PEDAGOGICAL BOOKLET ON VR TECHNOLOGY

LIFEX PROJECT

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INTRODUCTION TO VR IN EDUCATION

In the last decades, the internet has revealed itself as a more and more effective tool to provide virtual courses, due to the increase of population immersed in digital platforms. E-learning proved to be a successful way to learn during periods of physical limitations like the recent COVID-19 pandemic. However, to cope with the need for a more practical way of learning through digital technology, the application of virtual reality methods represented a step further in today's education.

To introduce virtual reality in the educational process you just need three components: hardware, software, and solutions. The hardware element is represented by devices used to project virtual reality content such as head-mounted displays, VR headsets, and projectors, while the software is simply the digital course created for that specific immersive experience. Virtual reality in education can be applied in many spaces, both residential and training institutions.

The main impact VR has on education is the innovative approach that brings in the learning process: introducing VR as a learning tool allows students to experience more engaging immersive lessons. Thus, virtual reality can transform the way education is provided nowadays, creating more interactive and impactful learning experiences for learners.

Especially in the case of practical training where physical approach is essential, the creation of VR immersive lessons can allow trainees to test themselves through an “hands-on” methodology in real-situation experiences without taking any risks, which may represent a more effective learning method in fields like medicine, mechanical engineering, etc. (Business Research Company, 2022). Virtual reality does not only provide a more engaging and less risky learning experience, but is also an equal access way to provide education: all students, regardless of their abilities, backgrounds, or geographical location can benefit from VR-driven learning experiences.

Also, virtual reality is revealed to be an effective training tool for the development of employees’ soft skills. A survey conducted by PwC showed that VR learners were four times faster to train and more emotionally connected than in a physical classroom, as well as way more confident in applying these skills acquired after the VR training in comparison to a physical or e-training (PwC, 2022).

EThe global virtual reality in the education market is rapidly growing, from $8.67 billion in 2022 to $11.95 billion in 2023 at a compound annual growth rate (CAGR) of 37.9%. (Business Research Company, 2023) According to the Business Research Company, it is expected to reach $32.94 billion by 2026, with an annual growth rate of 39.7% (Business Research Company, 2022). This data gives the size of this market and the high potential of its application in the education of the future.

HOW DIGITAL TECHNOLOGIES ARE CHANGING LEARNING PROCESSES

Since the beginning of the new millennium experts in pedagogy are debating around a very relevant question: to what extent digital technologies are changing the way people, especially those belonging to the youngest generations, learn? The answer is crucial because it deeply affects how we are going to conceive, design, and deliver educational and training programs in the next future. At the same time, the answer is not simple and straightforward with studies saying that the digital era brought a revolution in education, and we are facing today a completely different generation of learner, i.e., the digital natives (Tapscott, 1998; Prensky, 2001); and other researchers convinced empirical data confirming this difference are not so reliable, and probably learning processes are not undergoing such a revolution (Bennet et al., 2008; Bullen et al., 2011).

Recently, it has been suggested to overcome this ideological opposition, linking the ongoing transformations in the way people learn not only to new technologies but also to broader cultural changes happening in our society; and being aware that is not an abrupt revolution but more an incremental transition towards a new perspective about learning (Quaratino, 2023).

HOW DIGITAL TECHNOLOGIES ARE CHANGING LEARNING PROCESSES

Firstly, technological and cultural changes are accelerating the transition from 'broadcasting learning', based on teacher-centricity, standardized content and teaching methods, focus on knowledge transfer, and an individual experience; to 'interactive learning', based on learner-centricity, flexible and customized content and methods, focus on exploration and self-development, and a cooperative experience. The implication is that teachers and trainers are challenged today to rethink the way they approach their audiences if they want to fit with these new expectations.

