

Research on the Effectiveness of Metaverse-Based Learning in Business Courses: A Systematic Review

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Abstract: Metaverse-based learning has emerged as an increasingly popular trend in higher education. However, previous studies on the efficiency of business education within the framework of Metaverse-based Learning is insufficient, despite its profound importance in higher education. To address this problem, the PRISMA methodology are employed to examine recent studies conducted over the last five years. The search encompassed two major databases, namely Scopus and Web of Science, supplemented by the inclusion of Google Scholar as a supporting database. A systematic exploration of the literature yielded a total of 14 articles. The review of these articles indicates that the integration of Metaverse technologies in business education offers enhancements in students' learning experiences and practical skills. Furthermore, the majority of students exhibit a positive attitude towards this educational approach. But there still exit some challenges cannot be ignored.

Keywords: Metaverse-based Learning; Teaching Strategies; Higher Education; Business Courses.

1. Introduction

The COVID-19 pandemic led to a shift in education towards online learning, with technology playing a crucial role in replicating the teaching and learning experience in classroom. And with the advent of the 5G era and the continuous development of information technology, online education with network resources has become a general trend in higher education teaching. Metaverse should deem to be a trend of future education with great potential.

The term "Metaverse" was first coined in Snow Crash, a Cyberpunk science fiction published in 1992. And over the next three decades, it was vividly depicted in science fiction films and with the rapid growth of emerging technologies, the application of Metaverse also present in game industry and social network application (Ng, 2022; Zhang et al., 2022). In fact, Metaverse was not regained widespread popularity until Facebook, the largest social network company, announced its rebranding as "Meta" in 2020 (Stassen, 2021).

In terms of the definition of Metaverse, according to the previous studies, there are various definitions of Metaverse were identified, with most studies considering it as a digital virtual world where people can live, learn, and work, creating virtual identities by using avatars (Kye et al., 2021). And there are four types of Metaverse in education studies, including Augmented Reality (AR), Lifelogging, Mirror Worlds, and Virtual Worlds (VW). Among which VW being the most frequent category, followed by AR (Kye et al., 2021; Tlili et al. 2022).

The concept of Metaverse refers to a world where virtual and reality interact and evolve together. In other words, it is not just a simple combination of the real world and virtual reality, but rather an interaction. Additionally, the metaverse can represent a world where daily life and economic activities are conducted in a unified manner (Kye et al., 2021).

Ng (2022) found that there are five main technologies being used in Metaverse education, namely AR and VR, avatar-based and second life systems, learning management systems and social media, simulation and AI. All these different types of technologies accelerate the use of

Metaverse in online and blended learning. Thus, Metaverse should be conceptualized as a combinatorial technological innovation that combines existing technologies.

Based on the review of Tlili et al. (2022), the research trends in Metaverse in education can be categorized into three waves: social aspects, technology-mediated presence and immersive technologies, and self-organized AI-powered virtual learning ecologies. Other researches have similar findings. According to Ahao (2022) and Zaharuddin (2023), virtual reality technology is now widely used in higher education and in the field of STEM education, but it is rarely used in humanities and social sciences, and only exists in media art, language teaching (Zhao, 2022; Zaharuddin, 2023). According to Firmansyah1 and Umar (2023), marketing has emerged as the prevailing domain of business due to the fact that a majority of research endeavors associate the metaverse with a diverse range of marketing activities. Additionally, in terms of the quantity of published works, management information and finance rank second and third, respectively.

One criticism of business schools is the separation of theory and practice. The Metaverse is becoming popular in the business world, so it makes sense to expose and train future business professionals in it.

In light of the rapid advancement and widespread adoption of technological innovations, coupled with the escalating demands for specialized skills in the labor market, particularly in developing nations, has resulted in a transformation of the role of universities. In order to better cater to the requirements of the future, universities need to anticipate upcoming needs and adapt their teaching methods accordingly (Tarabasz et al., 2012).

Since the research of the application of Metaverse technology in business education is still in its infancy. Thus, the intention of this study is to make efforts to the effectiveness of the teaching in business disciplines in Metaverse-based learning through the exposition of present discoveries and subjects that must be tackled in forthcoming studies. This will be achieved by adhering to the clear and purposeful procedures outlined in the PRISMA methodology for undertaking a systematic examination of the existing body

of literature. And research questions are as follows:

- (1) What are the Metaverse technologies, including platforms or devices used in business course teaching?
- (2) What is students' attitude on Metaverse-based learning in business education?
- (3) What major challenges were found in business course teaching in a Metaverse-based learning environment?

