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The Metaverse as a Virtual Learning Space: Perceptions from the UAE

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Abstract

This study investigated stakeholders' understanding and perceptions of the Metaverse, particularly its potential advantages and challenges in higher education. A mixed-methods triangulation design was used for data collection, incorporating (a) surveys with university students and professors, (b) interviews with leaders and educators, and (c) focus group discussions with undergraduate students. The total sample size was 300 participants, including 232 university students, 62 educators, and 6 educational leaders. Detailed analysis of both quantitative and qualitative data showed that educators and leaders possess a greater understanding of the Metaverse compared to students. However, despite their familiarity with the Metaverse concept, they lack practical experience in its educational application. Similarly, most students also lack experience with the Metaverse and have practical concerns about its use in their studies. Overall, the study reflects stakeholders' views on the Metaverse in the context of the United Arab Emirates, highlighting a general belief in its potential for university-level teaching and learning.

Keywords: *Metaverse, Digital Education, Technology Enhanced Learning, Virtual Learning Space, Augmented Reality.*

Introduction

Before the pandemic, blended learning involved a mix of online resources and traditional in-person classroom teaching methods. However, during the pandemic, the shift to online education was sudden and unavoidable, as educators had no choice but to adopt digital technology to continue teaching amidst lockdowns and social distancing measures (Charles & Hill, 2023). This period highlighted the importance of home learning and online education. Yet, the experience also led some students to develop negative attitudes toward educational technology (Charles, 2021). This negative reaction was partly due to educators attempting to replicate traditional teaching methods online without fully leveraging the potential of digital technology. Additionally, some researchers point out limitations of tools like Zoom and Microsoft Teams. For instance, a study by Aristovnik et al. (2020) found that students had more difficulty concentrating in virtual classes compared to in-person ones, and their academic performance declined. Online learning also led to reduced student participation and increased stress as students adjusted to a new system based on flat 2D displays, which lacked the engagement and immersion of traditional physical classrooms (Elsawah & Charles, 2023).

There may be a necessity for innovative digital learning environments and teaching methods specifically designed for technological integration. The Metaverse, for instance, might be a viable option, akin to emerging technologies such as Artificial Intelligence (AI), Virtual Reality (VR), and Augmented Reality (AR). Research in this area is particularly scarce in the Middle East, but there is also a global need for comprehensive studies on the Metaverse as an educational tool. This study aims to examine stakeholders' understanding of the Metaverse, its potential benefits, and the challenges associated with its integration into higher education. Specifically, it seeks to evaluate the feasibility of using the Metaverse as an educational tool in universities in Dubai. The research questions are as follows: (a) to what extent do university students know about the Metaverse? (b) to what extent do university educators know about the Metaverse? (c) is there a difference between students' and educators' perceptions of the Metaverse? (d) to what extent do educational leaders in the higher education sector know about the Metaverse? (e) what are the perceived advantages and obstacles of using the Metaverse in teaching and learning?

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Literature Review

Theoretical Framework

Our research is grounded in three essential theories: the connectivism learning theory, the TPACK framework, and the TAM model. These theories provide a robust foundation for understanding how pedagogy, technology, and learner perceptions influence the educational process. The theory of connectivism, introduced by Siemens and Downes in 2005, explains how technology has transformed our lives, communication, interactions, and learning processes. This learning theory suggests that social interactions within online communities and networks facilitate learning (Shehzad & Charles, 2023). It is premised on the idea that the advent of internet technologies like wikis, web browsers, online forums, and social networks has created new opportunities for learning and information sharing across networks. Connectivism has gained popularity recently as technology enables people to learn and exchange information online. Consequently, acquiring and constructing knowledge does not happen in isolation but within and across various networks that share information to create integrated knowledge.

The Technological Pedagogical and Content Knowledge (TPACK) model, developed by Mishra and Koehler in 2006, offers a framework for integrating technology into the classroom to enhance the educational experience (Mishra, 2019). TPACK identifies three distinct categories of knowledge: (a) Technological Knowledge (TK): Understanding the technology resources and tools to be used; (b) Pedagogical Knowledge (PK): Comprehending pedagogy, including teaching and learning methodologies; (c) Content Knowledge (CK): Mastery of the subject matter to be taught or learned. In the TPACK model, these domains are not considered in isolation. Instead, the framework emphasises the intersections of these knowledge categories, namely Pedagogical Content Knowledge (PCK), Technological Content Knowledge (TCK), Technological Pedagogical Knowledge (TPK), and the comprehensive Technological Pedagogical and Content Knowledge (TPACK). The TPACK model is centrally positioned to highlight the significance of integrating technology in instruction. Consequently, TPACK equips educators with a framework to merge their expertise in technology, pedagogy, and content, fostering innovative teaching and learning approaches. Davis (1989) introduced the Technology Acceptance Model (TAM), which explains how users come to accept and utilise new technology. According to TAM, the perceived usefulness (PU) and perceived ease of use (PEU) of a technology are key determinants of whether stakeholders will adopt and use it (Hill, Abu-Ayyash, & Charles, 2023). TAM posits that technology usage improves performance and reduces the time required to complete specific tasks.