Secondly, the intensive use of new technologies and the continuous immersion in digital settings is somehow transforming our cognitive processes as neuroscientists are beginning to study and test. In particular:

- Prevalence of spatial visual intelligence, as the ability to catch multidimensional images, drawing information from pictures, mastering visual communication.
- Sound competences in using nonverbal channels for the comprehension and expression of concepts.
- Reduced capacity in memorizing notions, a function that is more and more delegated to technology.
- Increased ability in multitasking.
- Preference for creative and mental associations (surfing across many different content and sources of learning) rather than linear cognitive processes.
- Predilection for an explorative comprehension of content rather than an historic (chronological) or systemic one.
- Transition from the assimilation from one single formal and validated source of knowledge to screening and scrutinizing across many sources.

HOW DIGITAL TECHNOLOGIES ARE CHANGING LEARNING PROCESSES

Finally, it is possible to identify three priorities educators should focus on to adapt their pedagogical approach to the emerging transformations.

1. Teaching methods and materials: flipped classroom or adaptive learning, where content is absorbed before through online pills, and lecture time is totally devoted to participated discussion and cooperative interaction; new micro-design guidelines as peer-to-peer activities, 'hands-on' sessions, and emotional involvement (remember Generation Z members are fan of gaming!); attractive materials, full of images and videos.

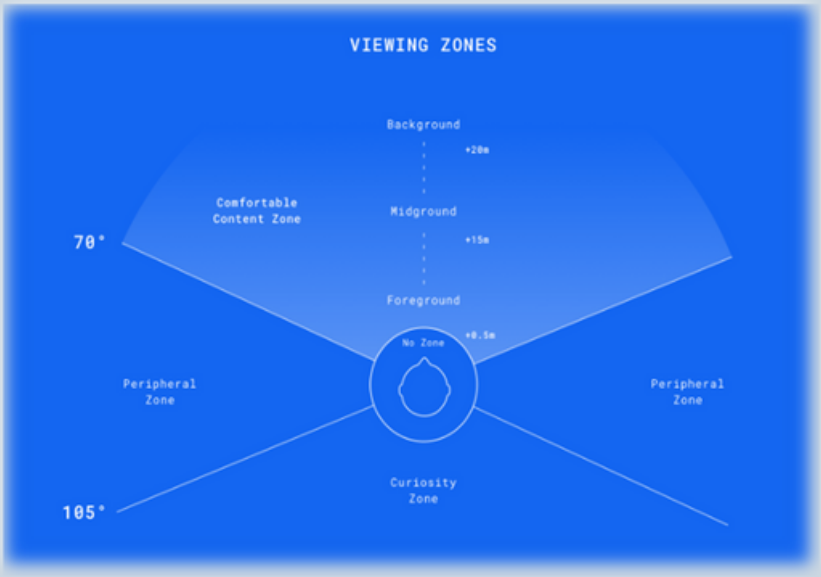
2. Learning physical spaces: de-structured rooms, flexible arrangements, mobile desks, writable walls, are just a few of the many options available today.

3. Technology: designing hybrid and blended learning settings, where the use of laptop, tablets and smartphones is valued also using 'clickers' (Audio Response System); the richness of blog, podcast, video-streaming and social network is fully exploited; and finally, the largely unexplored opportunity of immersive learning, augmented reality and metaverse will be used to produce better learning experiences.

DESIGNING FOR VR: CREATING AN IMMERSIVE EXPERIENCE

Virtual Reality (VR) is an approachable instructional technology for many educators, to create engaging and coherent online learning experiences. Instructional designers are faced with even greater challenges of blending media with more immersive and visually complex forms of instructional content. Therefore, resources and skills are needed to produce highly interactive and immersive content “and instructional designers need to be able to address the design challenges of integrating these diverse forms of media using evidence-based guidelines” (Antonenko & Dodd, 2012). Virtual learning through Virtual Reality can provide a visual representation of the real world, by using a smartphone and earphones devoiding the external physical world environment with a 360⁰ view of the virtual world, where the learner is in the centre of the experience, integrated with image/photography, video or 3D modelling content, moving inside the virtual world and seeing a setting from different perspectives and scenarios (personal, social and learning to learn) to trigger emotional responses similar to how learners would likely feel in the real world.

