


Towards Virtual University based on Virtual Reality and Terabits Internet Speed

A Review Paper

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Abstract—With the advances in data communication, high speed internet in terabits per second, and the coming next generation (6G), where the data rate will be very sufficient for virtual reality application such as telepresence and tele-operation, the old-new concept of virtual university will be revolutionized. This paper presents a review for one type of distance learning, which is online synchronous education supported by multimedia and Virtual Reality (VR) or simply a virtual university (VU) or Virtual Classroom (VC). We review the concept of the VU for the past and how it will be in the coming futures. We review, its types, component, and how it will be. Furthermore, we review and discussed next generation VU/VC obstacles in addition to their cons and pros. Moreover, we examine the motivation for establishing VU/VC and the advantages of its availability to the virtual society. Recent advances in computer and communications technology have delivered capabilities to today's distance learning and virtual classroom. Advances in virtual reality, real-time streaming on the internet have created a revolution in curricula and classrooms. We explain how to integrate multimedia, 3D videos, Virtual Reality (VR), tele-operation, tele-presence, and Internet-based learning technologies into a common framework for the virtual classroom

Keywords—virtual reality, virtual classroom, virtual teaching, 6G in education, 6G for VR

1 Introduction

Virtual reality (VR) becomes a major player in education. Recently, several universities began to use emerging technologies online and distance classes that could be taken from the home. The technology of virtual reality is taking students to the next level of immersion in education. This paper illustrates how VR maximizes the student benefits of using VR for distance learning [1].

Reliable data connection is essential for virtual universities and distance learning. Optical fiber and mobile networks are the highways for data, and in a fully connected,

intelligent digital world you will need to connect everything, including students, to the world they are learning from. Sixth generation (6G) wireless networks, which are currently advanced research, provide important developments, which may be able to meet the full connectivity requirements of virtual universities and distance learning in the future. Therefore, this article discusses the technologies that will develop the virtual university [2].

Virtual reality goes beyond the imagination of programmers, reached a virtual environment in 3D space, utilizing special glasses to interact with the virtual environment [3, 4]. With the recent revolution in information technology and advancement in communication and the computer industry which affect our daily life, it must affect our educational system and change its methods [5]. We have realized that we can go beyond the real place to imagine a virtual world through tangible tools to help us to interact and simulate the reality from a virtual view. The virtual world has started from virtual games and expanded to train flying for pilots and to simulate real wars in a virtual environment for soldier training, to reach our imagination deep in oceans and walking on Mars. Advancement in virtual reality gave birth to virtual classes, virtual labs, virtual halls, virtual libraries, and virtual universities [6]. Virtual universities were established, students were enrolled, and professors were worked in such universities. Training courses have conducted to educate professors on how to use virtual technology. The virtual university is connected to the internet through a communication service provider. The authors of, presents their research in the area of virtual reality in education and they develop CLEV-R, a Collaborative Learning Environment with Virtual Reality. Which is a web-based learning system that uses VR and multimedia and provides communication tools to support collaboration among students.

In this study [7], the authors aim to study how virtual reality with telepresence robots can be used to create virtually inclusive classrooms that provide better educational opportunities for home-bound students with disabilities.

In study [8], the authors present a telepresence system for distance education. The system follows an Augmented Distributed Reality approach, where the students at home, wearing a VR's Head Mounted Display, are immersed in a mixed reality scene composed of a real-time 360 video stream of the classroom, a pass-through view of his/her own hands, and additional augmented information obtained via Artificial Intelligence. The system can help students in having to be attending class remotely such as students in quarantine to improve their learning experience, in particular for hands-on sessions with high interaction between students that are physically present and their teacher. The research importance appears from the reason to transform from traditional learning to virtual learning in the globalization and internet era. We should deal with virtual reality technology; it saves effort and time [9]. Furthermore, the huge number of students enrolling to traditional universities lead to congestion and over demand on universities public sources, in addition to transportation cost, safety, and traffic jam [10]. This need thinking about new practical methods to solve the problem crowd at universities [11]. Besides, the many criticisms of traditional teaching which is based on memorization and indoctrination and do not depend on the interaction between the teacher and the student [12]. These criticisms were combined with several types of research papers and seminars in education that call for utilizing advanced technology

and incorporates it into the curricula. The existence of a new generation with trends and tendencies far from traditional methods. This generation is technical in all his life and nature [13]. Therefore, to succeed in teaching this generation, we must consider agreement with their trends and favorites, since these youth are the main issue in our universities. The social interaction is becoming away from direct interaction between youth. Social technical communication is a common popular media between them. Therefore, it is hard to stay away from such technical media in teaching and we must include virtual university concepts and move toward virtual learning.

