng, 2016) and an astronomy application using a headmounted display to explore the solar system and give students a grasp for its scale (Hussein and Nätterdal, 2015). Virtual reality and augmented reality make it possible to visualize concepts that are abstract or difficult to relate to real-world experiences, such as a marker-based augmented reality application that helps teach electromagnetism and the interaction between different circuit elements(Ibáñez,2014).

Engineering.

A variety augmented reality apps have been developed and tested in introductory electrical engineering courses (Martín-Gutiérrez et al., 2014). ElectARManual dispalys animations and instructions over electrical machines used in the lab to help students learn how to use the machines safely. ELECT3D is a markerless system that reads and interprets electrical diagrams. A third application is called ElectAR_notes, which is a study assistant that recognizes markers located on the course study notes and illustrates the concepts with video, animations, and more detailed information.

Another study developed a virtual reality application to teach microcontrollers and Arduino boards with Google Cardboard headsets (Ray and Deb, 2016).

Distance Learning

The Internet has made distance learning far more accessible and rich in content than ever before, but in many cases the only forum for discussion and interaction with classmates is through online message boards or e-mail. Virtual reality can improve distance learning by allowing easier and more natural class discussions in the distance learning setting. The simplest examples are giving lectures in a virtual classroom, such as in Second Life (Jarmon, 2009). [3] Another misconception is related to the opinion that BP causes the effect of "motion sickness" among users. This effect is due to lack of synchronization between the image that transmits helmet, and the data that the user receives from his body. This happens when the brain expects to receive one image (according to corresponding to the normal order of things, following its cognitive model), and gets another. Such flaws were the result of the imperfections of the first helmets and poor-quality content. At present, there is no such problem. It is widely known how dangerous radiation is from modern media devices (phones, computers, televisions).[4]

Adjacent to the last misconception is that BP kills live communication and alienates people from each other. But the same was said about mobile phones, SMS-messages, social networks. However, those who consider the use of new technologies to escape from reality forget about their advantages: mobile communication makes it possible to connect with a person on the other side of the planet, and social networks can enrich remote communication with various types of content and activities. Virtual reality technology can be applied in the field of social interaction. Using VR helmets will soon be possible to communicate with friends in one virtual space, for example, on the river bank or in the forest. In this case, the picture will be clear and believable, and the movements of the head and the sound of the voice will create an effective illusion of live communication.[5]

**Educational**

The effect was low, only 20% of students were able to recall the information provided for memorization in vAcademia. Therefore, the use of vAcademia for conducting such forms of study as a lecture and a seminar (most common in the educational process) seems to be low productive, unlike a webinar.

Preparing a teacher for a lesson in virtual reality requires much more time than to the webinar. In addition to designing a new location or studying the characteristics of a typical location, the teacher has to think through alternative scenarios for the development of a lesson due to the possible unplanned behavior of students. "Pedagogical situations" in a virtual 3D environment.

There is much more happening than in a real audience or webinar. The teacher's avatar is very often not associated by students with the personality of the teacher, which creates an atmosphere of excessive informality and freedom of expression during the lesson. In conclusion, there are several points that should be paid attention to when designing VRcontent for education. The technology brings positive results when used in short sessions or in the form of simulators and simulators. It is inappropriate to use BP for lectures and seminars. When developing software solutions, you should focus on the latest models of BP equipment, the most environmentally friendly and ergonomic for users.[6]

**The calculation of generalized evaluations.** The main disadvantage of the virtual caves is the high cost, which makes the use of this type of immersive VR limited. On the other hand,the use of an HMD can often cause some level of cybersickness. In addition to, I will show working scheme of VR in education system.