2. Methodology

The method adopted to retrieve articles on the effectiveness of application of teaching strategies in business education in Metaverse-based environment is discussed in this section.

The systematic review process followed the PRISMA guide, which referred to as Preferred Reporting Items for Systematic reviews and Meta-Analyses. Both Scopus, Web of Science and Google Scholar are regarded as leading databases in the field of systematic review due to their comprehensive nature and advanced search capabilities. Moreover, these databases possess a multidisciplinary focus and possess the ability to ensure the quality of the articles. Under the guidance of PRISMA, there are four main process including phases of identification, screening, and inclusion, as shown in Figure 1.

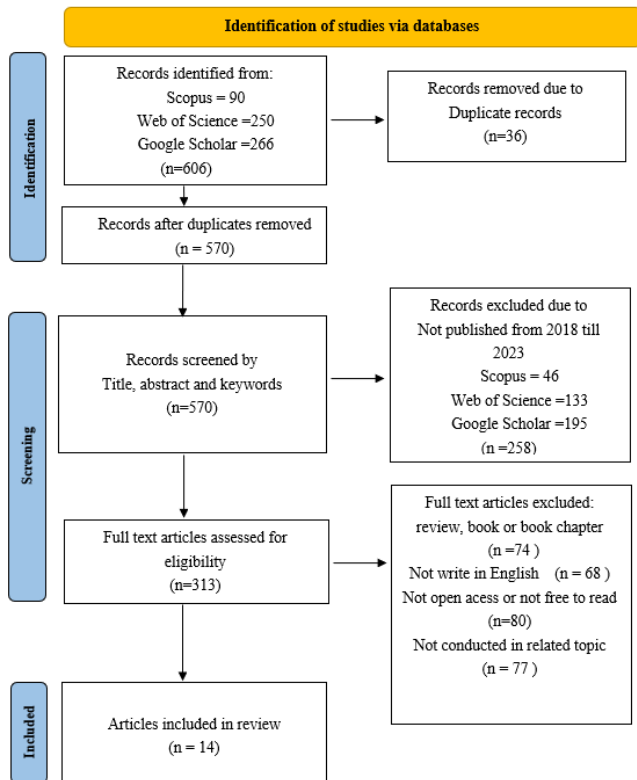


Figure 1. PRISMA Application Flow Chart

2.1. Identification

The first stage refers to as identification, involves the exploration of associated terms, synonyms, and variations for the primary keywords of the study, specifically “Metaverse-based learning”, “higher education”, and “business courses”. The objective of this process is to offer additional options for the identified database in order to procure more relevant articles for inclusion in the systematic review. This procedure relied upon previously employed keywords, an online thesaurus, and keywords suggested by Scopus.

In addition, boolean operators, such as “AND”, “OR”,

along with phrase searching and the use of double quotation marks, on the database, specifically Scopus and Web of Science, to improve the existing keywords and generate the comprehensive search string. In order to conduct the initial literature research, a series of search strings were entered into the database in a specified sequence. Keywords that were either similar or associated with Metaverse-based learning, higher education, and business courses were employed, as outlined in **Table 1**. The search string used in the first stage of systematic review. A total of 14 articles were obtained from the searching process conducted on Scopus, Web of Science, and Google scholar.

Table 1. The search string used

Database	Search String used
Scopus	TITLE-ABS-KEY = (“Metaverse”) OR (“Metaverse-based learning”) OR (“Metaverse education”) OR (“virtual reality”) OR (“immersive learning”) AND (“online teaching”) OR (“online education”) AND (“business course”)
Web of Science	TS=(“Metaverse”) OR (“Metaverse-based learning”) OR (“immersive learning”) OR (“virtual reality”) AND (“online teaching”) OR (“online education”) AND (“business course”) AND (“effectiveness”)
Google Scholar	"metaverse" OR "metaverse-based learning" AND "business course" OR "business education" AND "effectiveness"

Table 1. referred to Ramalingam et al. (2022)

2.2. Screening

The flow chart also illustrates the inclusion and exclusion criterion being adopted in the process of screening literature.