The sixth generation (6G) is not only for mobile phones, but also the basis for virtual reality (VR) and Internet of Things (IoT); connecting many electronic devices to the Internet. In this paper, the authors discuss 6G applications in virtual education and discusses common advantages and limitations in current technologies, applications, and future perspective [14].

An analytical research method to take details to enhance the assumption in terms of the advantages of applying virtual learning, the advantages of the virtual university, and the negative aspects of going deep into the virtual university in learning and technical and administrative obstacles to applying virtual learning . The rest of the paper, answer questions of what virtual reality is, how can we benefit from virtual reality in teaching at universities, what does it require to establish a virtual university . The advantages and disadvantages of a virtual university. Obstacles in applying virtual education at universities. Where the importance of this research is in putting together all the needs to establish a virtual university.

2 Research methodology

We relied on descriptive research where we search and collect scientific information to reach the goal of including virtual learning in universities. We utilized our practical experience from industry and academia to call for and encourage virtual courses in universities [15]. We utilized our practical experience from industry and academia to call for and encourage virtual courses in universities. We researched evidence in the importance and the benefits of establishing a specialized virtual university for a certain domain in education, a virtual university that keeps pace with the advanced developments of this era [11].

3 Literature review

Study [16] is an overview of the e-learning of the Virtual University in Pakistan. The goal of the research was to review the role of assessment aspects in the distance programs offered through the learning management system. Statistical analyzes such as means and standard deviations were used to analyze the questionnaire. The main objective of the study [17] is to make use of the web-based online learning system. Learning system supports online learning using the Internet. The research phase includes identification of user needs, model development, implementation, and testing. Study

torres2022effects analyzes the point of view of a group of students from a university in Ecuador. The main results showed that the students were not convinced that the virtual method is better than the face-to-face method. Study [18] compares international students' e-learning behaviors with online expectations. They found that while the participant can engage with the curriculum, there are signs of disconnection, isolation and emotional instability associated with creating and developing an e-learning environment.

In today's world with various opportunities for innovation, technology is changing the future of education by constantly creating new tools and platforms for teaching and learning. In virtual reality (VR), students and teachers participate in the virtual world rather than using it [19].

Education is advancing as fast as the technology that is used to assist teachers and students. With high-speed internet, it is possible for graduate students to learn remotely with few face-to-face classes. Recent advancement in technology including virtual reality provides an immersive experience with community and interactive telepresence in class [20].

This paper focus on the "virtual educational experience" that the current technology provides including visual and audio with the immersive experience of movement tracking and haptic feedback. This immersive experience is much more immersive than what is currently possible with current Classroom Management Software (CMS) applications used in most distance learning institutions. Classroom Management Software (CMS) Probably the most widely used CMS package today is the Blackboard suite. Blackboard is the most widely used CMS which allows Teachers to upload course content in the form of PowerPoint documents, videos, and other multimedia types. To use VR, the student would log into Blackboard, and click a link to start up the VR class [19, 21].

Virtual education is an advanced type of eLearning. Virtual education components are like traditional education but in a nonretail environment. Both the professor and the student are together in a virtual environment established by a computer developer [13, 22]. Virtual education is a website that contains educational, or training material, exercises, projects, self-tests, and electronics standardized tests. Virtual education has the advantage of the availability of attached external educational materials like scientific references, in addition to multiple educational resources such as videos and cartoons. Figure 1 shows the interaction with the virtual environment using special glasses.