To do so, instructional designers have to think “beyond the rectangle” and know what kind of experience they want to design. Usually, they’re used to designing from a rectangle point of view (because every viewing device is shaped in a rectangle), but the environment is boundless in an immersive experience.



Alger, Mike & Chu, Alex in Hudelson, Blake.(2019). Designing For VR | A Beginners Guide.

DESIGNING FOR VR: CREATING AN IMMERSIVE EXPERIENCE

Getting started in designing a Virtual Reality experience isn't that much different from the process of designing applications or a web or mobile product: there will be needed user personas, conceptual flows, wireframes, a VR prototype and an interaction model.

VR designers should use contrast and colour to denote hierarchy and base size on the distance between the user and a piece of content, understanding the scale and appropriating viewing distance. Regarding some experience principles when designing for VR, physiological comfort is the most important consideration (and a difficult one), similar to what occurs in the physical world, learners can easily get uncomfortable in small, large, or high spaces, so the comfortable range of motion zones factor needs to be considered. Establish healthy habits and movement standards, "instead of trying to adapt ourselves to fit the limited interactions supported by our existing technologies, our interactions with VR platforms will need to be as natural and intuitive as possible" (Hudelson,2017), allowing us to interact with the digital world in the same way we interact with the physical, real world.

Integrating Virtual Reality content within an online Learning Management system (LMS) represents an important design dilemma involving abstract, text-based content (Antonenko & Dodd, 2012).

DESIGNING FOR VR: CREATING AN IMMERSIVE EXPERIENCE

Integrating Virtual Reality into a LMS has various advantages such as low-risk factors (since it's done in a safe environment), increased personalization, and the simplification of complex contents, proving that a visual approach using VR is better for understanding and memory recall. This way the learners are more confident in applying what they're taught and more focused too, since the Immersive Learning Experience (ILx) commands their vision and attention, consequently becoming more connected to the VR content. The training scenario provides real-time feedback (positive or negative) in an immersive environment by changing the learner's experience based on their decisions and actions.

It's important to have in mind that not every learner learns in the same way, so personalization is key! This presumes attending to the learner's individual needs by the adequacy of the content regarding the target group and individualized value, who rely on a specific sense (sight), where they have to use their gaze to "unlock" the scenarios.Remembering that mistakes are acceptable in building confidence in their new experiences, where Virtual Reality meets the needs of today's learners.

TECHNICAL REQUIREMENTS FOR USING VR IN EDUCATION

Virtual Reality (VR) technology is a rapidly growing field that is becoming increasingly popular in education. It has the potential to revolutionise the way students learn by providing an immersive and engaging experience. However, before implementing VR in education, several technical requirements and considerations need to be considered.

Educators need to ensure that any VR equipment is easy to use and maintain, and that students only have access to relevant or approved content. This can be achieved through the use of device management solutions that present only approved apps to students and prevent the use of inappropriate content.

When selecting VR equipment, educators must decide on the type of hardware required to run the VR application. The VR headset is the primary component that enables learners to experience the immersive environment. Comfort, resolution, field of view, and refresh rate are all factors that should be considered when selecting a VR headset. The headset should be comfortable, lightweight, and easy to adjust for different users. Higher resolutions and wider fields of view provide a more realistic and immersive experience for learners. The computer or gaming console powering the VR experience must also be powerful enough to handle the high demands of rendering graphics and processing data in real-time.

TECHNICAL REQUIREMENTS FOR USING VR IN EDUCATION

Motion controllers are used to interact with the virtual environment, enabling learners to manipulate and explore the digital world. The motion controllers should be easy to use and responsive to user actions. Additional accessories, such as headphones, microphones, and additional sensors, may also be required to enhance the VR experience

The software should be easy to use and flexible, and should provide the virtual environment, learning content, and tools for interaction and assessment. The virtual environment should be visually appealing, immersive, and engaging, with a range of customisation options to match the learning objectives and activities.

