Enrolling in the Metaversity: A Meta-Analysis of Virtual World University Campuses in the Metaverse

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Abstract
Among the innovations in higher education during the Covid-19 pandemic are university-based initiatives in the metaverse. This paper provides a meta-analysis of a series of eleven of these international university educational undertakings in the emerging networked virtual worlds, or the metaverse. Findings show that metaversity initiative are organized into at least three main areas, including virtual world campuses, immersive courses, and programs of research about the educational implications of the metaverse and related learning capacities. It is posited these efforts are part of the resilience of higher education during a time of enormous challenge to adapt and provide quality education in an era of disruptive change.

Keywords: Metaverse, Virtual Reality, Immersive Learning, Metaversity

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Introduction

Metaversity is a portmanteau. It blends metaverse and university. Metaverse itself is also a portmanteau merging meta and universe. In a sense, then, metaversity is a double layered portmanteau. Meta comes from the Greek, meaning after or beyond (Merriam-Webster, 2023).

Designing and building a campus inside the metaverse is a goal of a growing number of universities across the globe (Singh, Malhotra & Sharma, 2022). Such initiatives to build virtual campuses is part of the resilience of higher education during a time of enormous challenge to adapt and to provide quality education in an era of disruptive change. The disruption is fueled by multiple factors, not only the COVID-19 pandemic that required an enormous increase in the role of remote or virtual learning, but technological, economic and cultural shifts that are fueling the reconsideration of a wide spectrum of assumptions of how organizations including universities operate in the 21st century and beyond.

Theoretical Framework

Science fiction writer Neal Stephenson coined the term metaverse in his 1992 science fiction novel, *Snow Crash*. Stephenson envisioned the metaverse as a "computer generated universe." A somewhat dystopian virtual world, humans live their lives digitally and immersed in an intense, videogame-like environment. Stephenson wrote, "In the lingo, this imaginary place is known as the Metaverse. Hiro spends a lot of time in the Metaverse" (p. 63). Hiro is the protagonist of Stephenson's book. In this context, the metaverse transcends reality.

Universities and other organizations have reimagined the metaverse in the intervening decades since Stephenson's provocative vision. In contrast to the dystopian view, many organizations, universities included, now view the metaverse as digital space filled with potential and possibilities, though not immune to problems such as the erosion of personal privacy or the threat of virtual assault or micro-aggressions.

University interest in the metaverse and their development of virtual campuses or some sort of presence inside the metaverse is multidimensional. At least three factors are significant. First, research, including a PwC 2022 comparative study shows that learning inside the metaverse can yield student engagement four times higher than student engagement in non-immersive learning environments, such as popular platforms such as Zoom or Canvas. Immersive learning in the metaverse, PwC found, is even 1.5 times more engaging than learning in in-person face-to-face settings, the traditional model of learning in physical university campuses. PwC found that this higher engagement is due largely due to fewer distractions that exist inside the metaverse or within the immersive learning environments that can be designed inside the metaverse. A second reason for university interest in the metaverse is the possibility for expanding their scope or operations without increasing their physical presence. A third reason is many faculty are advancing scholarship about the metaverse and its pedagogical impact, and this is motivating many universities to explore the possibilities without risking enormous resources.

A substantial body of research has begun to examine the potential and the pitfalls of the metaverse for education (Kye, Han, Kim, Park & Jo, 2021; Lee, 2020). Collins (2008) has examined higher education and the metaverse generally. Akour, Al-Maroof, Alfaisal, and

Salloum, (2022) have developed a conceptual model for the adoption of the metaverse in higher education in the Arab Gulf region. Go, Jeong, Kim and Sin. (2021) have similarly suggested a conceptual framework for the metaverse in higher education in a Korean context. Jang (2021) has examined the potential to use Gather.town as a metaverse platform for Korean speaking and language learning. Kim (2021) has similarly studied metaverse-based learning of Korean culture. Moneta has examined the role of metaverse-based architecure teaching and learning (2020).