Classroom talk is a critical component of effective teaching and learning. Research by Rapanta and Felton (2022) emphasises the importance of dialogue in the classroom, where structured talk helps students to articulate their thinking, develop reasoning skills, and enhance understanding. Palmgren-Neuvonen (2021) highlights the role of dialogic teaching in fostering a collaborative learning environment, where both teachers and students engage in meaningful discussions that promote higher-order thinking. Studies have shown that productive classroom talk is associated with improved student outcomes, particularly in developing critical thinking and problem-solving skills (Christie & Lingard, 2020). Therefore, incorporating strategies that encourage classroom talk can significantly enhance the learning experience in the Metaverse. Video-visualisation technology has emerged as a powerful tool in education, providing opportunities for teachers to reflect on their practice and for students to visualise complex concepts. Research by Prawiyogi et al. (2023) indicates that video-visualisation can improve teacher training by allowing educators to observe and analyse classroom interactions, identify effective teaching strategies, and receive constructive feedback. For students, video-visualisation helps in understanding abstract concepts through visual representations, making learning more accessible and engaging. In the context of the Metaverse, video-visualisation can be leveraged to create immersive learning experiences that enhance comprehension and retention of knowledge. Effective teacher training programs are essential for the successful integration of technology in education. Song et al. (2018) argue that high-quality professional development should be content-focused, incorporate active learning, support collaboration, and provide opportunities for feedback and reflection. Research has shown that teacher training programs that include these elements are more likely to result in improved teaching practices and student outcomes. With the advent of the Metaverse, teacher

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training programs must evolve to equip educators with the skills and knowledge to effectively utilise this technology. This includes training on how to create and manage virtual learning environments, integrate digital tools into their teaching, and address the challenges associated with virtual learning.

To summarise, the Connectivism Learning Theory, TPACK model, and TAM model are interconnected and relevant to the Metaverse field. This is because, in today's age, students are deeply integrated with technology, utilising it in nearly all facets of their lives, whether connecting globally, exchanging information, or seeking knowledge. Connectivism emphasises the importance of creating networks among students and gaining knowledge remotely, which aligns with the interactive nature of the Metaverse. Furthermore, the TPACK model suggests that educators need to integrate technology into their teaching materials and adopt modern pedagogies to meet the needs of contemporary learners, along with having a solid understanding of the subject content. This model can be implemented as the Metaverse offers opportunities for educators to design engaging learning experiences. The TAM model, on the other hand, identifies factors that might influence the adoption of the Metaverse in education. Additionally, the integration of classroom talk, video-visualisation technology, and comprehensive teacher training programs is crucial for the successful implementation of the Metaverse in education. Classroom talk fosters a collaborative and dialogic learning environment, while video-visualisation enhances understanding and engagement. Teacher training programs ensure that educators are well-prepared to navigate and utilise the Metaverse, ultimately leading to improved teaching practices and student outcomes. Together, these theories and research areas provide a comprehensive understanding of how an advanced online environment like the Metaverse can enhance education in the modern world.

Conceptual Framework

Initially, defining online learning uniformly is challenging due to varying interpretations based on individual practices and experiences. Nonetheless, terms commonly associated with online learning include "virtual learning," "remote learning," "e-learning," "tele-learning," "computer-assisted learning," "networked learning," "web-based learning," "Internet learning," and "distributed learning" (Ally 2004). Heng & Sol (2021) characterize online learning as a type of distance education where teaching is conducted entirely online using technology to facilitate the learning process. Students might be required to regularly engage in online lectures, presentations, and discussions, depending on the course requirements. Additionally, students typically utilize a Learning Management System (LMS) to access various online course materials, such as recorded lessons, presentations, weekly readings, and assignments. Online interactions between students are also feasible. Similarly, Khan (1997) described online learning as involving access to educational resources online, communication with instructors and peers, and receiving adequate support to enhance knowledge, understanding, and personal development through the learning experience. Today, the global education system increasingly integrates online learning, especially during and after the COVID-19 pandemic (Nambiar 2020). Indeed, online learning has significantly changed the way students study and has opened up new learning and development opportunities. Thus, COVID-19 has had a profound and enduring impact worldwide.

In recent times, many educational institutions have integrated technologies like Virtual Reality (VR) and Augmented Reality (AR). These technologies offer educators the chance to create immersive environments, making teaching more interactive and enjoyable for students. For students, VR and AR provide opportunities to explore virtual worlds that might not be accessible in real life, enhancing learning and information retention. VR is defined as a medium that creates a simulated environment, allowing students to engage with a digitally constructed world. This immersive experience gives users a sense of presence and reality (McGovern, Moreira & Nevarez 2020). The interactive nature of VR allows students to manipulate virtual objects and navigate simulated environments, making abstract concepts more tangible and easier to grasp (Ustun et al., 2020). Karaoglan-Yilmaz et al. (2023) developed an educational VR attitude scale, which demonstrated that students generally have positive attitudes towards using VR for educational purposes. This scale was found to be both valid and reliable, reinforcing the potential of VR as a beneficial tool in education. AR, on the other hand, merges digital and physical information through electronic devices (López-Belmonte et al. 2023). The Reality-Virtuality continuum, proposed by Milgram & Kishino (1994), spans from a real setting to a completely virtual environment (Norlund 2019). Mixed Reality (MR) is part

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of this continuum, combining physical and digital elements. It includes both AR and Augmented Virtuality (AV). AR blends the real and virtual worlds but leans more towards the physical world. Conversely, AV is a virtual environment that incorporates real-world elements to enhance virtual worlds, thus containing additional virtual information (Wu et al. 2013).

The Metaverse is often hailed as the future of social interaction. While some might consider it merely an extension of Virtual Reality (VR) and Augmented Reality (AR), the Metaverse encompasses a more immersive digital realm (Hwang & Chien 2022). Ustun et al. (2022) developed an acceptance scale based on the Unified Theory of Acceptance and Use of Technology (UTAUT) to measure students' acceptance of VR in educational settings. Their findings indicated that students' acceptance of VR is influenced by factors such as perceived usefulness, ease of use, and the overall learning experience provided by the VR environment. Within the Metaverse, people can engage in social interactions by participating in discussions, collaborating on projects, playing games, solving problems, and learning from experiences. Interactions can involve both real individuals and computer-generated characters. Moreover, the Metaverse can host a variety of activities and events, such as political gatherings, economic activities, and simulations of natural disasters, paralleling real-world scenarios (ibid). One notable feature of the Metaverse is lifelogging, which allows for comprehensive documentation of a user's history. The "shared" aspect enables individuals to communicate within the digital world. The "persistent" feature offers a continuous world where users can "live," engaging in activities like working, learning, owning, communicating, creating, and entertaining. Lastly, decentralized technologies are essential to ensure the security of economic operations and to protect users' personal property and logs within the Metaverse from alteration by others.

