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"New Perspectives on Virtual and Augmented Reality: Finding New Ways to Teach in a Transformed Learning Environment", Edited by Linda Daniela, Routledge, 2020, Book Review

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Abstract: The book "New Perspectives on Virtual and Augmented Reality: Finding New Ways to Teach in a Transformed Learning Environment" can be used in innovative pedagogy. There is an urgent need to teach and support learning in a transformed learning environment. Learning in a new way is made possible by technological advancements, but they also present educational institutions with new problems. Virtual reality solutions can be exciting, enthralling and accessible, and they can speed up the process of education. As a resource for educators, this book examines the potential of virtual reality, augmented reality, and mixed reality (VR/AR) to enhance learning, and how these technologies can be used in the classroom. As a tool for knowledge construction and the development of metacognitive processes, virtual reality (VR) solutions can be an effective educational tool. As a result, they help broaden the scope of educational opportunities for students from all backgrounds. Academics, researchers, and post-graduate students in educational technology will find this book invaluable.

Key terms: virtual reality, mixed reality, augmented reality, learning environment, educational technology

1. Introduction

Technological advances and digitalisation opportunities are transforming the educational environment in various ways. Therefore, it is necessary to provide the acquisition of essential competencies in today's world and ensure that the fascination with technology does not override learning goals. In this book, researchers examine the capabilities of virtual, augmented, and mixed reality by suggesting ways to improve learning, use existing VR/AR solutions as learning tools, and structure a learning process. VR/AR solutions can help people learn things that would otherwise be impossible or difficult to understand. There are several reasons why VR solutions can be used successfully in education: they can help to reduce barriers to otherwise inaccessible places, either because of changes in the historical period or because it is necessary to preserve historical and natural values from human influence; they can help to ensure that abstract learning becomes concrete by helping to master complex concepts, and they can help to ensure inclusive ed. These possibilities can and should be used to improve understanding. As VR/AR solutions have to do with educational shortages resulting from underachievement, researchers are currently looking at various ways to use VR/AR solutions in education to make the education process more efficient, modern, and diverse. They are also looking for technical solutions to make VR more accessible and appealing.

2. Structure of the book

The book "Finding New Ways to Teach in a Transformed Learning Environment" is structured in three parts. Part I, VIRTUAL REALITY IN HUMANITIES AND SOCIAL SCIENCES, comprises seven chapters. Part II, CONCEPTS OF VIRTUAL REALITY, contains five chapters, and Part III, VIRTUAL REALITY IN SCIENCES AND MEDICAL EDUCATION, comprises five chapters. The book contains 322 pages and includes 67 B/W Illustrations [1].

The first chapter, entitled "Virtual Reality Learning Experience Evaluation Tool for Instructional Designers and Educators", discusses the fact that, with the advent of virtual learning environments and virtual learning experiences, instructional designers and educators can focus on the context and background of learning rather than just the material. There is much study on virtual reality's technological solutions and limitations (VR). However, it is still difficult for educators and instructional designers to find guidelines for building VR learning experiences to ensure learning objectives are met. As a result, current VR learning research appears to struggle with comprehending the basic principles of this process and how they relate to existing learning theories, instructional practices, and curriculum. With the rapid growth of VR learning, it is necessary to systematise the pedagogical concepts that govern and assist VR learning. This chapter introduces a VR learning experience evaluation tool highlighting key aspects instructors and educators should consider when designing and implementing VR learning experiences [2]. High fidelity graphics and immersive content using head mounted displays (HMD) have allowed students to explore complex subjects in a way that traditional teaching methods cannot [3-4].

Chapter two, entitled: "The educational perspective on Virtual Reality experiences of cultural heritage", discusses how humans have always imagined virtual reality. Initially, VR was primarily linked with the ICT business, but subsequently, the military and medical industries were interested in its potential. Now VR is entering the realm of education, proposing new learning methods, opportunities, and outcomes. Virtual reality can transform education because technology allows students to experience things that are impossible in the actual world. VR offers a massive range of possibilities, but educational goals must be met. While it is true that VR may enhance learning, we must guarantee that knowledge is not lost in the VR craze. The chapter explores the educational potential of VR experiences and presents an evaluation tool used in order to assess four cultural heritage VR experiences.

