

# INCORPORATION OF VR IN EDUCATION

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**Abstract** — A powerful and interactive technology such as Virtual Reality is changing our lives like nothing else in the world. The concept of virtual reality, which can also be referred to as immersive multimedia, is an art form that simulates a physical presence for the audience in both real and imaginary locations for both entertainment and learning. The key characteristic that distinguishes VR from all previous media types is the concept of “presence”. There are generally two senses involved in it, namely sight and sound. It is a psychological sense of “being there” that makes us feel as if we are immersed in and surrounded by the environment, we find ourselves in. The purpose of this discussion is to provide an overview of the current state of environment-related VR, focusing on live experiences of VR in the environment. There is a rapid change taking place in the technology, art, and business of virtual reality. The next development based on virtual reality is augmented reality.

**Keywords** — *Virtual reality, Immersive multimedia, Environment, Augmented reality*

## I. INTRODUCTION

Virtual reality (VR) means experiencing things through our computers that don't exist. When we look at an amazing Canaletto painting, for example, we are experiencing

the sites and sounds of Italy as it was about 250 years ago, so that's a kind of virtual reality. In the same way, if we listen to ambient instrumental or classical music with our eyes closed, and start dreaming about things, is also an example of virtual reality. Moreover, to explain in a briefer way, it's about losing ourselves in a book or a movie. A believable, interactive 3D computer-created world that we can explore both mentally and physically. “Virtual reality” has often been used as a marketing buzzword for compelling, interactive video games or even 3D movies and television programs, none of which count as VR because they don't immerse you either fully or partially in a virtual world. If we search for “virtual reality” in your cellphone app store and we'll find hundreds of hits, even though a tiny cellphone screen could never get anywhere near producing the convincing experience of VR. Nevertheless, things like interactive games and computer simulations would certainly meet parts of our definition up above, so there's more than one approach to building virtual world and more than one flavor of virtual reality.

## II. CLASSROOM VS VR LEARNING

### (a) CLASSROOM LEARNING:

A classroom experience involves many layers of complexity and social interaction. It is not true that teaching is just a one-way transmission of information to students. It is

also a dynamic process influenced by both students and teachers. Although teachers play a major role in creating a meaningful classroom environment for their students, what they learn is ultimately determined by their social and psychological activities and responses.

Students' perceptions, interpretations, processing, and understanding of classroom activities determine whether they achieve the desired educational outcomes. Observations of student performance (whether formal or informal) by teachers and observers must be taken with caution. An external observer may not see the students in the same light as they perceive, interpret, and understand them. Since there are many ways students can answer questions and solve problems, their performance on an assessment instrument may differ from the teacher's interpretation.



Fig. 1 Classroom learning

Until recent times, there were no major flaws found with the traditional method of teaching in the classroom. However, with the recent pandemic situation, some major flaws have been identified. A few of them are discussed below:

- Classrooms can be a target for pandemic spread (direct and indirect) if social contact is involved.

- Adding up the travel time of the participants and facilitators to and from the center of learning can create too many man-hours wasted unproductively.
- Taking into account that 30 students and one teacher spend 30 minutes getting to the venue, a total of 31 hours would be lost (which would be more than a day's worth of other productive work).
- The classroom can also become a place where power distance is displayed between individuals, especially between teachers and students, which inhibits the transfer of knowledge.

#### (b) CLASS VR:

Virtual reality is a approach to improve student engagement in learning. VR education has the effectiveness to change the educational content ,it shows a new idea of creating a virtual world which tends to be real but actually imagined and also allowing users to interact. It helps as an assistive system and advisory panel whenever needed. It's much easier to learn something while experiencing it. Instead of reading a large amount of text in a book, when we put on a VR headset, we can instantly immerse ourself in the topic firsthand. This technology inspires students to discover and work things out for themselves and also for the welfare of society. It lets them learn about the subjects through interactive activities. Schools and universities constantly have to invest in equipment for their students, such as science lab apparatus, medical appliances, etc. With tight budgets, this means that the ratio of equipment to students is small and all this equipment needs maintaining and updating. VR training simulators allow educators to scale at a far lower cost. It only requires