In order to manage the large number of articles and make sure that no important relevant documents will be missed in the screening process, the author referred to the selecting standards in the study of Ar te al (2022). In this stage, the standards for article selection were applied to all 606 literature, which were automatically sorted within the three chosen database.

In the initial step, 36 duplicate articles were removed, leaving 570 articles for further screening. Then, the authors used a set of inclusion criteria to screen these 570 eligible articles to base on title, abstract, and keywords, related to metaverse-based learning and higher education. Additionally, this step also involved articles published in last five years, indicating the period from 2018 to 2023. Following this screening step, a total of 258 articles were eliminated, leaving 313 articles that met the criteria for further screening. Then these 313 articles were screen through their article types. Basically, review articles, books or chapter in book did not meet the inclusion criterion in this study. Thus 74 papers were eliminated. Additionally, the rest articles went through a simple filtered process that they were written in English to reduce the misunderstanding caused by the language barrier. So, some published articles which were wrote in Korean or Spanish were excluded, thus 68 were eliminated. Furthermore, other articles were selected after thoroughly reading the full text, with the requirement that they should be relevant to Metaverse-based learning in business education or business course teaching in higher education institutions, leading 80 articles to be deleted.

The search results in the chosen database revealed that there are 299 articles didn't meet the inclusion criteria which displaying in **Table 2**.

Table 2. Inclusion and Exclusion criteria

Criterion	Eligibility	Exclusion
Timeline	Between 2018 to 2023	<2018
Literature type	Journal articles	Reviews, books and book chapters, conference proceedings
Language	English	Non-English publication
Scope	Related to Metaverse-based learning and business course in university	Not related to Metaverse-based learning and business course in university

2.3. Included

As for the last stage known as Included, after exclusion period mentioned above, part of the articles was carefully identified in all the chosen databases, leaving 14 articles were prepared for further research, which are displayed in **Table 3**.

3. Results

3.1. General Findings and Background of the Articles

In general, the positive impact of Metaverse in Higher education was approved by most researchers. The findings of Lau and Lee (2019) suggested that students' learning achievements in the designed stereoscopic 360-degree learning environment are better than those traditional classroom or workshop practices. In addition, investigation of Sholihin et al. (2020) confirmed that media utilizing virtual reality have the capacity to instigate motivation and captivation in the process of learning, while concurrently augmenting the perceived effectiveness of learning. Some researchers stated that the use of modern technologies like VR, AI, AR, and Robotics allows for enterprise education in various fields, not just business schools. Students develop skills, understanding, and values required for future development by creating concepts, testing theories, and working in technology-influenced environments (Al-Gindy et al., 2022).

Sofiadin (2023) indicated that the use of different Metaverse-based technologies, including AR and VR, in students' learning experiences resulted in a high level of acceptance of the positive impact of the immersive learning environment. Similarly, Lee and his partners (2023) concluded that VR may increase the enjoyment students get from using the technology because it deviates from the old chalk-and-talk learning methods of college classrooms even though such technology may not be beneficial in terms of content delivery. Sofiadin (2023) believed that immersive reality possesses the capacity to facilitate a dynamic learning experience that shall amplify the motivation and engagement of students in the pursuit of knowledge, thereby fostering the cultivation of lifelong learning.

Other studies stressed the benefits of gaining practical business skills under the context of Metaverse-based learning, which making students more competitive in their future workplace. Some scholars proved that the application of virtual reality and other Metaverse technologies enabled students to experience the business world through immersive experiences, which may have a positive impact on developing information technology literacy skills, as well as the business skills needed in the future job market (Tarabasz et al., 2018; Andone and Frydenberg, 2019; Lee et al., 2023). Al-Gindy et al (2022) emphasized the importance of applying technologies such as VR an AR, 3D printing, AI, in entrepreneurship education. Since they proved that these Metaverse technologies enhance the overall learning experience of students. Other researchers have similar idea that the utilization of the Open-World Metaverse concept in

business education context can be more widespread and immersive, thereby yielding significant learning outcomes (Prabowo et, al., 2023).

Evidences also showed that applying Metaverse in business education can bridge the gap of the disconnect of theory and practice by improving students' cognitive skills, increasing productivity and preparing them for real-world experience (Zaharuddin, 2023). Digital platform based on other teaching methods, such as project-based learning, can make it easier for students to understand actual situations in business and gradually hone their entrepreneurial skills (Prabowo et, al., 2023).