The third chapter, "The Potentials of Virtual Reality in Entrepreneurship Education", considers contemporary entrepreneurship that entices people to use their skills and abilities to create new services and products that meet market needs. However, starting a new company venture is an uncertain and unstable process that requires a developed mental model to make sense of and make decisions. Entrepreneurship education equips people with the information and abilities necessary in order to identify relevant opportunities and risks, but it often lacks practical teaching tools. Therefore, examining virtual reality as a technological and supplementary tool that allows users to learn and develop abilities by immersing themselves in virtual worlds is a vital first step [2].

Chapter four, entitled "Mixed Reality applied theatre at universities", speaks about mixed reality (MR) educational concepts for a university applied theatre class. In applied theatre, people work together to better their neighbourhood. A lesson plan is developed using Augusto Boal's Theatre of the Oppressed and MR's interface design patterns. A dramaturgical pedagogy based on MR affordances and Boal's methods allows for new ways of thinking about communal challenges. The lesson plan was developed at Georgia Tech to address campus safety issues. The workshop participants believed they gained unique knowledge about safety from both MR and constructivist performance exercises. The students also felt their work might benefit the university campus. Beyond the lesson plan, educators wishing to incorporate MR into their own applied theatre practices will find various further possibilities. A lesson plan is developed using Augusto Boal's Theatre of the Oppressed and MR's interface design patterns. The theatre and academia should address the following question: What is mixed reality, and why theatre should care? What is scenography of mixed reality environments? What is the role of mixed reality technology as an integral part of the experiential artistic design process for education?

Chapter five, "Development of professional skills in higher education: problem-based learning supported by immersive worlds", encourages the acquisition of professional skills related to solving real-world situations using active teaching approaches. Developing these competencies for literate individuals in the knowledge society is a multi-stakeholder process. This chapter shows a project to build engineering and mathematics teaching professional abilities utilising environments replicated in immersive worlds. Interaction with professionals from several fields has been highlighted. Several role-playing scenarios for public contracts, technical support, and curriculum design were created. These scenarios were created by industry experts (policymakers, owners, etc.) and built into an immersive worlds environment. As a result, students interacted as diverse stakeholders in the processes, working on the corresponding documentation and assessing the professional role. The experience was evaluated based on students' opinions of their professional tasks. This learning experience increased participants' professional confidence. Immersive worlds can construct educational proposals that evoke student involvement and skill development [2].

Chapter six, "Virtual Reality and Augmented Reality in Educational Programs", discusses how these technologies have existed for years and can be used on smartphones, iPads, and computers. VR and AR can be used in education at various levels. This chapter introduces VR and AR education and discusses their use in educational programmes related to medicine, sports, military, and history.

Chapter seven, "An Exploration of the Impact of Augmented and Virtual Reality Within Compulsory Education", examines the use of augmented and virtual reality in the UK between the ages of 5 and 18. The chapter examines current research on primary studies of its use in the specified age range to assess the impact of augmented and virtual reality on the curriculum [2].

Part two, CONCEPTS OF VIRTUAL REALITY contains five chapters [2]. Chapter eight, "Transcendent Learning Spaces", discusses how emerging technologies like augmented and virtual reality can be used to model real-life situations in the digital world. As long as they are used with a sound pedagogical foundation, they can provide powerful educational experiences beyond traditional classrooms. We need to gain a better understanding of the ways in which the human brain processes these simulations or enhancements of reality to achieve this. The concept of transcendence is essential to grasping their value. Virtual and augmented reality learning spaces provide students with emotional reinforcement and stimulation in a transmedia environment. They can be highly effective for many learner populations, including those at risk of exclusion or in an educational crisis.