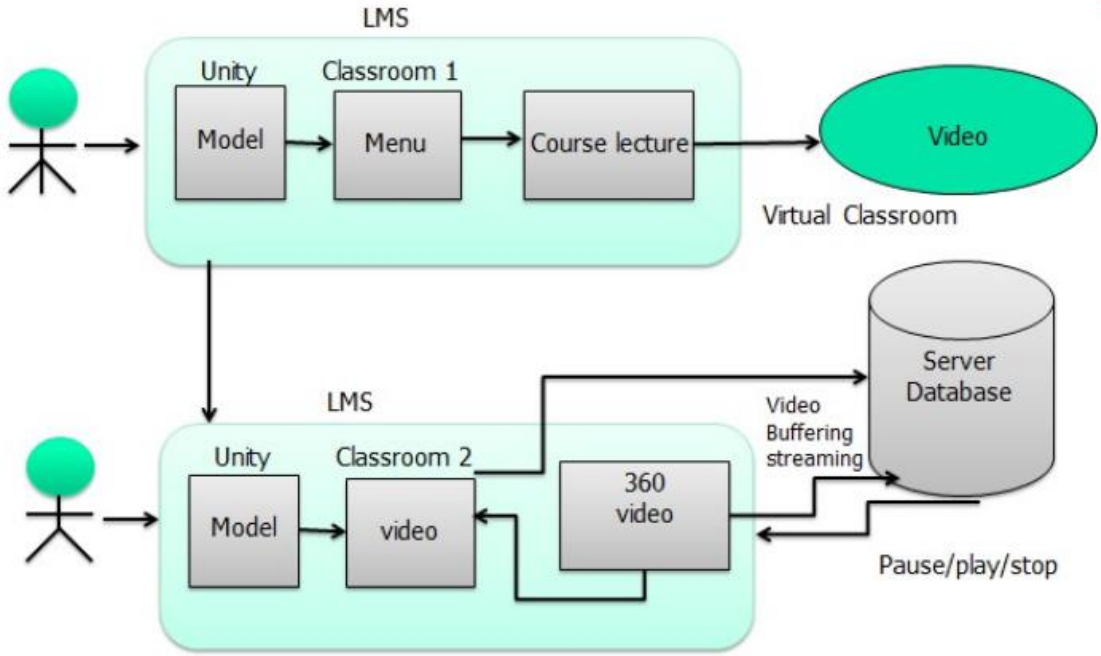


Figure *2*. – Viewing of Rough idea integration of applications VR with most common LMS in authorization part and transfer of user activity data from VR to LMS.

My workshop took place in Second Life on an island owned Tashkent University of Information Technology in Uzbekistan. Students at the university made virtual buildings with virtual classrooms for e-learning activities. The authors have already carried out lessons and projects with students in these classrooms. These teachers were not familiar with the virtual world, so they needed to learn about it and how to create, register, and use an avatar prior to the official workshop (which was a great success). During a test run, some of the teachers experienced technical problems with their computers, microphones, etc. The instructor met the teachers in a virtual classroom that contained red chairs, tables, a podium, and a poster attached to a whiteboard. She presented five creative teaching techniques and discussed them in detail with the group.

Students can participate in virtual world activities with their teacher. They can take virtual tours of museums, different countries, etc. For young student, a teacher can project the virtual world on a large screen for the entire class to use and enjoy. In Second Life, students are able to experience sunrise, midday, sunset, and midnight.

As universities continue to increase their online presence, they are challenged to reevaluate their ways of teaching to best utilize the new opportunities that digital technologies offer. While these technologies present a variety of methods for online collaboration, virtual worlds offer the added ability to interact within a realistic graphical environment, situating learners together in the same space and time. These features give participants a highly social and immersive environment within which they can represent their role-play characters through avatars.

***How To Implement Virtual Reality In The Learning Process***

While VR adoption has been a bit slow across the board, educators are certainly finding some nifty ways to use this technology within the classroom. Used correctly, this technology can be employed by teachers to create some innovative learning opportunities for students. Anyone thinking of using VR in the classroom should consider one of these 5 creative applications.

1. Immersive Language Learning

Language learners have long touted immersion as an ideal way to help students master languages. Rather than simply learning through typical classroom experiences and instruments like lectures and worksheets, teachers often prefer to use experiential learning so that students ‘live’ the language rather than simply studying it. One example of this is opting to only speak the language

being learned in the classroom. Other teachers use cultural experiences. In some cases, language learning classes even culminate with exchange trips to other countries. As with any other educational experiences, the ability for teachers to engage in immersive language teaching is limited by resources and geography. Fortunately, there are several language learning apps developed to combine language with VR to create these experiences. One example of this is Mondly VR . Using this app, students are able to practice conversational language skills from within a series of realistic simulations. Students can also use VR to interact with students from other countries and go on virtual sightseeing tours.

1. Creating Better Learning Opportunities For Underserved Populations

Some educators have the fortune to be able to create unique and enriching learning experiences by taking students on field trips. For others, that's a bit more difficult. They may be serving students who are:

1. Disabled to the extent that field trips are not optional
2. Homebound, institutionalized, or hospitalized
3. Living in remote areas

In addition to this, many educators simply work in school districts that don't have the resources that allow them to reserve school buses, cover admissions fees, or any other costs relating to traditional field trips.