Communication between users of virtual education is done by different communication means such as messages, emails, and video or sound communication. The student has a folder for his/her educational materials, send his reports, his academic records, and the professor send the educational materials to the student on his/her electronic folder. There is synchronous and asynchronous virtual education [23]. In synchronous classes, the student exists in the virtual environment as an AVATAR. For this type, students must be existing at the same time [24].



Fig. 1. A student is using a virtual education environment

4 Virtual education

Virtual University is an educational institute with academic professors and students are attending for education [25]. Students are granted accredited degrees through a virtual world that goes beyond real place. The basic philosophy is that the university comes to the student, not the student who come to university. Both Mestre and Vercher believe that each student has the right to have a chance for education and get a degree [12]. Virtual University fulfills these propositions. The advancement in telecommunications and technology were the main motivation after the eLearning to reach virtual universities [5]. Virtual universities are a consortium of educational and training institutions to offer academic degrees from virtual universities In addition, it has training courses for the job market.

Figure 2 illustrates the presence of students within the virtual halls [24], which is what represents virtual university teaching, through the figure, we see the meeting of students at the same time and place to receive the lecture and interact with it through a virtual environment, so that students are located as AV TAR format. Not every student knows the true personality of his colleague in the classroom, even the lecturer is in the form of AVTAR. Lecture-style adopts the interactive 3D method with knowledge sources.

Examples of virtual universities in second life include the following universities:

CF University – Cystic Fibrosis University.

Nova Southeastern University.

The University of Western Australia, UWA



Fig. 2. Virtual class in a virtual university

To create a virtual university, several conditions must be fulfilled. The most important of these are [26]: Two forms of access to the information system, access to the scientific curricula of lectures or the scientific subject from the teacher and the access to curriculum experts [27] who can provide feedback to the student. E-curriculum rich in graphics, sound, and multiple animations needs large spaces to store data. Direct videos can be a solution but at the expense of extra time for the lecturer.

Developing the scientific method for the virtual university is the biggest issue raised here. Who can do this, and what will the interactive interface be?. The development of interactive multimedia educational programs is a process that requires considerable work and effort [28]. There are great things to do, but a high-quality educational project requires a synergy between faculty experts, computer software developers, and graphics designers. Other aspects of the project are the project implementation timeline and testing before deployment [29].

Many questions need to be answered before a virtual university can be implemented like [4];

- When it becomes a virtual university, will it be validated? \item command.
- Do you need to outsource content development?
- What happens when multiple universities contribute to one curriculum in several large e-courses? Who gets the credits?
- How are financial matters done?
- What is the salary/pay system for faculty members' contributions to e-curricula, and how can intellectual property rights be preserved and respected?

These questions are all serious challenges from an administrative point of view. Each question must be resolved and a clear structure established before a virtual university can be implemented on the ground. The governing faculty over content and curriculum is the basis for typical classrooms. Before creating a virtual university must identify potential students first. Real studies must be done to correctly identify the target audience Is the target audience who are older than 25 years old who cannot attend campus? are they the employees in the business or industry sector who want some form of continuing education to comply with job requirements? Are they the traditional

youths between the ages of 18 and 22 who enjoy the real college life as they play a role in his social life on the real campus?

By creating a complete program for a virtual university, you need extensive training. Giving the lecture to students on the virtual university requires more effort and time by the lecturers.

The electronic curricula in the virtual universities must be within appropriate prices [30], the low cost is the biggest incentive for the student's direction for the virtual classes. The prices of virtual classes are considered as financial revenues for the university, so that competition occurs in marketing virtual lectures between virtual universities. Virtual universities develop their directions to a large electronic market that has its competitors and its position in e-commerce, and these are among the most motivated to go towards virtual universities (educational electronic commodity) .