The virtual environment is the heart of the VR experience, and it is essential to ensure that the environment is visually appealing, immersive, and engaging. The software used to create the virtual environment should provide a range of customisation options, such as lighting, textures, and effects. The software should also allow for easy modification of the environment to match the learning objectives and activities.

TECHNICAL REQUIREMENTS FOR USING VR IN EDUCATION

Compatibility is essential, both between hardware components and between hardware and software. The software used for implementing VR in education should be easy to use and accessible to learners of all abilities, provide accessibility options for learners with disabilities, such as text-to-speech and colour contrast adjustments.

Cost is another important factor to consider when selecting software, as well as ensuring that it comes with adequate support and updates. Network infrastructure is also critical for providing learners with a glitch-free experience. A high-speed internet connection is necessary to stream data and ensure a smooth and immersive experience. Latency, or the time it takes for data to travel from the user's computer to the server and back, should be minimised to prevent a disorienting experience for users.

By carefully considering these technical requirements, educators can successfully integrate VR into their lessons and provide learners with a transformative learning experience. VR technology has the potential to enhance learning outcomes by offering an immersive and engaging way to learn, that allows students to experience situations that they might not otherwise have experienced.

ETHICAL CONSIDERATIONS ON VR IN EDUCATION

Virtual Reality (VR) technology is finding its way into education, introducing a fresh approach to learning and student engagement. However, like any new technology, there are important ethical considerations to bear in mind when incorporating VR into education.

One significant ethical concern revolves around the potential for addiction. VR can be incredibly immersive, and students might become so engrossed that they lose track of time or find it difficult to step away from the virtual world. This is especially concerning for younger students who may struggle with self-control. Educators should be vigilant and establish guidelines to prevent excessive VR use.

Another ethical aspect to consider is the potential for VR to be misused as a tool for propaganda or indoctrination. VR's capability to shape beliefs and opinions can be exploited to promote biased or inaccurate information. To mitigate this risk, educators must ensure that VR content used in classrooms is accurate, balanced, and free from bias.

ETHICAL CONSIDERATIONS ON VR IN EDUCATION

Privacy is yet another ethical dimension when implementing VR in education. VR technology can collect substantial personal data, including biometric information like eye movements and heart rate. This raises concerns about privacy and surveillance. Educators should ensure that personal data is handled responsibly, and students are informed about the data collected and its purpose.

Another ethical concern involves the potential for VR to perpetuate stereotypes and discrimination. VR environments can replicate real-world settings and inadvertently reinforce biases and stereotypes. Educators should strive to create VR environments that are inclusive and free from discrimination.

Lastly, there's the concern that VR technology could worsen existing social inequalities. Not all schools or students have equal access to VR technology, potentially creating disparities. Educators must ensure that VR technology doesn't exacerbate these inequalities, providing equal access to all students.

In conclusion, while VR has the potential to revolutionize education, it's crucial to consider the ethical implications. Educators should address the potential for addiction, propaganda, privacy concerns, stereotype reinforcement, and social inequality. By doing so, VR technology can enhance learning and educational outcomes while minimizing risks.

UNIVERSITY OF MARYLAND VR TRAINING PROGRAM

Virtual Reality (VR) technology has been making waves in the world of education, offering fresh and innovative avenues for students to dive into their studies and interact with their course materials. A shining example of VR's success in education can be seen in its use in medical training at the University of Maryland.

At the University of Maryland's School of Medicine, VR has been a part of the learning journey since 2016. Through VR simulations, students gain hands-on experience in a controlled and realistic environment, enhancing traditional medical training methods.

One of VR's significant perks in medical education is the chance for students to practice procedures repeatedly without any real patients at risk. In the past, students had to learn by observing or working on live patients, which could be nerve-wracking. With VR, students can hone their skills as much as needed until they feel confident for the real deal.
Additionally, VR exposes students to rare and complex medical scenarios that might be hard to come by in real-life situations. These simulations allow students to build their responses, preparing them for future encounters.