In summary, online learning became widely adopted during the COVID-19 pandemic, leading educational institutions worldwide to familiarize themselves with the concept and develop policies and strategies for future online learning. While VR and AR technologies have been recognized for about 15 years, they are still evolving. Nevertheless, some well-funded schools and universities have VR devices like Oculus headsets, allowing students to study in virtual environments. For example, students learning about the solar system can use VR headsets to explore planets. Alternatively, with devices like iPads or mobile phones, instructors can set up AR activities in the classroom. The next potential advancement in education might be the Metaverse, which extends the concept of a virtual world beyond the classroom to a global scale. This would enable students from different countries, such as Dubai, Italy, and Japan, to interact in real-time within a shared virtual environment.

Related Research

Singh (2024) investigated the potential of integrating the Metaverse into higher education in India, considering its unique socio-economic and cultural context. The research highlights several challenges, such as ensuring accessibility, maintaining quality control, and addressing cognitive dissonance among students. Singh emphasises that while the Metaverse offers innovative learning experiences, it is crucial to address socio-economic disparities and ensure that all students, regardless of their background, have equal access to these technologies. The National Education Policy 2020 supports the thoughtful incorporation of technology in education, emphasising the importance of contextual factors, ethical considerations, and psychological well-being. The study concludes that collaborative efforts are essential to responsibly implement the Metaverse in Indian higher education, ensuring meaningful outcomes for learners. Pregowska et al. (2024) provides a detailed overview of the application of the Metaverse in higher education, highlighting its advantages and limitations. The study focuses on Extended Reality (XR) and its potential to revolutionise education by offering immersive, multisensory learning experiences. The authors note that XR-based solutions are particularly beneficial in fields such as medical education, STEM, and spatial skills development. Additionally, XR facilitates remote learning and socialisation during events like the COVID-19 pandemic. The research suggests that while XR and the Metaverse offer significant educational benefits, challenges such as accessibility, inclusivity, and the psychological impact on students must be addressed. The study advocates for further research to develop effective Metaverse-based educational solutions that promote open and inclusive learning environments.

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Khalil, Saher, and Haqdad (2023) assert that the Metaverse facilitates a more flexible and accessible learning environment. They argue that higher education students can participate in lessons anytime, anywhere, without geographical or physical limitations, thus gaining practical experiences they might not encounter in real life. Sá and Serpa (2023) also highlight the Metaverse's potential to enhance educational quality, identifying four key benefits for higher education: (a) The Metaverse will significantly transform education by altering the interactions between educators and students and changing instructional delivery methods. Higher education students can engage in immersive and interactive learning through virtual simulations, digital field trips, and other activities. This will enable access to complex experiments and applications in virtual classrooms, offering opportunities for modeling. (b) The Metaverse allows for more personalized education, enabling students to explore topics at their own pace and interact with virtual materials. It also facilitates student performance assessment, providing instructors with the data needed to deliver individualized instruction. (c) Students can collaborate in real-time in Metaverse classrooms, regardless of their geographical locations. This promotes teamwork and richer, more engaging discussions. (d) The Metaverse increases accessibility for students with disabilities or those in remote areas by allowing them to participate in discussions and activities from any location, free from physical barriers (ibid). As mentioned earlier, the Metaverse can facilitate social connections by providing a virtual space where people with common interests can collaborate, despite real-world limitations. However, the quality of interactions in the physical world tends to be stronger than those in the Metaverse (Kye et al. 2021). For example, individuals can create fake identities, selectively presenting or omitting information in the Metaverse. This ability to control how others perceive them can lead to a lack of authenticity, negatively impacting interpersonal relationships. Additionally, privacy invasion is a significant concern in the Metaverse. Every action students take is recorded, and there is uncertainty about where this data is stored and how it might be used, potentially for unethical purposes (Sá & Serpa 2023).

Alfaisal et al. (2024) conducted a systematic review of the Metaverse, focusing on the potential benefits and challenges of implementing the Metaverse in higher education. The study highlights the importance of ensuring equitable access to technology and addressing potential psychological impacts on students. It also discusses the need for comprehensive policies and strategies to support the integration of the Metaverse into educational systems. The research underscores the significance of collaborative efforts among educators, policymakers, and technology developers to create an effective and inclusive educational environment using Metaverse technologies. Notably, there is limited research on the theoretical and practical aspects of using the Metaverse in education. This lack of development suggests that the Metaverse is not yet ready to be a fully integrated educational tool. There is no clear methodological plan or strategy for incorporating the Metaverse into education, and teacher training is insufficient for effective teaching methods, pedagogies, and techniques within the Metaverse. Our literature review highlights several areas that require further exploration. For instance, it is unclear whether students and educators in the Middle East are familiar with the Metaverse, as there is limited research on its application in education. For those who are aware of the Metaverse, their perceptions remain largely unknown. Additionally, no studies were found that examine the perspectives of educational leaders in higher education regarding the Metaverse. Thus, more research is needed to understand its impact on education and to formulate strategies that enhance students' educational experiences.

Research Gap

Based upon the literature reviewed, we hypothesised the following:

- *Hypothesis 1***:** Stakeholders in higher education will have a generally positive attitude towards the use of VR and the Metaverse, as reflected in their potential benefits for enhancing learning experiences.