paying for software licensing costs and some relatively inexpensive virtual reality hardware. The potential way to overcome distance learning is enhanced through VR, bridging the gap between the educator and student. Social and collaborative learning is important. Experiential VR enables online students and lecturers to transport themselves, as virtual characters, into the same virtual world. As the teacher guides the student through experiences, they all get a sense of being in the same room. This form of online learning gives opportunities for personal feedback. Also, both people in the experience are actively involved. What's more, is that people from anywhere in the world can come together in the same virtual space. Although many people still consider going to a traditional university or school as the principal way to educate themselves, VR online learning can be a great alternative.



Fig. 2 Class VR

### III. DESIGNING VR ENVIRONMENT

#### (a) GAME ENGINE:

Game engines, also called game architectures or game frameworks, are software development environments that are used by game developers to create interactive video games. Developers construct games for

consoles computers, and mobile devices using gaming engines as they are reusable components used to build the framework of the game. A typical game engine allows developers to add general features such as physics, input, rendering, scripting, collision detection AI, and more without having to write any code.

Although there are several game engines out there but we shall discuss and weigh those two titans of the gaming industry which is unity and unreal engine.

#### (b) UNITY VS UNREAL

The Unity tool allows you to accomplish a variety of tasks related to game production. Game developers can create video games using Unity's 2D and 3D platforms. As a game engine, It can provide most important built-in features that make a game work. That means things like physics, 3D rendering, and collision detection. Therefore, developers do not have to reinvent the wheel. Rather than starting a new project by creating a new physics engine from scratch and calculating every last movement of each material, or the way light should bounce off of different surfaces. Unity's "Asset Store" allows developers to upload their creations and make them available to the community, making it even more powerful. Unity is not just a game engine, it's an IDE as well. The term "Integrated Development Environment" refers to an interface that provides access to all the tools you need for development in one place. Using Unity's visual editor, creators can drag and drop elements into scenes and manipulate their properties. Most Unity editors provide a range of features and tools ranging from navigation through subfolders to creating animations via a timeline tool. When it comes to coding in Unity, the installation process will automatically consist of choosing an alternative editor of your



choice. The most common options are Visual Studio from Microsoft.



Fig. 3 Unity game engine

Now, entering into another game engine that is unreal which was first showcased in the 1998 first-person shooter game unreal. The Unreal engine shows a high degree of portability, which allows for a wide range of platforms. Ubisoft verifies the suitability of this engine in putting together next-generation physics and graphics. This is demonstrated by the Unreal Engine consistently winning from various gaming publications (Gamasutra, G4tv). Unreal Engine is written in C++, which is a more difficult language to master for beginners. To develop a game using Unreal Engine is really involving in improvement and iteration. Unreal's visual scripting system, Blueprint, allows designers who do not have a technical background to explore their ideas. Blueprint is the reason the engine is so valuable for prototyping and iteration.



Fig. 4 Unreal game engine

## (b) LANGUAGE OF UNITY:

As mentioned above, coding also plays an important role in unity software. Unreal uses C# to handle code and logic, with an entire bunch of classes. Unity can handle complex game worlds without requiring a large amount of code. That said, understanding how to program will create many more options for what we can achieve, and Unity gives us the flexibility to change almost everything. Fortunately, C# is also an easy programming language for beginners. And it's worth learning, as it is widely used in the industry and shares similarities with other popular languages such as C and Java. As such, learning Unity with C# is a great introduction to programming.