The University of Maryland's School of Medicine offers a variety of VR simulations, covering emergency medicine, surgery, patient consultations, and more. These simulations feature realistic medical settings, such as operating rooms and emergency departments.

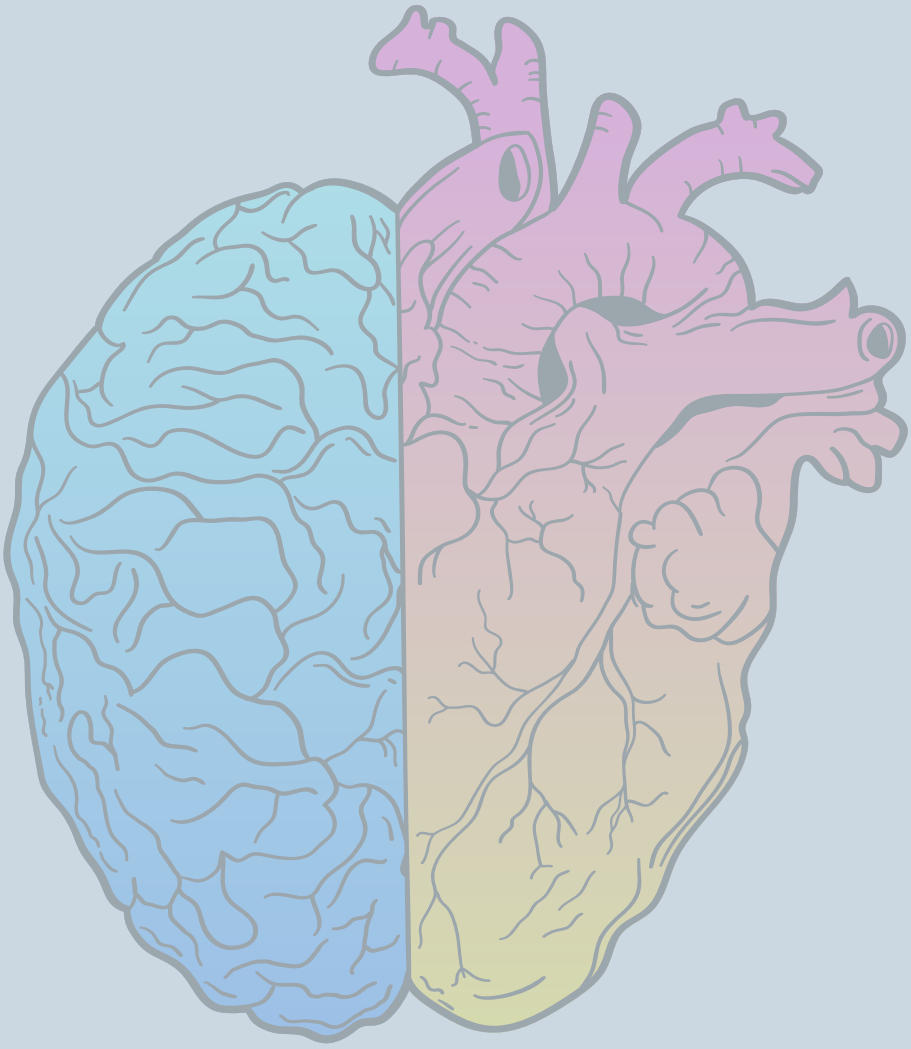
UNIVERSITY OF MARYLAND VR TRAINING PROGRAM

A standout example is the VR training program for spinal anesthesia, complete with a simulated patient and a spinal needle. This program offers haptic feedback, giving students a lifelike sensation of inserting a needle into the spine. As a result, students gain confidence and reduce the number of failed attempts when performing the procedure on real patients.

The University of Maryland‘s School of Medicine has found that the use of VR simulations in medical education has improved students‘ engagement and understanding of the material, as well as their confidence in performing procedures. The use of VR technology has also been found to increase students‘ retention of information, as the immersive and interactive nature of the simulations makes the learning experience more memorable and engaging.