- *Hypothesis 2:* Despite the potential benefits, there will be significant challenges and concerns among stakeholders regarding the implementation of the Metaverse in educational settings, particularly related to content creation and user comfort.

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- *Hypothesis 3:* Students' acceptance and positive attitudes towards the Metaverse will be significantly influenced by their perceptions of its usefulness, ease of use, and the quality of the learning experience it provides.

- *Hypothesis 4:* There will be a significant gap in Metaverse awareness and experience between educators and students, necessitating targeted educational interventions to bridge this gap.

Despite the increasing interest in the Metaverse and its potential educational applications, there is a significant research gap in understanding its impact, especially in the Middle Eastern context. Current literature primarily focuses on VR and AR technologies but lacks comprehensive studies on the Metaverse as an educational tool. Few studies have explored the perceptions and experiences of stakeholders in higher education regarding the Metaverse. This study aims to fill this gap by investigating the understanding and perceptions of university students, educators, and leaders in the UAE about the Metaverse. Understanding the potential and challenges of the Metaverse in higher education is crucial for several reasons. First, it provides insights into how emerging technologies can transform teaching and learning processes, making them more engaging and effective. Second, it highlights the need for appropriate training and infrastructure to support the integration of the Metaverse in education. Finally, it addresses the concerns and expectations of various stakeholders, helping policymakers and educators make informed decisions about adopting new technologies. The research questions are designed to explore the knowledge and perceptions of different stakeholders regarding the Metaverse. By examining the extent to which university students, educators, and leaders are familiar with the Metaverse, the study seeks to understand the current state of awareness and readiness for its adoption. Furthermore, the study aims to identify the perceived benefits and challenges of using the Metaverse in higher education, providing a comprehensive understanding of its potential impact.

Methodology

This study examines stakeholders' understanding of the Metaverse, its potential advantages, and the challenges associated with integrating it into higher education. The research questions are as follows: (RQ1) Are university students knowledgeable about the Metaverse? (RQ2) Are university educators knowledgeable about the Metaverse? (RQ3) Are there differences between students' and educators' perceptions of the Metaverse? (RQ4) Are educational leaders in higher education knowledgeable about the Metaverse? (RQ5) What are the perceived benefits and challenges of using the Metaverse in teaching and learning? Our study utilized an abductive research approach, which combines inductive and deductive reasoning, thereby incorporating both qualitative and quantitative research methods (Cohen, Manion & Morrison 2002). A mixed-methods triangulation design was chosen because it is often argued that the greater the difference between the approaches, the higher the researchers' confidence and the more authentic the results. Additionally, employing various techniques can be highly beneficial in providing insights, especially when exploring a relatively under-researched area like the Metaverse in higher education. Three data collection tools were used in this study: (1) a survey with students and educators to gather quantitative data on their understanding, perceptions, and experiences with the Metaverse; (2) interviews with leaders and educators; and (3) focus group discussions with students. The independent variable in this study is the integration of the Metaverse in higher education. The research tools and techniques are arranged to explore this variable's impact on the participants.

We created surveys for students and educators, adapted from recent studies by López-Belmonte et al. (2022) and Salloum et al. (2023). The survey questions were designed based on the following constructs: Perceived Usefulness (PU): Adapted from the Technology Acceptance Model (TAM), measuring how participants perceive the Metaverse's benefits in education. Perceived Ease of Use (PEU): Also adapted from TAM, assessing how easily participants can navigate and use Metaverse technologies. Attitude Toward Usage (ATU): Gauging participants' overall attitude toward using the Metaverse in their educational activities. Behavioral Intention (BI): Predicting participants' likelihood of adopting Metaverse technologies in the future.

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The surveys began with seven demographic questions, such as gender, age, and nationality, followed by questions on internet usage and knowledge of the Metaverse. Depending on their familiarity with the Metaverse, the number of questions varied. Students aware of the Metaverse answered 24 questions: the first was open-ended, and the rest were on a five-point Likert scale. Educators familiar with the Metaverse had the same question format but with three additional questions. Those with little or no knowledge of the Metaverse watched a short video for a general understanding and then responded to 18 statement-based questions on a five-point Likert scale.

The interview process had two phases: pre-interview and the actual interview. During the pre-interview phase, we explained the interview's purpose, estimated duration, and asked the interviewee to sign an informed consent letter. The interview was then recorded and divided into three sections: introduction, main questions, and conclusion. In the introduction, we provided background information on the study and asked the interviewee about their knowledge of the Metaverse. If the interviewee was unfamiliar with the concept, we gave a brief explanation. The main questions focused on the interviewee's perceptions of the Metaverse. Finally, the interviewee was asked for their opinion on whether the Metaverse could facilitate meaningful learning in the classroom and, if so, how it could enhance students' learning. The interview protocol focused on the following areas: (a) understanding of the Metaverse: Participants' familiarity with and conceptualization of the Metaverse; (b) educational applications: Specific ways participants have used or envision using the Metaverse in education; (c) challenges and barriers: Obstacles faced in integrating the Metaverse into educational practices; (d) support and resources needed: Participants' views on the support and resources required for effective Metaverse integration.

Our study included 20 students for focus group discussions, divided into four groups of five participants each, who shared similar age ranges, backgrounds, and experiences. The discussions began with welcoming and thanking the participants. The interviewer then asked questions to stimulate discussion, leading the discussions to obtain in-depth information. The questions were the same as those used in one-on-one interviews, but this time, participants had ample time to discuss the issues in detail with their peers. The goal was not to reach a consensus but to uncover a variety of opinions and experiences. We ensured a non-threatening environment where students felt comfortable sharing their views without fear of judgment. The selection of students, educators, and leaders was based on the maximum variation purposive sampling technique, allowing us to collect a wide range of viewpoints and experiences from different stakeholders in higher education (Rai & Thapa 2015).