Duan, Li, Fan, Lin, Wu, and Cai (2021) have proposed a university campus prototype in the metaverse. Han (2008) has likewise proposed a typology of virtual world application in a higher education metaverse context. Han and Noh (2021) have surveyed instructor perceptions of the metaverse higher education. Jeon (2021) has studied communication effectiveness in educational environments in the metaverse. Jovanović and Milosavljević (2022) examined VoRtex as a metaverse platform for learning a collaborative gaming environment. Likewise, Yoo, & Chun (2021) have examined gaming-based metaverse learning effectiveness as has Zhu (2022a). Kanematsu, Kobayashi, Barry, Fukumura, Dharmawansa, & Ogawa (2014) have examined metaverse-based STEM education in nuclear safety. Similarly, Lee and Hwang (2022) have examined the use of VR for teacher readiness. Pande, Thit, Sørensen, Mojsoska, Moeller and Jepsen (2021) have examined the long-term effectiveness of immersive simulations. Suzuki, Kanematsu, Barry, Ogawa, Yajima, Nakahira, & Yoshitake (2020) have studied virtual experiments in Metaverse collaborative learning. Ning, Wang, Lin, Wang, Dhelim, Farha, and Daneshmand (2021) have outlined the state of the art in technologies for the metaverse. Zhu (2022b) has studied the role of artificial intelligence in metaverse learning platforms. Park and Kang (2021) have employed the Technology Acceptance Model (TAM) among early users of studied users metaverse platforms.

Articulating what is the metaverse and its potential in higher education is important. Yet there is no single agreed-upon notion, at least not at this time of what is or will be the metaverse in higher education. Instead, there are varied definitions of and approaches to the metaverse, and a wide range of digital platforms for designing spaces such as campuses inside the metaverse. Most conceptualizations and platforms for the metaverse involve notions that reflect three qualities or dimensions. These are networked virtual worlds featuring 1) immersion, 2) interaction, and 3) multi-sensory engagement. Immersion refers to an enveloping, absorbing experience. In the metaverse, immersion can be the envelopment of the user or the absorbing psychological nature of virtual reality. Interaction refers to a mutual or reciprocal influence. It may be between humans or humans and digital entities, such as media content or virtual experiences and artificial intelligence (AI) agents or bots. Multi-sensory engagement refers to the sight, sound or haptic experiences possible in the metaverse, regardless of the eXtended Reality (XP) platform employed, including augmented reality (AR), virtual reality (VR), mixed reality (MR) or otherwise.

The theoretical framework of this paper draws upon structural analysis, as suggested by Kultawanich, Koraneekij, and Na-Songkhla (2015). This framework offers a four-part model of educational innovation in the metaverse based upon the organizational or systemic characteristics and parameters that define or shape the its affordances, or possibilities of that environment, especially for the user, student, faculty, staff or other (Gibson, 1966, 1977). This framework yields a four-part research question revolving around the how universities adapting or designing for educational purposes the metaverse in terms of 1) systemic and organization qualities (e.g., building a virtual campus), 2) curricula and course content (e.g.,

developing and offering courses inside the metaverse), 3) student engagement (e.g., enrolling students in metaverse courses, programs and other activities such as research), and 4) pedagogical practices (e.g., innovating new approaches to teaching and learning).

Methodology

Because this study revolves around the structural parameters related to the development of higher education in the metaverse, it employs a methodology called meta-analysis. Meta-analysis is a method that quantitatively and systematically assesses multiple existing research studies to synthesize new research findings based upon the existing, or secondary, data. This paper employs an adapted meta-analytic approach. It uses an exploratory meta-analysis of a spectrum of eleven universities across the globe that have self-identified as developing or studying the development of virtual university campuses and programs in the metaverse. A limited quantitative analysis is performed to designate the number of universities that have pursued metaverse educational strategies in virtual campus building, metaverse research, and designed virtual learning programs or curricula for the metaverse. Data examined include 1) systemic and organization dimensions such as the building of a virtual campus), 2) curricula and course content such s developing and offering courses inside the metaverse, 3) student engagement measurements such as the enrolling of students in metaverse courses, programs and other activities such as research, and 4) assessments of pedagogical practices such as innovating new approaches to teaching and learning in the metaverse.