Some scholars focused on the teaching effect of implementing game-based digital platforms into business courses. The study of Ng and Lok (2022) found that the integration of gamification in the flipped classroom approach significantly improved student engagement and sustained their learning performance during the shift to fully online instruction in the COVID-19 pandemic era. Similar to Prabowo's findings, which proved the validity and efficacy of the gamification of project-based learning methods (PBL) in business and management teaching and learning (Prabowo et al., 2023), Ar, Ward and García (2023) also highlighted the effectiveness of game-based techniques, e-platforms, and virtual pedagogical tools in enhancing student learning outcomes and developing sustainability-related skills and increase their intrinsic motivation to explore further of what they have from the teacher.

Apart from this, the significance of sustainability in business education in both practical and theoretical terms was stressed by some researchers. They claimed that it's necessary for business schools to place greater emphasis on sustainability education (AR, et al, 2023; Prabowo et al., 2023 and Sofiadin, 2023). In addition, Mariam et al (2023) pay attention to the quality of immersive learning in order to examine the blended learning sustainability in business education.

3.2. RQ1: What are the Metaverse Technologies, Including Platforms or Devices Used in Business Course teaching?

Tarabasz, Selaković and Abraham (2018) found out that in the case of S P Jain School of Global Management, the school has successfully built a "classroom of the future" into its teaching, incorporating the latest technologies, namely Virtual and Augmented Reality (VR and AR), interactive workstations, smartboards, and video display walls into the business learning environment. By this way, students could obtain the comprehensive skillset which better prepare them for the future business world.

Andone and Frydenberg (2019) discussed the outcomes of a joint project carried out by American and Romanian universities. Students investigate the use of virtual reality in business and design their own VR scenes for a specific industry with CoSpaces platform.