The purpose of maximum variation sampling is to gain a comprehensive understanding of a phenomenon from multiple perspectives. After determining the target population, sampling frame, size, and technique, the final stage was data collection. The total sample size was 300 participants. The survey included 212 university students and 49 educators. Additionally, 20 students participated in focus group discussions, divided into four groups. Finally, interviews were conducted with 19 individuals, including 13 professors and six leaders, to gather more evidence on their awareness and perceptions of the Metaverse.

The quantitative data was analysed using R, a statistical programming language. The study aimed to predict the differences between students' and educators' perceptions of the Metaverse; thus, a t-test was conducted. This statistical test compares the means, standard deviation, and skewness of two data groups (students and educators) to determine if the differences are statistically significant. For the qualitative data, interviews and focus group discussions were analyzed using thematic analysis with ATLAS.ti, a free online software package. The coding process involved: (1) initial coding: Identifying significant statements and assigning codes; (2) focused coding: Grouping codes into categories based on emerging themes. (3) thematic analysis: Developing themes that capture the essence of participants' experiences and perceptions. The mixed-methods approach was chosen to capture both the breadth and depth of participants' experiences with the Metaverse. Quantitative methods provided a broad overview of perceptions and attitudes, while qualitative methods offered in-depth insights into individual experiences and contextual factors. This approach ensures a comprehensive understanding of the research problem, addressing both the 'what' and 'why' questions related to Metaverse integration in education.

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To ensure the validity of the survey instruments, we adapted peer-reviewed and previously published survey questions (Salloum et al. 2023; López-Belmonte et al. 2022). Additionally, the survey questions were piloted with 30 participants using a "cognitive interview" technique, where participants reflected on and thought aloud while answering the questions to assess their comprehension (Check & Schutt 2012). Reliability refers to the consistency and stability of an assessment tool; similar measurements should yield similar results (Heale & Twycross 2015). To ensure reliability, a Cronbach's Alpha analysis was performed, yielding a reliability score of 0.97, indicating high reliability. The data collection adhered to the research ethics requirements of the British University in Dubai. Participants were clearly informed about (a) the research purpose, (b) their right to withdraw at any time without explanation, (c) the promise of confidentiality for their identities, and (d) the availability of more research details upon request.

Results

Survey Results

Students were asked "which of the following best describes your understanding of the Metaverse?" (*see* Figure 1) and they were presented with a Likert scale ranging from 'excellent' to 'no idea'. 57% of them shared that they were indeed familiar with it. Additionally, Question 6 asked students to agree or disagree with the statement "I wish to utilize the Metaverse due to its amazing features that are innovative"; notably more than half of the students agreed with this. Furthermore, Question 10 asked students to indicate the extent to which they agree with the statement "I think that the Metaverse has the potential to offer unique and exciting experiences"; and it was noted that almost 70% of them agreed with it. Moreover, around 73% of students agreed with the statement "I think that the Metaverse will offer new opportunities for education". Also, regarding the statement "When I am in the Metaverse, I feel as if I am in the real world", 43% agreed.

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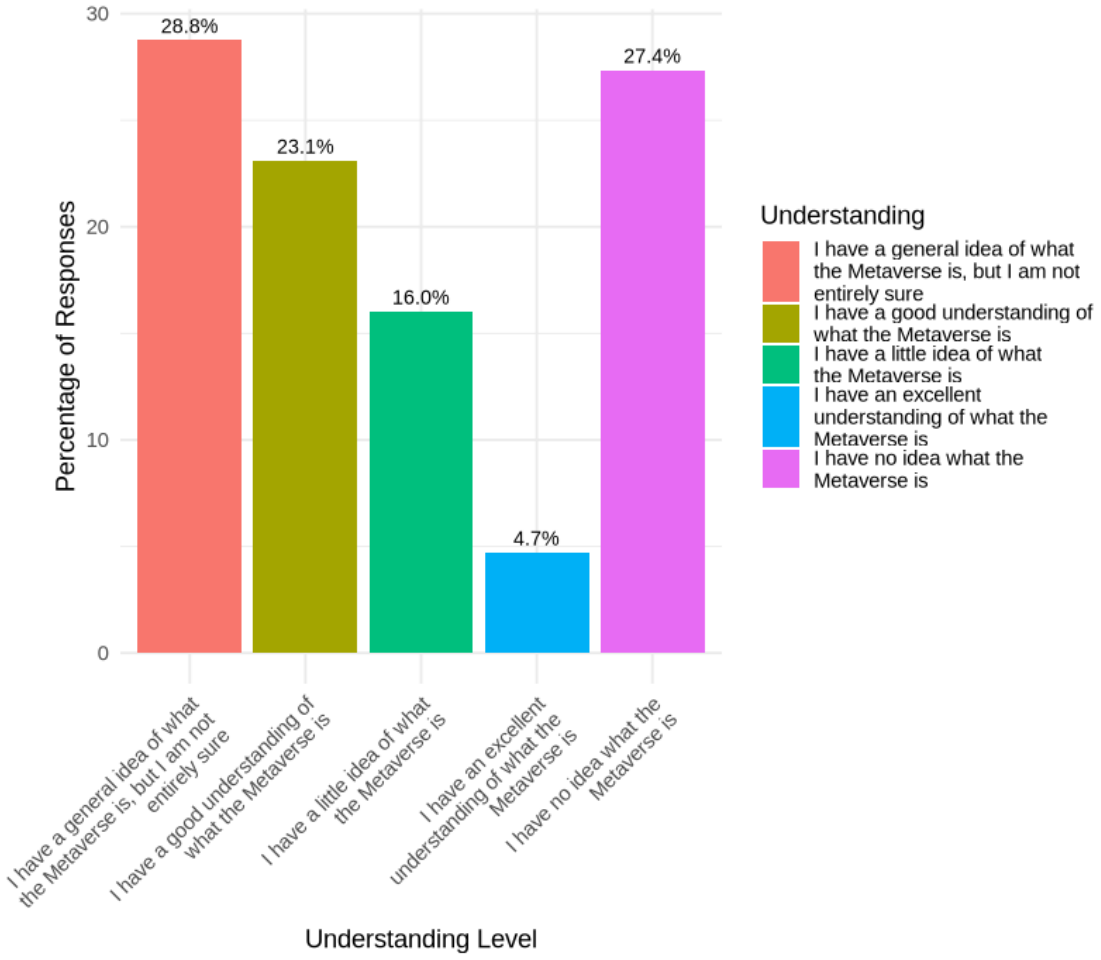