Chapter nine, entitled "Enhancing trust in virtual reality systems", discusses how virtual reality (VR) technology has gained popularity in recent years, both in entertainment and business. VR systems are widely used in healthcare, training, and education. VR has clear educational advantages over other technologies, and its use in learning and teaching is growing. However, users' trust must be considered for any technology to be effective and used. This is true for VR and tech. Various studies have shown that untrusted e-learning systems can be ineffective and even cause higher dropout rates. This chapter describes a study designed to test the influence of usability, technology acceptance, and presence on trust in a VR model. The results help validate the model, which could shape VR technology design to improve user trust, human-system interaction, and technology effectiveness when fully demonstrated [2].

Chapter ten is entitled "Simulation data visualisation by using Mixed Reality with Microsoft HoloLens TM". Simulations and testbeds are complex topics for mechanical engineering students and new employees. HoloLens is used in order to visualise CAD models, sensor data, and simulation data from a test run on an air conditioning system testbed. Temperature and pressure changes are challenging to see in opaque parts like tubes, compressors, condensers, or electrical expansion valves. The HoloLens app supports virtual reality and CAD. For example, MR overlays were used to colourise temperature and pressure changes on the testbed. The HoloLens app is designed to reduce the time and effort required to understand simulations and testbeds. The app could also be used for sharing knowledge and experiences between departments [2].

Chapter eleven, entitled "A+Ha!: combining tactile interaction with augmented reality to transform secondary and tertiary STEM education", argues that using novel technologies that combine haptic interaction with pedagogically strategic digital augmentation to promote the faster and more effective acquisition of subject matter intuition (e.g. structural mechanics) can significantly improve the effectiveness, accessibility, and engagement in STEM teaching and learning in secondary and tertiary education [2].

Chapter twelve, entitled "The Use of Fuzzy Angular Models and 3D Models on a Construction Method Assessment on the Great Wall of China in Jinshanling as a Case Study of the History and Heritage of Civil Engineering in Education", introduces three possible construction methods that were likely implemented during the building of the walls and towers of the Jinshanling section of the Great Wall of China during the Ming Dynasty period. The lack of data concerning ancient construction methods in this region warrants a subjective assessment approach using the fuzzy modus ponens deduction technique. Fuzzy angular models were selected and employed to determine the most likely and feasible construction methods and sequences. Factors contributing to method selections include the availability of labour, materials and equipment; soil condition and existing structures and accessibility to the site and storage of materials. While each method might have its advantages and disadvantages, the modus ponens deduction technique using fuzzy angular models suggests that the first method associated with simultaneous sequence from both the inside and outside for both the walls and towers has the highest likelihood of having been implemented by ancient Chinese construction workers. The same methodology can be applied to recreating construction sequences for other old structures in engineering courses. The results can be displayed in virtual reality (VR), with or without the fuzzy logic methodology, suitable for teaching in primary, secondary and university classroom settings [2].

Part III, VIRTUAL REALITY IN SCIENCES AND MEDICAL EDUCATION, comprises five chapters. Chapter thirteen, "Virtual Reality for Teaching Clinical Skills in Medical Education", discusses how virtual reality (VR) has become a viable method of teaching clinical skills to medical students due to technological advances and cost reductions. Over time, clinical governance, patient safety awareness, and cost efficiency have become more critical to healthcare providers. This chapter examines the use of VR in healthcare education and whether it is more effective than other methods of teaching clinical skills to medical students. VR is likely to be as good as traditional methods of medical education for clinical skills. [2].

Chapter fourteen called "Virtual Photoreality for Safety Education" discusses the industry that causes the most accidents and injuries is construction. Safety education is critical to improving worker safety before entering the construction industry. However, university safety curricula are isolated and lack knowledge and professional skills. Virtual Photoreality (VP) has enabled many disciplines with cutting-edge technology. As a result, the chapter proposes a novel VP-based construction safety education approach. A VP prototype is presented based on standard construction site accidents. Preliminary findings suggest that VP could be used to promote safety education [5].