Table 3. Summary of the selected studies

Study	Database	Aim	Samples	Findings
Tarabasz et al. (2018)	Scopus, Google Scholar	To discuss and elaborate on the skillset required in education of managers and entrepreneurs to face challenges of their future positions.	A case study of S P Jain School of Global Management in Dubai/Mumbai/Singapore/Sydney and experts' insights	The classroom of future, equipped with the latest modern digital technologies and innovations, is regarded as the key to success. It allows business students to get new skills and prepares them for future working spaces.
Andone and Frydenberg (2019)	Google Scholar	To share the outcomes of a cooperative project between universities in U.S.A and Romania, where students explore the use of virtual reality in business and design their own VR scenes for a specific industry.	A collaborative learning project, TalkTech between students in the US and Romania universities	This project help students improve their technical literacy while learning about the commercial applications of VR. Students found that virtual reality will change the way companies display and sell products, the way consumers experience products, and how they apply the knowledge they gain in the virtual world to the real world.
Lau and Lee (2019)	Scopus, Google Scholar	To enhance business students' learning achievement and develop their professional knowledge and problem-solving skills through the use of a designed stereoscopic 360-degree learning environment.	40 business students (undergraduate level) in both experiment and control groups	The educational outcomes of students in the immersive 360-degree learning environment surpass those of traditional classroom and workshop practices. However, the findings also suggest that the implementation of this innovative platform does not currently exhibit significant potential to inspire and equip students for self-directed learning and self-assessment.
Lee et al. (2019)	Scopus, Google Scholar	To assess the potential of using Google Cardboard virtual reality as a content delivery system in business classrooms.	Forty-four undergraduate and graduate students from a business school in a large Canadian university	The study explored the potential use of Google Cardboard VR as a content delivery platform in business classrooms. Participants in the VR condition rated their enjoyment and interest higher compared to the flat-screen (FS) condition.
Sholihin et al. (2020)	Scopus, Google Scholar	To address the challenges faced by business schools in internalizing ethical values in business, by bridging the gap between ethical theories and their application in the real world.	Accounting students who take business ethics course at the Faculty of Economics, Yogyakarta State University, Indonesia.	It was found that VR-based learning media made the learning process motivating, interesting, and increased perceived learning effectiveness. It also improved self-efficacy, which in turn increased the level of ethical efficiency in individuals.
Zhao (2022)	Google Scholar	To explore the application of VR in the teaching of international business negotiation	The teaching of international business negotiation in economic management majors.	The paper highlights the advantages and development prospects of using virtual reality technology in education, particularly in creating immersive teaching scenes. It also identifies the problems existing in the teaching of international business negotiation and explores how VR technology can address these challenges.
Ng and Lok (2022)	Scopus, Google Scholar	To explore better pedagogical solutions for sustainable business education in the current and post-pandemic era, focusing on students' engagement and learning performance	Seventy-six adult students, three teachers and three teaching assistants	The study used dual-cycle action research to explore pedagogical solutions, indicating that the second cycle promoted students' perceived learning and behavioral, emotional, and cognitive engagement, with sustained learning performance.
Al-Gindy et al. (2022)	Web of Science, Google Scholar	To investigate the role of immersive technologies in Enterprise Education	Business students who take on Enterprise courses	This paper emphasizes the importance of technology and entrepreneurship education in enhancing the learning journey of students.
Zaharuddin (2023)	Google Scholar	To deliver new insights to existing knowledge of the Metaverse education by studying business students in Malaysia and their attitude towards the application of the Metaverse in business education.	Business school students in Malaysia, including undergraduate and postgraduate students, 1000 in total	Interaction with technology, interest, motivation, and netiquette, are significantly related to students' attitudes towards utilizing Metaverse in education.
Ar et al. (2023)	Scopus, Google Scholar	The paper examines pedagogical strategies for sustainability in business education, focusing on Modern Responsible Management Education and digital teaching tools.	286 scholarly works chose from the Web of Science Core Collection databases from the last five years	The findings highlight the effectiveness of gamification techniques, e-platforms, and virtual pedagogical tools in improving students' learning outcomes and developing sustainability-related skills.
Prabowo et al. (2023)	Google Scholar	To transform the learning materials into a gamified format, using ubiquitous learning, aiming at converting project-based learning in business and management courses into an open-world Metaverse.	The comments of media experts, material specialists, and lecturers and students from 100 institutions in East Java	The gamification of project-based learning can make it easier for students to understand real conditions in business and hone entrepreneurial skills.
Sofiadin (2023)	Google Scholar	To examine the obstacles encountered by the higher education face to play their role towards sustainability to ensure sustainable future-ready graduates, especially in Malaysia.	77, 66% male students and 34% female students of Information Technology students enrolled in the Business Fundamentals course	Sustainability practices were enlightened with the use of AR and VR that enrich sustainable education in the business course.
Mariam et al (2023)	Scopus, Google Scholar	To survey the impact of initial use of blended learning on students' intention to use it in the future in business and management education in Pakistan.	589 students enrolled in different degree programs at 22 leading business schools in Pakistan	The students' immersive experience with the online component of blended learning in management courses further influenced the relationship between their cognitive flexibility for change and their future intention to utilize blended learning.
Firmansyah and Umar (2023)	Web of Science, Google Scholar	To evaluate the metaverse scholarly work using a business perspective, providing state of the art connecting metaverse technology and business function areas in a corporate setting.	29 selected documents published by publication outlets in Scopus	This study's novelty is investigating metaverse studies related to business function areas, which is absent in metaverse literature.

In the experiments of Lau and Lee (2019), a stereoscopic 360 degree learning environment with Oculus system was designed. All the learning materials and activities were applied in such environment in a form of Oculus Virtual Reality.

Zhao (2022) pointed out that in the course of International Business Negotiation, static virtual reality scenes can be used

for scene integration. Thus, MAYA software was used to collect relevant information and conduct 3d modelling.

In the research of Al-Gindy et al (2022), a variety of immersive technologies were pointed out, namely Virtual and Augmented Reality, 3D printing, Robotics and Artificial Intelligence (AI), and Cloud Computing.

The application of use IAMCARDBOARD, which is a

Google Cardboard VR platform with Apple iPod fifth generation (Apple, Cupertino, CA) as the supporting hardware as the content delivery system in a Canadian business school was mentioned in the survey of Lee et al (2019).

Investigation of other researchers indicated that electronic learning commons, e-collaboration landscapes, and multi-media platforms find application in management courses to bolster sustainability viewpoints and enrich the educational experiences of students. Management courses frequently incorporate online discussion boards, gamification, and multi-media platforms, as well as the virtual reality-based simulations to offer immersive learning experiences and empower students to implement theoretical concepts in practical scenarios (Ar, et al., 2023).