Figure 1. Students' understanding of the Metaverse

We conducted chi-square tests of independence to explore the relationship between students' understanding of the Metaverse and various demographic variables. Interestingly, there was only one notable finding, which was with the survey item 'Confidence in using online communication platforms', the chi-squared test produced a chi-squared value (χ^2) of 23.978 (df=12; p=0.02048). The analysis revealed a significant association between participants' understanding of the Metaverse and their confidence in using online communication platforms. This suggests that individuals who are more confident in using online communication platforms tend to have a better understanding of the Metaverse.

Educators were asked "which of the following best describes your understanding of the Metaverse?" and they were presented with a Likert scale ranging from 'excellent' to 'no idea'. 75% of them had knowledge of the Metaverse, while 25% did not know anything about it. For this quarter of the sample, a video was played about the Metaverse before they were permitted to proceed with the survey. Additionally, Question 13 asked educators to agree or disagree with the statement "the immersive experience of the Metaverse has generated my interest in teaching about the Metaverse in other contexts"; notably, only 43% of them agreed with this. Furthermore, Question 22 asked educators to consider whether "Metaverse enables me to interact in a free manner regardless of the limitations of time or location", to which 40% of them agreed. Moreover, in response to the statement "Metaverse provides a unique experience", over half of the educators agreed. Lastly, regarding the statement "I would like to carry out academic activities in the Metaverse", 62% of educators agreed. We conducted chi-square tests of independence to explore the relationship between educators' understanding of the Metaverse and various demographic variables. Notably, there was only one finding, which was 'internet usage', the chi-squared test produced a chi-squared value (χ^2) of 19.265 (df=4;

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p=0.000697). The significant relationship suggests that the frequency of internet usage may influence or be the associated with the level of understanding of the Metaverse among educators.

Results of the independent t-tests, which compared educators and students' responses were mostly insignificant; however, there were three noteworthy findings. Firstly, educators (M=2.96, SD=1.12) compared to students (M=3.39, SD=1.24) demonstrated more knowledge of the Metaverse, and this was statistically significant (t(258)=-2.23, p=.02). Secondly, educators (M=2.83, SD=.83) compared to students (M=3.74, SD=.96) plan to use the Metaverse in the next academic year, and this was statistically significant (t(102)=-3.13, p=.00). Thirdly, students (M=3.01, SD=.94) compared to educators (M=3.74, SD=.62) believe that the Metaverse offers unique experiences, and this was statistically significant (t(102)=2.63, p=.01).

Focus Groups and Interview Results

Many students did not know about the Metaverse; for example, Student C said "*I have heard about it on Facebook. I think it is connected to the imaginary world*". However, they were familiar with using VR headsets to enter a virtual environment for the purposing of gaming. We asked if they would be interested in studying in such a virtual space but most of them were against this idea, and it appears their negative perceptions were due to their experiences during the coronavirus pandemic. For example, Student D said "*During the COVID-19 lockdown, my academic performance has dropped a lot and up until now I'm still recovering. Actually, before COVID-19 happened, I used to sit for hours and study, now I cannot take an hour without breaks*".

Educators' knowledge of the Metaverse was surprisingly good. For example, Professor B defined it as "*Metaverse is an immersive environment where people can interact with each other. It is a virtual environment like in a secret world*". Although they had conceptual knowledge of it, only a few possessed any practical experience of engaging with it, and these experiences were limited to short-term trials. For example, Professor D said "*It was a kind of experiment with a company where they provided me with all the tools... I have been moving everywhere in the Metaverse, in a virtual university*". Notably, all educators were interested in using the Metaverse for teaching purposes; for example, Professor C said "*I am interested in using the Metaverse in my teaching because this is a new way with technology, and we have to be updated. Otherwise, we will be out of date*".

During the focus group discussions, it became very apparent that students do not feel the Metaverse facilitates a meaningful learning experience. For example, Student C said "*I feel like learning in the classroom is better than virtual learning… students prefer face-to-face learning over virtual learning and it is easier for them to understand, interact with professors*". Another student argued "*Even if they are actually studying in the Metaverse, they are not going to be in a professional environment, which will ultimately drive them from taking things seriously*". Conversely, interviews with educators revealed that they mostly perceived the Metaverse in a positive light, as a tool for teaching and learning. For example, Professor E said "*I think moving forward, my view is that the usage of Metaverse is going to be needed and… for education purposes, I think it is something that institutions need to look into integrating it into their curriculums*". Another educator said: "*Metaverse enables permanent and meaningful learning in the classroom*".

Interviews demonstrated that educational leaders are aware of the Metaverse. One said "*People are using it for a variety of reasons, some people use it for gaming purposes, some people are using it for educational purposes, some people use it for business purposes so yes I am aware of the Metaverse and I understand it is a new form of technology which is spreading globally*". Another described it as "*a simulated environment where you select your avatars. It is literally another simulated universe kind of thing*". Again, this demographic lacked any meaningful experience in the Metaverse but they had used VR headsets for gaming. For example, one said "*I used the VR for gaming with my kids and it was interesting… I think it is quite captivating and once you get immersed in it you will love it*".