As an interactive virtual university. Having a set of advantages over traditional education, we will mention some of these advantages:

- The personal presence of the student and the teacher is not required in the classroom [31].
- There is no specific time upon which the lecture depends.
- High-quality presentation of the lecture because it is supported by multimedia and interactive.
- It costs less for the student.
- Providing an opportunity to enroll in higher education for anyone who has difficulty in the traditional university.
- The possibility of attending prestigious universities, even if they are far away.
- Provides a variety of learning aids and techniques.
- Easy access to libraries and learning resources.
- Easier to search and electronic scientific research from within the virtual lecture.
- Save time because you do not need to travel to a traditional university.
- Plan your quarterly lecture as per your time.
- The student is more motivated to learn because of privacy in the virtual lecture.
- Virtual texts and lectures are more useful, not to speak constantly.
- Availability of many educational lectures in virtual universities, which is provided continuously by the lecturers.
- Increased ability to learn more through virtual lectures.
- Provides social justice through access to technology.
- The student controls the academic learning path because learning is according to his request in the virtual classes.
- A creative learning method.
- The continuous cooperation between the teacher and the student.
- Less barriers a student faces in completing his university studies.
- Virtual University does not achieve any success in the field of practical learning.
- The method of presenting courses in virtual lectures is slower than traditional.
- Virtual universities are science-oriented and students may encounter problems understanding technical information.
- Failure to get immediate quick reactions during the lecture [32]. Virtual learning takes us away from the sensory experience of learning.

- Staying away from students because of the sensory distance from them and communicate with them virtually.
- There is no close relationship between the student and the teacher, which often plays a positive role for students to determine their inclinations and skills, thus we lose the greatest motivation for the specialized scientific orientation.
- No comprehensive government policies.
- The virtual university needs some technical skills.
- Social isolation due to the apparent interaction between students and their colleagues virtually.
- There are technological limitations and when one is in a state of no communication or system failure, the virtual lecture cannot be continued.
- Supervision on Students is difficult.
- Until now, there is no trust in the virtual university.
- The most important reasons that hinder the spread of virtual universities in Developing countries are the following reasons:
 - Infrastructure: The infrastructure in most developing countries has not yet reached the level that embraces virtual universities, as there are weaknesses in the means of communication, problems in the Internet, either in terms of speed or not covering all urban areas [33].
 - The cost of infrastructure networks including the possession of connected computers to the network, periodic maintenance, and continuous update.
 - Popularity, the virtual university does not have popularity worldwide yet.
 - Popular suspicion of the level of the virtual university educational system.
 - Governmental policies of higher education will take time to accept the idea of adopting this type of education [34].
 - The traditional educational mentality: The traditional generation will reject the idea of modern methods of education, including virtual universities [35, 36].
 - Constantly training and technical support must be available for professors and students at the virtual university [37].

There are many virtual universities, we mention here some of them which include:

1. University of Maryland University College (*UMUC*). *UMUC* is a virtual university with 110 students in 1994 and 86,769 students in 2002. Its global rank is 2123 within Webometric rankings. The courses include arts and humanities, social sciences, business, management, computing, technology, education, and professional doctoral degree in management.
2. African Virtual University <http://www.avu.org/avuwweb/en/>. Founded in 1997 by the World Bank, and developed in 2003 in Nairobi SA, Ghana, Mozambique, Kenya, Senegal, Ivory Coast, the Democratic Republic of the Congo, South Sudan, Benin, Tanzania, the Republic of Guinea, Sudan, Burkina Faso, Mali, and Mauritania. Headquarters in Nairobi, Kenya, and the regional office in Dakar, Senegal.
3. Syrian Virtual University <https://www.svuonline.org>. The university was established in 2002, it includes specializations in informatics, business administration, and humanities. it has several centers in Syria and abroad, globally ranked in 2013 is 8448.

4. Pakistan Virtual University <http://www.vu.edu.pk>. The university is founded in 2002 and located in Punjab, a public university that includes several programs, undergraduate programs, master's programs, and doctoral degrees [38].

5 Conclusion

This paper discussed a type of synchronous online education: virtual education or Virtual University (V U). We explained V U importance and effectiveness in educational achievement and discussed all V U components including managerial and technical aspects. Our goal in this research is to present the necessary information to establish synchronous online learning supported by multimedia and virtual reality or a V U in developing countries. In addition, we showed the importance of this type of university and its positive impact on both the student, academic professor. The main result is to present a complete study for the decision-makers and higher education authorities in developing countries to encourage including virtual education in universities' regulations, to be part of higher education in these countries.

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