Chapter fifteen "Encouraging immersion in the Soil Sciences through virtual conferences where ideas are shared among avatars to improve the educational background of young scientists" describes a teaching experience where an immersive virtual conference was created for senior researchers and young soil scientists to interact. An international conference like the European Geosciences Union Assembly is an excellent opportunity for PhD students to present their work to experts and share their knowledge with others. An overview of the last three conferences (2015–2017) is provided. The main issues were technical. It was critical that the conference server could provide a reliable internet connection for many attendees. However, they praised the fun atmosphere and the sense of immersion, which encouraged them to interact, express themselves freely, and use a foreign language. The less formal format of these innovative meetings increased participant interaction, which the young scientists valued [2].

Chapter sixteen entitled "Educational Technologies in the area of ubiquitous historical computing in virtual reality" points out that new technologies emerge with an ever-increasing frequency, expanding application areas. This includes VR and AR devices. The public and education sectors, in addition to the private sector, benefit from these technologies. However, few frameworks are flexible enough to create immersive virtual environments, especially historical education. This chapter fills this void using VAnnotatoR, a flexible framework for creating and using virtual environments that model historical processes. In addition, this chapter describes VAnnotatoR's components and uses in historical education.

Chapter seventeen, entitled "Virtual and Augmented Reality Applications for Environmental Science Education and Training" discusses sensing technologies, graphics processors, and artificial intelligence that have enabled the development of generalised and affordable virtual and augmented reality devices. Individuals can now immerse themselves in cutting-edge simulations with real-world physics and scenarios. Virtual and augmented reality applications can help the public, scientists, decision-makers, and professionals work in a realistic and safe environment with repeatable measurements. This chapter reviews the literature on the effectiveness and efficiency of using virtual and augmented reality in environmental applications. For example, a decision support system for environmental planning and disaster management and a training platform for technical staff and first responders are examples of mixed reality (XR) educational tools for K-12 and college-level students. Finally, future directions for augmented reality (AR) and virtual reality (VR) for next-generation environmental information systems are discussed [2] [6-11].

Chapter eighteen, entitled "ViMeLa: Interactive Educational Environment for Mechatronics Lab in Virtual Reality" presents a blended-learning method using theory classes and virtual reality (VR) as an experimentation tool. The work has been developed as a joint European project, ViMeLa. The main objective is to create a virtual mechatronic laboratory for learning and teaching students in mechatronics. Within the frame of the project, flexible solutions are developed. For demonstration purposes, use-cases were created: design, construction and operating principles of electric motors; industrial automation solution for controlling the sorting of packages in a warehouse.

3. Editor

Linda Daniela is a professor at the University of Latvia's Scientific Institute of Pedagogy in Riga, Latvia, and serves as Dean of the University of Latvia's Faculty of Education, Psychology and Art, and Chair of the university's Council for Promotion of Pedagogy. Her research interests include educational robotics for learning and ways to reduce social exclusion through virtual education and innovative education technology. Professor has authored and co-authored numerous works on educational processes [12].

4. Concluding remarks

As many young people are choosing not to pursue higher education, HEI believes that utilising technological resources will help boost this level of education. Finding solutions for the use of XR, which is popular with the younger generations, in higher education can help make academics and practical training more appealing to a broader audience. At the same time, students' enthusiasm for learning can be increased by providing them with a sense of autonomy and competence [13].

While digital solutions like virtual reality (VR), mixed reality (MR), and augmented reality (AR) have been around for some time, their educational applications have yet to be thoroughly explored. However, suppose we believe that education is the key to more tremendous success, new ideas, and a better society. In that case, we must also believe that education must look for and solve any further problems in education or culture. In this book, a group of researchers have come together to discuss how virtual reality (VR) can improve the acquisition of specific knowledge, measure knowledge progress, and make processes that would otherwise be more expensive, dangerous, time-consuming or ineffective more efficient.

The book "New Perspectives on Virtual and Augmented Reality: Finding New Ways to Teach in a Transformed Learning Environment" teaches valuable lessons from virtual reality in education. There are 18 chapters in this book devoted to explaining various techniques for using VR and AR. In addition, several authors examine these possibilities from multiple perspectives, including knowledge gain, the effectiveness of the learning process, and the need for a shift in views toward VR.

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