Interviews and focus group discussions revealed varying perspectives from students, educators, and leaders about integrating the Metaverse into Education. Although students addressed some benefits to using the Metaverse, they were overwhelmingly against it. Student A said "*I feel people will become more socially awkward… And also I feel that students will actually become more isolated instead of being more engaged"*. Student B added "*I think it requires extra equipment that you cannot carry around. The system itself is going to be affordable. But the equipment to have it will be expensive*". As for educators, they mentioned a plethora of benefits to using the Metaverse. For

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example, one suggested "*It will bring people from different geographical parts of the world to participate in one platform, one single environment. This can be one of the opportunities regardless of where they are living. You can attend a course wherever you are, whenever you are, in any place without paying for travel expenses, accommodation, visa issues*". Regarding the educational leaders, they addressed pragmatic issues and presented a very balanced argument about the advantages and disadvantages of adopting the Metaverse for teaching and learning.

Discussion

The findings of this study provide a comprehensive overview of stakeholders' understanding and perceptions of the Metaverse in the context of higher education within the UAE. The study reveals significant insights into the potential advantages and challenges associated with integrating the Metaverse into educational settings.

Students' Knowledge and Perceptions

Our results indicate that a considerable portion of students (43%) were unfamiliar with the Metaverse, reflecting a significant knowledge gap. This aligns with Talan and Kalınkara's (2022) findings, which highlighted similar trends among students. The limited exposure to and use of the Metaverse in educational settings can be attributed to several factors, including the nascent stage of its implementation in education, insufficient training for educators, and a lack of comprehensive research on its efficacy as a teaching tool. Despite the general lack of familiarity, those students who were aware of the Metaverse expressed enthusiasm for its innovative potential. This enthusiasm mirrors global trends where students show interest in novel and engaging learning technologies (Bale et al., 2022). The Metaverse's promise of creating immersive and interactive learning experiences is a significant draw, as it can potentially transform abstract concepts into tangible experiences, thus enhancing understanding and retention. However, focus group discussions revealed a preference for traditional face-to-face learning among students. This preference is likely rooted in negative experiences with online learning during the COVID-19 pandemic, where many students struggled with engagement and academic performance (Nambiar, 2020). The transition to online learning was abrupt and often lacked the necessary pedagogical adjustments to fully leverage digital tools, leading to a general wariness towards fully virtual environments.

Educators' Knowledge and Perceptions

Educators displayed a better understanding of the Metaverse compared to students, with 75% having some knowledge of it. This discrepancy suggests that while educators are more informed, practical experience with the Metaverse remains limited. Educators recognized the potential of the Metaverse to enhance teaching and learning by offering unique experiences that traditional methods cannot. This perspective aligns with findings from Mustafa (2022) and Şeyma & Özdemir (2022), who reported positive attitudes among educators towards the use of immersive technologies in education.

The study also highlights the importance of professional development for educators to effectively integrate the Metaverse into their teaching practices. Given the rapid evolution of educational technologies, ongoing training is essential to equip educators with the skills and confidence to utilize these tools effectively. This need for comprehensive training is echoed by Song et al. (2018), who emphasize the importance of high-quality professional development in achieving meaningful educational outcomes.

Differences in Perceptions

The study found significant differences in the perceptions of students and educators regarding the Metaverse. Educators were more optimistic about its potential benefits, likely due to their focus on educational outcomes and the pedagogical opportunities presented by immersive technologies. Conversely, students' reservations highlight the importance of addressing their concerns and ensuring that Metaverse-based learning addresses the limitations of previous online learning experiences. Educators' enthusiasm for the Metaverse is rooted in its ability to create dynamic and interactive learning environments that can foster deeper engagement and understanding (Hwang & Chien, 2022). This potential for enhanced learning is

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supported by research indicating that immersive technologies can significantly improve student attitudes towards learning (Karaoglan-Yilmaz et al., 2023).

Educational Leaders' Knowledge and Perceptions

Educational leaders showed a general familiarity with the Metaverse, though their practical experience was similarly limited. Leaders recognized the potential of the Metaverse to provide inclusive and flexible learning environments, echoing the sentiments of Khalil, Saher, and Haqdad (2023). Their balanced perspective on the advantages and challenges of Metaverse integration highlights the need for careful planning and consideration in its adoption.

Benefits and Drawbacks of the Metaverse

The study identifies several key benefits of using the Metaverse in education. It offers a flexible and inclusive learning environment, enabling students to participate in classes regardless of geographical or physical limitations. This can be particularly beneficial for students with health issues or those studying abroad, as it ensures equal access to educational opportunities. Moreover, the Metaverse can make learning more engaging by transforming abstract concepts into immersive experiences. This aligns with the findings of Talan and Kalınkara (2022), who noted that the Metaverse can be particularly effective in subjects that benefit from practical and visual learning approaches, such as STEM fields and specialized training. However, the study also highlights significant drawbacks. Prolonged use of the Metaverse can lead to physical and mental health issues, such as eye strain, headaches, and feelings of isolation. Additionally, the high cost of VR equipment can be a barrier to widespread adoption, particularly in less affluent educational institutions. Privacy concerns also emerge as a critical issue, as the immersive nature of the Metaverse involves significant data collection, raising questions about data security and ethical use (Shim, 2023).