This is unfortunate because in many instances the students who could most benefit from enriching experiences don't have access to them. Fortunately, teachers can use VR to give these student populations access to places they wouldn't ever have otherwise. Here are some examples of VR 'field trips' students can take:

1. Visiting and exploring national parks
2. Touring museums
3. Exploring historical locations and monuments
4. Discovering remote regions such as Antartica or Sub Saharan Africa

3. Giving Students The Opportunity To Create With VR

Students don't need to simply consume VR content. They can also spend time using VR technology to create. For example, Google's Tilt Brush tool allows users to create three-dimensional art in VR. The tool provides students with a variety of brush types and palettes. Students can then wear VR headsets and create beautiful art including characters, landscapes, skylines, and more.

That's not all. Coding in the classroom isn't new, but VR coding is. Just like students have learned coding skills to build games, apps, even robotics programming, now they can be taught to apply those skills to VR. Students can create VR apps and then test them out in the classroom.

4. Modeling And Simulations

Imagine a drivers ed student driving a route over and over again without spending any money on gas. Now, picture an architectural engineering student testing different building materials to create a walkway that spans a city block. What about a squeamish student dissecting without complaint?

With Virtual Reality, students can use modeling to understand and test a variety of concepts and theories in engineering, math, and science. VR simulations can provide students with important experiences as well as providing needed information for ongoing assessments. In addition to this, once the original cost of hardware and software is covered, other expenses are minimal.

5. Developing Empathy Within Students

A great number of students have never experienced war where they live. They haven't lived in abject poverty or with little to no resources. Many have never experienced a devastating natural event. Putting major tragedies aside, many students simply have not had experience of exposure to different cultures, traditions, or belief systems.

Current events curriculum, pen pal programs, and other efforts can help. Still, their impact is limited. Fortunately, VR can be used to put students in places they have never been and in contact with people they may not otherwise meet. Imagine students 'sitting' in a classroom in Kenya,

navigating the daily search for clean water in Flint Michigan, or being taken on tour in a country where there is currently political unrest. These experiences can increase understanding, and develop a sense of empathy.

**Conclusion.**

We will review in this example model of University and there are studentschoose their subjects where they learning his timetable. Students can now experience the topicsthey are learning about. Use of virtual reality technology has been shown to increase studentengagement and focus, while the immersive and interactive environment encourages the studentsto become active learners.

Using 3D models for educational environments is one of the most actual topics not only in our country, in abroad also. These are just a few ways that VR can be used in the learning process. The possibilities seem endless. Different combinations of classrooms and educational goals can lead teachers to conceive their own uses for this technology. In any case, students are guaranteed to come out ahead as long as educators are committed to using VR to its full potential.

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# РАЗНООБРАЗИЕ РЕАЛИЗАЦИИ ВИРТУАЛЬНОЙ РЕАЛЬНОСТИ ДЛЯ ТВОРЧЕСКОЕ ОБУЧЕНИЕ И 5 СПОСОБОВ ВНЕДРЕНИЯ ВИРТУАЛЬНОЙ РЕАЛЬНОСТИ В ПРОЦЕСС ОБУЧЕНИЯ

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**Аннотация**.Предыдущие исследования по использованию цифрового прототипирования и виртуальной реальности (VR) при проектировании, а также при оценке новых продуктов показали, что VR сокращает как время разработки, так и затраты, одновременно повышая мотивацию и творческий потенциал учащихся. Текущее исследование демонстрирует, что виртуальное и трехмерное прототипирование в контексте проектного обучения (PBL) способствует эффективному общению, развитию навыков решения проблем и улучшению результатов обучения. VR и цифровое прототипирование широко используются в промышленности с целью разработки дизайна продукта и оценки его удобства. В контексте инженерного образования многие научные исследования пытались исследовать влияние виртуальной реальности на командную работу, вовлеченность, удержание и мотивацию. В этой статье VR используется совместно с PBL в самостоятельном подходе к проектированию и реализации продукта с использованием программного обеспечения 3D, а также с использованием иммерсивного дисплея CAVE в виртуальной реальности для оценки их дизайна. Гипотеза заключается в том, что использование виртуальной реальности с подходом, основанным на обучении на основе проектов, облегчает достижение желаемых целей в проекте технического проектирования, улучшает достижение результатов обучения по курсу и способствует эффективной коммуникации. Согласно результатам исследования, подход VR существенно повлиял на распределение совокупных оценок проекта. Улучшены оценки студентов, особенно компонент реализации. Кроме того, результаты курса, связанные с дизайном проекта, были лучше достигнуты в подходе VR. Навыки общения и решения проблем были улучшены в подходе VR по сравнению с традиционным подходом.

**Ключевые слова:** типы моделирования, 3D модель, VR и AR, образование, наука, инженерия, дистанционное обучение.