**Immersive Environments and Virtual Worlds (“Second Life”) Metaverse Technology: Pedagogical Intelligence to Solve Real-World Problems**

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**Abstract**

The *Abstract* is similar to an *Executive Summary* as the preface of a large report. The purpose of the *Abstract* is to prepare the reader for the subject matter to be explored as well as to generate interest in what he/she is about to read. Your abstract should normally be a single paragraph double-spaced and between 150 and 250 words. It serves as a summary of your writing and typically is not composed until the paper/works have been completed. This is written as a last step.

**Immersive Environments and Virtual Worlds (“Second Life”) Metaverse Technology: Pedagogical Intelligence to Solve Real-World Problems**

**Introduction**

Immersive environments put the subject, students, patient, or clinician directly into the experience or circumstances of the event studied or evaluated. Immersion in a content area is critical for learning. Immersion refers to an experiential learning methodology of virtual dialog that uses virtual reality to simulate real-world scenarios while educating in a safe, engaging learning environment. Virtual reality (VR) platforms such as Second Life, Decentraland, and others are becoming increasingly popular and have been termed *metaverses* because they are created by computer-generated simulations. Users are represented in human form and termed *avatars*. These applications afford new ways to engage learners in immersive learning environments. (Barrientos, 2022)

 Of note is the use of artificial intelligences (AI), which are personified in computer generated forms and are termed *Intelligent Pedagogical Agents* (IPA). These and other advancements in technology have made VR useful for educational purposes because they better engage learners educationally and evaluate whether learning has occurred (Soliman, 2013).

This paper will review different learning settings and how they use VR to teach and evaluate acquired learning.

**Historical Background**

The concept of the metaverseis not new; they have appeared in popular books and movies for the last decades. The first use of the term Metaverse was by Neal Stephenson in his novel *Snow Crash*, some popular movies such as *Tron Series* (1982-2010), *Matrix Series* (1999-2021), and the *Free Guy* (2021). All these take place in a Metaverse.

*Ready Player One* is the 2018 American science fiction action film based on Ernest Cline’s novel. The protagonist, Wade Watts, only really feels alive is when he is in the *OASIS* (Ontologically Anthropocentric Sensory Immersive Simulation) a vast virtual world where most of humanity spends their time. According to new research … Wikipedia contributors, 2022)

However, these simulated contexts are gaining popularity as more applications have begun to explore their potential to engage users in absorbing ways. What follows is a short timeline spanning thirty years with much of the progress in IT occurring over the last few years.

**Snow Crash-1992** Neal Stephenson first to coin the word metaverse in his novel *Snow Crash*, describing a virtual shared space where humans navigate in the form of avatars. “The [*Metaverse*](https://en.wikipedia.org/wiki/Metaverse), a phrase coined by Stephenson as a successor to the Internet, constitutes his early 1990s vision of how a [virtual reality](https://en.wikipedia.org/wiki/Virtual_reality)–based Internet might evolve in the near future. “ (Wiki, Snow Crash)

**Second Life – 2003** is an online multimedia platform allowing people to create an [avatar](https://en.wikipedia.org/wiki/Avatar_%28computing%29) for themselves and then interact with other users and user created content within a multi player online [virtual world](https://en.wikipedia.org/wiki/Virtual_world). Developed and owned by the [San Francisco](https://en.wikipedia.org/wiki/San_Francisco)-based firm [Linden Lab](https://en.wikipedia.org/wiki/Linden_Lab), it launched on June 23, 2003, ( Wiki,

**World of Warcraft-2004** is an extensive multiplayer online role-playing game where players use avatars to explore an open game world, interact in player versus player combat, and access digital goods and clothing worth real money.

**Grand Theft Auto Online-2013** is a game with its own currency where players compete to earn and spend on virtual properties and cars. Players continually invest in their avatars for years and keep growing their possessions.