## (c) ESTABLISHING VR LAB:

The Virtual Lab is a simulation of a chemistry lab which can be accessed online. It allows students to select from hundreds of standard reagents (aqueous) and manipulate them in a manner resembling a real lab. This can be used to help students link chemical computations with authentic laboratory chemistry. The VR Chemistry Lab is built upon learning theories like constructivism and cognitive theories such as embodied cognition. The virtual reality chemistry lab aims to be a supplementary tool to real-world, hands-on science experiences that students usually have in school. In the case where students cannot have these traditional physical experiences, the VR Chemistry Lab can provide a comparable learning experience. It also can provide a unique experience where students can enter the experiment at the molecular level and interact with the molecules as the experiment is happening. It is designed to be a bridge between the real-life chemistry experience and a model of abstract concepts that are usually difficult to visualize.



Fig. 5 Traditional chemistry laboratory

Chemistry Lab VR is an educational experience that lets users virtually simulate lab procedures and important lab safety measures in a safe environment. The user is immediately immersed inside a Virtual Reality laboratory and can begin walking around using the HTC Vive to interact with the environment. There are lab procedures and safety guides spread across the tables, and a great deal of lab equipment that can be picked up, placed, thrown, or used in real lab procedures. Few of which are discussed below:

- The first step is to put on goggles, which can be grabbed and physically placed on the user's head.
- After that, the user is given free reign over the experiment. For example, the user can grab a beaker from the lab bench, fill it with water from the sink using a pipette, place a ring stand on the Bunsen burner, place the beaker on top of the ring stand, and boil water.
- Another cool experiment involves burning steel wool to observe an increase in weight.

To create Chemistry Lab VR, we primarily used the Unity Game Engine and C# scripting. We also used Autodesk Maya to

create a vast majority of models in the experience. Of course, we built for HTC Vive and utilized SteamVR technology. We brought our desktop computer capable of running Virtual Reality systems, and our own HTC Vive for development.



Fig. 6 VR chemistry laboratory

#### IV. BENEFITS OF VR IN EDUCATION:

- 1) By exploring immersive learning environments such as visiting the moon, teachers can boost classroom excitement and engagement while inspiring students' imaginations. Students can also experience a sense of learning, by participating in the lesson with virtual reality technology.
- 2) Virtual reality fully immerses students in a way that allows them to gain a better understanding of the topic being taught. The use of virtual reality has proven effective at creating clear, detailed mental maps in students' brains, helping them to retain knowledge by up to 75%.
- 3) Experiential learning with virtual reality can improve a range of student outcomes, including attainment and test scores. Teachers can help students understand concepts better by engaging them in individualized experiences, such as walking with prehistoric dinosaurs or holding a beating human heart.
- 4) Virtual reality can help teachers to put their students into other people's shoes.

By helping students to see life from different points of view, such as exploring different cultures or experiencing what life is like for refugees, educators can improve emotional awareness and build empathy.

- 5) Virtual reality improves teamwork and social skills by creating exciting, collaborative learning environments that allow students to safely communicate and investigate learning topics virtually in pairs or groups.

## V. FUTURE SCOPE:

Virtual reality (VR) offers a completely new way of learning, one that could change the way we teach and learn forever. With the technology steadily becoming more advanced, students will become more engaged with their classes and therefore be able to absorb information more effectively.

As a result of the coronavirus pandemic, which began in late 2018 and ended in early 2019, eLearning is expected to be worth \$375 billion by 2026. VR has become an increasingly popular way to provide immersive learning experiences and bring learners closer to the content being taught. However, the year 2020 changed everything, and eLearning is no exception. According to a report by Global Marketing Insights, eLearning is expected to be worth \$375 billion by 2026. The long-term impacts of the coronavirus pandemic have created a need for better and more immersive eLearning platforms and better ways to achieve that with VR.

## VI. CONCLUSION:

Virtual reality (VR) in education offers enormous opportunities for education providers, technology companies in the EdTech sector, universities, and business investors. It provides opportunities to reinvent learning and engage audiences. VR technology is evolving fast. Commercial products are gaining more advanced features while custom education technology providers are finding ways to compete in the flourishing market. VR is becoming a viable learning solution alongside other learning solutions. Many people can benefit from VR in education from school children to medical professionals and even learn how to use it by themselves.

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