UNIVERSITY OF MARYLAND VR TRAINING PROGRAM

In conclusion, the use of VR simulations in medical education at the University of Maryland is a best practice case of the effective implementation of VR technology in education. The use of VR simulations has improved students‘ learning outcomes, prepared them for real-life scenarios, and provided a safe and controlled environment for practicing medical procedures. The success of the program at the University of Maryland highlights the potential of VR technology in education and provides a model for other institutions looking to incorporate VR into their teaching methods.



IMPLEMENTATION CONSIDERATIONS OF THE VR TECHNOLOGY

It has been proved that VR technology can be used effectively in many learning situations. Theoretical knowledge and formulas alone are frequently not sufficient to understand complex phenomena, therefore simulations are a valuable tool to support the conceptual understanding by visualising invisible processes. However, this being a relatively new technology, those who would like to implement it are advised to keep in mind some important aspects:

Virtual reality (VR) technologies enable interaction with the virtual environment with a high intensity of immersion. This experience can be familiar to learners who are used to virtual gaming situations but it can be altogether new and even disturbing to those who are not familiar with it.
Therefore learners needa guided tutorialor someone tohelp them andguide them throughtheir first experiences. Researchers report that it has a positive influence on the learning effect when theoretical information is availablеduring the simulation. This can be optimised by using guided tutorials to explain how to use the controls.

VEvaluation of the effectiveness of VR experiences can be another aspect that needs to be clarified.
One of the first steps to evaluate VR for education is to define the learning objectives that the VR activity or content aims to achieve. Learning objectives are specific, measurable, achievable, relevant, and time-bound (SMART) goals that describe what students should know, do, or feel after completing the VR experience. Learning objectives can be aligned with curriculum standards, learning outcomes, or competencies, and can cover cognitive, affective, or psychomotor domains.

IMPLEMENTATION CONSIDERATIONS OF THE VR TECHNOLOGY

The next step is to measure the learning outcomes that the VR activity or content produces. Learning outcomes are verifiable results of the learning process, such as knowledge, skills, attitudes, or behaviours. Learning outcomes can be measured using various tools and methods, such as quizzes, tests, surveys. Learning outcomes can be compared with the learning objectives to determine the extent to which the VR experience met the expected goals.

Another aspect to evaluate VR for education is the engagement and motivation that the VR activity or content generates. Engagement and motivation are the psychological and emotional factors that influence the students‘ involvement, interest, and persistence in the learning process. Engagement and motivation can be assessed using qualitative and quantitative indicators, such as feedback, and ratings. Engagement and motivation can reflect the quality and appeal of the VR experience and its impact on the students‘ learning.

IMPLEMENTATION CONSIDERATIONS OF THE VR TECHNOLOGY

A unique feature of VR for education is the immersion and presence that the VR technology enables. Immersion and presence are the subjective and objective degrees of realism and involvement that the VR environment and the user create. Immersion can be influenced by various factors, such as interactivity, fidelity, feedback, agency, or social cues. Immersion and presence can be evaluated using self-report measures, such as questionnaires, or physiological measures, such as eye-tracking, or measuring heart rate. Immersion and presence can indicate the effectiveness and impact of the VR technology and its potential to enhance the learning experience.

Overall, those institutions that would like to use VR technology as a teaching method should be prepared to give clear instructions, even guidance to the learners, formulate clear learning objectives and take surveys after the learning sessions to measure the effectiveness of the method.

CHALLENGES OF VR

Virtual reality (VR) systems like VR headsets permit immersion in an artificial, simulated world while shutting out the physical world. VR technology seems to be a promising new way of teaching on many educational levels from highschool to university education and adult education as well. Researchers are still investigating the use of VR as alearning tool.These studies show that in the process of the VR technology being used by learners, a few challenges may arise:

1

Acquisition of the equipment:

At the first period of implementing VR technology in education one of the most significant challenges was the cost of the equipment, the large size and bulkiness of initial VR tools, the difficulty of using them, and the high cost of design and implementation, which slowed down the process of using these tools. Nowadays these problems are already solved as performant Smartphone VR headsets are available at an affordable price for everyone. One consistent issue is however that VR applications on the smartphones need to be updated from time to time, otherwise they will lose their speed of response and image quality.