**Decentraland – 2020** is a 3D [virtual world](https://en.wikipedia.org/wiki/Virtual_world) [browser-based](https://en.wikipedia.org/wiki/Browser_game) platform.[[3]](https://en.wikipedia.org/wiki/Decentraland#cite_note-ravenscraft_2021-3) Users may buy virtual plots of land in the platform as **non-fungible token** [NFTs](https://en.wikipedia.org/wiki/Non-fungible_token) via the MANA [cryptocurrency](https://en.wikipedia.org/wiki/Cryptocurrency), which uses the [Ethereum](https://en.wikipedia.org/wiki/Ethereum) [blockchain](https://en.wikipedia.org/wiki/Blockchain). It was opened to the public in February 2020 and is overseen by the nonprofit *Decentraland* Foundation. (Wiki, Decentraland)

**Meta Platforms-2021.** In 2014, Facebook acquired *Oculus,* both virtual reality hardware and platform. In 2021, it rebranded its parent company to Meta, pledging to spend $10bn USD for the metaverse and employing 10,000 people to build it.

**Microsoft- 2021** They presented the platform *Mesh*, created for virtual collaboration on multiple devices. **Microsoft Mesh** is a collaboration and communications platform developed by [Microsoft](https://en.wikipedia.org/wiki/Microsoft). [Engadget](https://en.wikipedia.org/wiki/Engadget%22%20%5Co%20%22Engadget) described it as "the company's ambitious new attempt at unifying holographic virtual collaboration across multiple devices, be they [VR headsets](https://en.wikipedia.org/wiki/VR_headset), [AR](https://en.wikipedia.org/wiki/Augmented_reality) (like [HoloLens](https://en.wikipedia.org/wiki/HoloLens)), laptops or smartphones"

**Application:**

Virtual worlds need more educational support. The use of simulated human-like interface(s) between learner and content in an educational environment has been used successfully (Soliman, 2013) uses an Intelligent Pedagogical Agent (IPA) to add intelligence, believability and to increase communication by interacting with learners and learner object to teach a natural science experiment involving capacitors. In this use the IPA and learning scenario are computer generated in the open-source virtual world, *Open Wonderland*. Open Wonderland was used because it allowed changes to be made to the software to optimize use for educational purposes. (Open-Source 3D Virtual Collaboration Toolkit – (Openwonderland, n.d.)

Virtual Reality (VR) applications have been successfully used to treat many types of psychological issues including phobias (i.e., irrational fears) (Bullinger, 1998), and eating disorders (Kucera, 2022). Virtual reality is thus being used in psychiatric and psychological therapeutic contexts.

Learning tools based on VR have been developed and used successfully for people suffering from phobias using the HTC Vive VR system (Kucera et al., 2023). In their application, increasing difficulty and levels of exposure to phobic stimuli are used as appropriate for even the most severe phobic individuals. The effectiveness of these applications was verified by recording heartrate and skin conductivity data.

In addition, Virtual Reality (VR) applications have been used successfully in neuroscience research issues to investigate questions in a controlled environment. This realistic environment engages the sensorimotor system more fully than the simple stimuli used in most psychological research. Furthermore, VR’s compatibility and use with MRI brain imaging technology make it a useful tool for investigators. (Bohil, 2011).

To increase the motivation of students and their training competencies in Computer Architecture augmented reality (AR) considered as a diversification of virtual environments was utilized as a resource in higher education. “AR allows the enrichment of reality through the superposition of metadata and formats such as text image video and others such as geographical coordinates which can be viewed through widely used devices such as cell phones tablets and computers” (Barrientos, 2022)

**Affordances/Benefits**

Effective VR design for immersive educational purposes must follow state of the art learning theory and technologies and methods. Design and assessment (particularly audience analysis) are critical if the user interface is to iteratively improve. For instance, meetings can be highly collaborative and gamified making them more engaging and interesting. Recruiting can be done within the metaverse, so new staff can join the company from anywhere. The metaverse can accelerate onboarding and learning. People have a virtual place identical to the physical location where they will work and interact with each other.