Practical Recommendations

To address these challenges, several practical recommendations are proposed. For educators, investing in professional development programs that focus on both technical skills and pedagogical strategies for using the Metaverse is crucial. Collaborative learning activities within VR environments can enhance student engagement and peer interaction, while regular feedback mechanisms can help refine the use of VR in education. For educational leaders, allocating resources to build and maintain the necessary technological infrastructure is essential. Developing strategic plans for integrating VR into the curriculum and creating support networks for educators can facilitate the effective use of immersive technologies. Policymakers should establish guidelines to promote the ethical and equitable use of VR in education, provide funding for research and development projects, and develop frameworks for evaluating the impact of VR on educational outcomes. This study underscores the potential of the Metaverse to revolutionize higher education by providing immersive and engaging learning experiences. However, significant challenges remain, particularly in terms of knowledge gaps, practical experience, and the need for comprehensive training and infrastructure. By addressing these challenges, educators, leaders, and policymakers can harness the potential of the Metaverse to enhance educational experiences and outcomes in the digital age.

Conclusion

Our study aimed to investigate stakeholders' knowledge of the Metaverse, its potential benefits, and the challenges associated with implementing it in higher education. The findings from our mixed-methods triangulation design, which combined surveys, interviews, and focus group discussions, provide several key insights into the current state of Metaverse awareness and its potential application in educational settings within the UAE. The results indicate that while most educators and leaders had a general understanding of the Metaverse, they lacked practical experience using it. Conversely, few students had a basic idea about the Metaverse, but the majority were unaware of it. This disparity in awareness between educators and students suggests a critical need for educational interventions that can bridge this knowledge gap. Despite the lack of practical experience, most stakeholders believe there is significant potential for using the Metaverse in

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higher education, citing its innovative features and ability to provide immersive and engaging learning experiences.

The enthusiasm for the Metaverse among educators is particularly noteworthy. Educators highlighted the unique opportunities the Metaverse presents for creating interactive and immersive learning environments that go beyond the capabilities of traditional classroom settings. This aligns with the broader literature that suggests digital environments like the Metaverse can enhance engagement and facilitate deeper learning through experiential activities (Hwang & Chien, 2022; Salloum et al., 2023). Moreover, Karaoglan-Yilmaz et al. (2023) demonstrated that immersive VR technologies can significantly improve students' attitudes towards learning, thereby increasing engagement and learning outcomes. However, the gap in practical experience raises concerns about the readiness of educators to effectively integrate this technology into their teaching practices. Training and professional development will be essential to equip educators with the necessary skills and confidence to leverage the Metaverse's full potential. Students, on the other hand, demonstrated mixed feelings about the Metaverse. While they acknowledged the potential benefits, their preferences leaned towards traditional face-to-face learning. This preference can be attributed to negative experiences with online learning during the COVID-19 pandemic, which many students found less engaging and effective compared to in-person instruction. These findings highlight the importance of addressing students' concerns and ensuring that the implementation of Metaverse-based learning addresses the shortcomings of previous online learning experiences.

The conclusions drawn from this study are grounded in the comprehensive data collected and analyzed. The mixed-methods approach provided a robust framework for understanding the diverse perspectives of different stakeholders. By triangulating data from surveys, interviews, and focus group discussions, we were able to validate our findings and ensure their reliability. The study's implications for policymakers in the UAE's higher education sector are clear. Firstly, there is a pressing need for targeted teacher training programs that focus on the effective use of the Metaverse in educational contexts. Such programs should not only familiarize educators with the technological aspects of the Metaverse but also provide pedagogical strategies for integrating it into their teaching. Secondly, students need guidance on how to effectively engage with Metaverse-based learning environments. This may involve developing new curricula that incorporate digital literacy and virtual collaboration skills. Thirdly, institutions must establish comprehensive policies and regulations that address the ethical and practical aspects of Metaverse use in education. These policies should ensure data privacy, equity of access, and the provision of necessary technological infrastructure.

Limitations and Future Directions

Although this study is novel, it has several limitations that should be acknowledged. Firstly, the sample size is relatively small and may not be representative of the entire UAE population. Future research should consider larger and more diverse samples to enhance the generalizability of the findings. Secondly, the study relies on self-reported data, which may be subject to social desirability bias and inaccurate reporting. Thirdly, almost all participants in the study lacked adequate experience with the Metaverse, raising the question of the basis upon which they provided advantages and disadvantages; their perspectives seem to be based on expectations rather than experience. Future studies should include participants with hands-on experience in using the Metaverse for educational purposes to provide more meaningful insights.

Moreover, the study did not include the K-12 sector, limiting it to higher education. Including a broader range of educational levels in future research could provide a more comprehensive understanding of the Metaverse's impact across different age groups and educational contexts. Additionally, there was a lack of longitudinal data to examine how perceptions and experiences with the Metaverse evolve over time. Longitudinal studies would be beneficial to assess the long-term effects and sustainability of Metaverse integration in education.

In conclusion, while the study highlights the potential of the Metaverse in higher education, it is crucial to address these limitations to strengthen the validity and reliability of the findings. The enthusiasm among educators and the mixed feelings among students underscore the need for thoughtful and well-planned

implementation strategies. Future researchers should aim to build on this foundational work by addressing these gaps and exploring the practical implementation and outcomes of Metaverse-based learning environments. By doing so, we can better understand how to harness the power of the Metaverse to enhance educational experiences and outcomes.

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Conflict of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Author Contributions

Conceptualization, S.A. and C.H.; methodology, S.A.; software, T.C.; validation, S.A., T.A., and C.H.; formal analysis, S.A. and T.C.; investigation, S.A.; resources, T.C.; data curation, S.A.; writing—original draft preparation, S.A., T.C. and C.H.; writing—review and editing, T.C.; visualization, T.C.; supervision, C.H.; project administration, C.H.; funding acquisition, S.A. All authors have read and agreed to the published version of the manuscript.

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Data Availability Statement

Original datasets are available in a publicly accessible repository: The original contributions presented in the study are publicly available.

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