CHALLENGES OF VR

2

Side effects:

A challenge that might emerge from using VR technology, especially for first time users is the existence of physical side effects. Cybersickness is a physical discomfort with symptoms comparable to those of motion sickness. This feeling of discomfort is caused by a sensory mismatch, as the visual information is not aligned with the vestibular and sensory-motor information about movement and locomotion. The likelihood of experiencing these symptoms is as high as 22%–56%.

Studies show that VR users with a tendency to motion sickness were relatively more affected by this challenge to their sensory integration.

Acknowledging these possible side effects, VR technology providers recommend starting the sessions with a standardised balance evaluation protocol, the Sensory orientation test, this will show whether the learner feels any discomfort caused by the VR experience.

3

The immersion in the experience

The main purpose of VR is to create a sense of the user's presence in a virtual space. The created space should be believable and sufficiently interactive. The believability of the virtual environments depends on several factors, including the real-time processing capability of the system, and the appealing quality of the interface designof the VRsimulation. According to studies the successful immersion of the VR users in the experience does not depend on highly realistic surroundings, as long as the virtual space offersenough cues forthe perceptual system,immersion can beachieved. However, creating a good virtual experience requires thatusers are not initially overwhelmed with the virtual world, they are introduced in the experience gradually, possessing theoretical knowledge of what is about to happen.

The organisers of the learning sessions have to be careful when choosing the space for the experience as well, studies with different group setups showed that different room layouts, light conditions and the shape of play areas had amarginal influence on the tracking accuracy, which caused slightly different experiences.

As a conclusion, we can say that it is especially important for VR learning sessions to be conducted in the presence of experienced supervisors who can offer guidance and can help when problems arise.

FUTURE DIRECTIONS IN VR LEARNING EXPERIENCE

Adopting new technologies for pedagogical purposes through innovative learning methodologies is quickly imposing itself as the future of education. Regarding the COVID-19 pandemic, the landscape of technology-enhanced learning has shifted towards blended learning, personalized learning spaces and user-centred approaches. Virtual Reality (VR) can be the future of education since it offers users a multi-sensory, immersive experience, going far beyond what learners might encounter in a “conventional” training setting, encouraging more autonomy, and giving them space for self-motivated learning.

On the other hand, education is not static, it changes and evolves and, increasingly, there is a recognition that learning must prepare learners for the real world. And why use continuously Immersive Learning Experiences (ILx)? Various applications for immersive Virtual Reality, including virtual field trips to distant, inaccessible places (or even to familiarise learners with the cockpit of a vehicle before getting into the real thing) and content creation for any theme or as a training tool to study complex material through practical tasks, represents a significant evolutionary step forward, transforming the delivery of educational content. So the aim is to give the learners the right tools so they can simulate and model real-world events and environments, apply their learning to decision-making and experience the impact of their choices, capturing their actions and collecting data that provide insights into behaviour that traditional methods never have.

Therefore, Virtual Reality can transport the learners and “propel them into the future, using vivid, experience-based techniques. It can transform a learning environment into a multipurpose space for education and research” (ST Engineering Antycip, 2022) connecting learners, remotely and globally, breaking down geographical barriers to both learning and empathy.

In addition to it, this presumes a shift of mindset and development of soft skills by the learners’ end for this Immersive Learning Experience to achieve its full potential. Now more than ever, it’s imperative for learners to become resilient, independent and persistent: game-based learning is one way to make this happen, in this case, by learning through experience as an effective way to learn and to do so, they need to adopt a Growth Mindset.