The metaverse has already impacted the working environment. For example, Meta’s Horizon Workrooms, and Microsoft’s Mesh are designed to empower work in a virtual world by facilitating working remotely through mixed reality applications represented as a 3D avatar.

Horizon Workrooms is a collaboration platform that allows employees to gather in a virtual space, using VR or web, and engage in productive activities through whiteboards, VR workstations, calendar apps, file sharing, chat, and other virtual replicas of office tools.

Microsoft Mesh enables persons to share collaborative holographic experiences on many kinds of devices. Users will be able to project themselves as their lifelike, photorealistic selves. Designers or engineers who work with 3D physical models could appear as themselves in a shared virtual space to collaborate on holographic models. (Krill, 2021)

 Productive work is being accomplished in the metaverse. Of note, collaborative VR review of maintenance documentation and risk assessment has shown promise as more importance and focus is being paid to providing support and technical instructions to the maintenance technician in the field (Heinonen et al., 2022)

**Challenges**

New experiences and enhanced digital identities increase the need for a heightened emphasis on cybersecurity. The kind of interactions we will see in this virtual world are unique; we are not prepared for them and cannot test them yet. Risk is higher as well. You can personify another individual in the metaverse instead of just stealing their data.

Other challenges involving cybersecurity also need to be addressed. For instance, there have been cyberattacks whereby the safety boundary that prevents a user from colliding with physical objects has been manipulated. In another instance attacks have caused visual discomfort and VR sickness (nausea, sweating, drowsiness, discomfort, and fatigue). (Blessing, et al., 2023)

**Implications for the Future**

Practice makes perfect and VR and the Metaverse promise to able us to do so in a low cost, low risk environment. Just as playing as a child helps young people learn the required skills of an adult person immersive computer VR games help us learn to succeed in low-risk practice environments. Games can prepare us for the real world so that when the time comes, we have had the necessary practice to succeed.

 Sian Bielock explores why people often fail at routine tasks in her new book called *Choke: What the Secrets of the Brain Reveal About Getting It Right When You Have To*. With fMRI (functional magnetic resonance imaging of the brain), she has shown that the prefrontal cortex of our brains can get in the way, causing us to overthink routine tasks and choke when trying a short putt in golf or a free throw in basketball……The good news is that practice—developing a routine—can help. Experience at performing under pressure helps you develop new ways of coping with pressure and coming through. Gaming gives you a low-risk environment to practice your skills. (Taylor & Cosker (2020)

**Conclusion**

  This paper has outlined some of the history and background leading up to the advancement of immersive environments and virtual worlds. Examples were taken from Second life, World of Warcraft, Grand Theft Auto, Decentraland, the Meta platform, and the Microsoft mesh.

Immersive environments are 21st century advancements using state-of-the-art technology to teach and optimize a student’s learning experience. This experiential learning environment uses a virtual or simulated dialogue methodology to engage students access, enthusiasm, and safe information acquisition. This environment acts as a collaboration of affordances, the quality or property of an environment that defines its possible uses and clarifies how it can or should be used.

Virtual Reality (VR) platforms such as Second life, Decentraland and Meta Platform use computer generated applications and *avatars* as proxies to interact with real-life learners. These technologically configured applications exist in a virtual world of Intelligent Pedagogical Agents, all facilitating access for motivated and enthusiastic learners.

While immersive virtual environments create novel opportunities for learning, their innovation is met with contemporary challenges. A significant area is identifying needs and measuring to what extent learners have met those specific tasks objectives. Another crucial concern is identifying and managing cybersecurity challenges. These issues disrupt the smooth pedagogical flow: access, needs, dialog, responsiveness, safe feedback, evaluation, and goal completion. While in their early stages of development, virtual landscapes are still in their infancy.

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