The universities studied are listed here alphabetically by country (country designated in parentheses):
1) Davenport University (USA);
2) University of California, San Diego (UCSD) (USA);
3) University of Miami (USA);
4) Guangdong University of Technology (China);
5) Tecnológico de Monterrey (Mexico);
6) Nanyang Technological University (NYU) (Singapore);
7) Fundación Universitaria San Pablo (CEU) (Spain);
8) Korea Advanced Institute of Science and Technology (KAIST) (S. Korea);
9) Chulalongkorn University (Thailand).
10) Sabancı University (Turkey);
11) University College of London (UCL) (UK).

Findings

Four universities have as of 2022 had already designed and built virtual campuses in the metaverse, and even begun offering courses. These are Davenport University UCSD, Tecnológico de Monterrey and Fundación Universitaria San Pablo. As shown in Figure 1, these schools, including the Tecnológico de Monterrey, have designed their virtual campuses, and began teaching courses and hosting seminars in metaverse in 2022 on the Virbela platform. As shown in Figure 2, Fundación Universitaria San Pablo CEU) in 2021 designed a metaverse learning environment via Minecraft (CEU Universities, 2021).

Figure 1: Tecnológico de Monterrey Virtual Campus on Virbela

Figure 2: Fundación Universitaria San Pablo via Minecraft

Five universities or their faculty are conducting research on the metaverse, including learning effectiveness, metaverse development, and metaverse and culture (Swayne, 2022). Guangdong University of Technology has established a program for metaverse study. Projects include "Reliable Coded Distributed Computing for Metaverse Services: Coalition

Formation and Incentive Mechanism Design" and "Optimal Targeted Advertising Strategy For Secure Wireless Edge Metaverse."

Nanyang Technological University (NTU) has introduced research on the metaverse and its development. Studies include investigations into" Reliable Coded Distributed Computing for Metaverse Services" and business aspects of Web 3, the" Optimal Targeted Advertising Strategy For Secure Wireless Edge Metaverse." Korea Advanced Institute of Science and Technology is conducting research on metaverse and its development. Researchers are also conducting research on Web 3 and the metaverse. University College of London is conducting research on the metaverse and education. Research there is examining the future of trust in the metaverse and "how socially contested organizations affect the birth and renewal of industries operating at the vanguard of capitalist economies." Sabancı University is conducting research on the metaverse and culture, including "Spatial poetics, place, non-place and storyworlds: Intimate spaces for Metaverse avatars" as published in the journal *Technoetic Arts*.

Two universities have developed projects in immersive learning programs and curricula. The University of Miami has designed immersive learning environments via eXtended Reality (XR) through the University's XR Initiative (Tannen, 2022). Students and faculty are developing projects in AR and VR using the Hololens 2 platform. At Chulalongkorn University Professor Dr. Jaitip Na Songkhla is studying implications of metaverse for education, particularly for learners and learning (Somboon, March 2022). Research at Chulalongkorn looks at how metaverse experiences can help students transcend limitations to learning in physical reality.

In sum, the data from this meta-analysis indicate that at least eleven international universities are investing resources to establish a presence in the metaverse or to become centers for leadership and research on metaverse and its development. Efforts in the metaverse and higher education range widely and reflect adaptation on multiple levels, including pedagogical approaches, systemic changes (e.g., virtual campuses), new ways to engage students (e.g, AR, VR, XR), and research-based endeavors.

Since this study was conducted in early 2022, other universities have announced or begun projects in the metaverse. Using a platform called VictoryXR, these schools have received grants to build a metaverse campus: Morehouse College, University of Kansas School of Nursing, New Mexico State University, South Dakota State University, West Virginia University, University of Maryland Global Campus, Southwestern Oregon Community College, Florida A&M University, California State University, Alabama A&M University. This development suggests interest in building the metaversity is growing.

Conclusion

The Metaversity is still embryonic. Universities around the world are investing, or perhaps more accurately, dabbling, in the metaverse and its development. Questions include which platform to utilize and how. Problems are emerging as well, including the digital divide, protecting student privacy and ensuring educational benefits across a diverse, inclusive and equitable fashion.

Further research is needed to examine more fully how university engagement with the metaverse advances beyond exploration (i.e., assess size of enrollment in metaverse) and into a transformative environment for higher education.

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