FUTURE DIRECTIONS IN VR LEARNING EXPERIENCE

To develop a Growth Mindset using Game-Based Learning the learners need to be prepared to try again and learn from it, instead of having a Fixed Mindset where they will want to prove themselves correct over and over rather than learning from their mistakes/choices.
Through game-based learning, Virtual Reality (VR) can create engaging and immersive scenarios, making the unreal visceral real, taking the learner's brain to another level by full immersion, representing an incredible learning tool. The Immersive Learning Experience (ILx) has proven to be extremely beneficial since this kind of realistic training can lead to real-world behavioural changes, increasing impact and retention, and also real-time feedback which accelerates proficiency.

2023 and beyond is full of promise in simulation technology, and we're right on the cutting edge, aiming to use, improve and expand immersive scenarios with a wide range of applicability. So, we need to introduce more gamification and experience-based learning into the curriculum and more Virtual Reality possibilities. Holographic images may also play an important part in future education, bringing personalities to life who can share their knowledge without physically being on-site.

RESOURCES FOR VR EDUCATION

The world of education has changed dramatically over the past decade as technology continues to advance at an unprecedented rate. Traditional chalkboards and textbooks are now being replaced with innovative tools that enhance the learning experience for both teachers and students. Online e-learning platforms that provide a safe and secure immersive environment are becoming ever more popular, with students and teachers now able to collaborate as avatars. To introduce teachers and eduators to a range of online plaforms, we have selected a number of recommneded platforms to support educators engage with immersive teaching.

Eduverse offers the ability to access its platform from any web-enabled device, allowing up to 32 students to participate in a teacher-initiated session concurrently. This allows for a truly interactive and engaging experience that is accessible from anywhere with an internet connection. In addition to Eduverse, there are many other edtech platforms available to educators looking to integrate technology into their classrooms.

Discovery Education is a popular edtech platform that features a vast library of videos, virtual field trips, lesson plans, and other interactive teaching resources in topics ranging from STEM (science, technology, engineering and mathematics) to English or History. Although there is a cost associated with the platform, the multimedia offering provides educators and students with a wide variety of video content, lesson plans, quiz-generating features, and other standards-aligned educational tools, including virtual labs and interactive simulations.

RESOURCES FOR VR EDUCATION

EdTechTeacher is another platform that offers professional development and resources for educators looking to integrate virtual reality (VR) into their classrooms. Their mission is to help educators thrive in modern learning environments and provide students with innovative and engaging learning experiences.

Nearpod is a free platform that allows users to access thousands premade interactive lessons and interactive videos and activities that can be customized and delivered to 40 students per session. The platform also offers VR with hundreds ready-to-run VR lessons.

YouTube is still a top tool for finding quality 360-degree videos for instruction, although it doesn't provide tools to create VR experiences. There are great VR playlists available with powerful 360-degree YouTube videos from media outlets like The New York Times, Discovery, and National Geographic.

Google Arts & Culture is another platform that offers a variety of free interactive content that is fully accessible via Chromebook or mobile device, much of which is 360 degrees and curated by experts. Google's virtual reality tours enable users to explore masterpieces at famous art galleries and cultural sites around the world. These tours are only available on the mobile version of Google Arts & Culture, so to experience them, you must install the mobile app on a smartphone and use a Google Cardboard viewer.

ClassVR is another tool that brings affordable, innovative virtual reality lessons and experiences to learners of all ages. It comes complete with hardware, software, curriculum-linked activities, and lesson plans, equipping teachers with everything they need to introduce this cutting-edge technology straight into the classroom.

RESOURCES FOR VR EDUCATION

EdTech Impact is a platform that enables schools to find quality EdTech solutions that fit their needs and contexts and connects vendors to the largest and most-trusted global marketplace of in-market EdTech buyers.

In conclusion, the world of edtech platforms has exploded over the past few years, providing educators with a choice of unique tools to enhance the learning experience. From immersive virtual reality experiences to interactive lesson plans, these platforms provide learners with engaging and innovative learning opportunities. The technology that teachers choose to use may depend on the specific functionality, lesson plans or topic areas they wish to cover. Most likely a combination of tools will help cover more content and keep students engaged and interested.

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