Other researcher also regarded a learning media gamification-based ubiquitous learning application as an effective game related teaching and learning tool in business and management study (Prabowo et al., 2023).

3.3. RQ2: What is Students' Attitude on Metaverse-based Learning in Business Education?

In addition, scholars' studies were focused on student's attitudes on Metaverse-based learning in business education.

According to the study of Andone and Frydenberg (2019), students underlined the use of Virtual Reality in diverse sectors and acknowledged the significance of cooperation and efficiency in virtual settings, particularly in the corporate realm where individuals may not consistently be present at the same place. Besides this, the scholar found out that the business related project facilitated students in acquiring knowledge about culture, teamwork, and operating in global teams, along with the importance of internet-based collaboration tools in the information technology industry.

The study of Sholihin et al. (2020) suggested that students concur that the utilization of virtual reality enhances the educational encounter by heightening motivation, generating curiosity, and bolstering the efficacy of learning in general.

Zaharuddin (2023) stated that the interaction of technology, interest, motivation and netiquette significantly influence attitudes of business students towards the utilization of Metaverse in class teaching. Zaharuddin (2023) also emphasized the importance of understanding students' perspectives.

Moreover, based on the research of Ar, Ward and García (2023), students who majored in management, appreciate the collaborative and interactive nature of VR platforms, as they enhance learning outcomes, stimulate interest, and provide a more effective and engaging educational experience.

In Sofiadin's research, most students reached a consensus that the utilization of immersive learning materials significantly enhanced their educational journey, while concurrently promoting sustainability. Nevertheless, there were a few students who expressed dissent regarding the efficacy of these learning materials in waste reduction and accessing restricted areas (Sofiadin, 2023).

3.4. RQ3: What Major Challenges Were Found in Business Course Teaching in a Metaverse-based Learning Environment?

In the process of constructing a classroom of the future based on VR and AR technology requires not only technical

support, but also relevant support from teachers, such as adjusting teaching methods and how to cultivate students' different business skills (Tarabasz et al., 2018).

The findings of Lao and Lee (2019) implied that the use of stereoscopic 360-degree learning environment is not yet promising to enhance students' independent learning processes and critical reflection skills, thus further investigation is needed.

According to Zhao (2022), there is a small number of individuals engaging in this endeavor within the marketplace, and due to the exorbitant price, there exists no foundation for widespread adoption. However, owing to the constraints of technical proficiency, the outcomes are less than desirable.

Researchers also claimed that one major criticism of business schools or business course in universities is that the theory is far away from practice in teaching. And the research on Metaverse business education mainly focus on STEM education, which is still infancy (Zhao, 2022; Zaharuddin, 2023).

Furthermore, there's a lack of educational theories yet to interpret the term and few studies provide comprehensive explanations of how to conceptualize it. One study proposed four key elements of Metaverse to enhance the values of existing technologies and suggested using online communities of inquiry as a theoretical framework to support social, cognitive, and teacher presence in the Metaverse (Ng,2022). Ng (2022) also pointed out that well-designed and affordable smart wearable device is essential. The issues of privacy and data security, ethics and morality, addiction and identity and social interaction need to be widely noticed. Apart from issues of security, privacy, business models, moral and ethical principles, Kye et al. (2021) highlighted the social and physiological impacts of blurring the boundaries between physical and virtual worlds.

Ar, Ward, García and Abbas (2023) pointed out that the current teaching strategies for sustainability of some higher education institutions lack the intellectual challenge and practical learning opportunities needed for students to understand and internalize complex ideas.

The results of Lee and his partners research (2023) demonstrated that while VR may provide a more fun and enjoyable experience for business students, the Google Cardboard VR platform was not superior to the iPod flat-screen format in terms of novelty, reliability, and understandability of the content.

Lee, Sergueeva, Catangui (2017) and Sofiadin (2023) pointed out the main concern with VR technology in teaching is motion sickness. Very few students have a short period of dizziness. However, it's believed that this side effect is likely to decrease with more frequent use and improvements of VR devices.

4. Discussion

The findings of this review highlight one key issue is that the benefits of Metaverse-based learning in business education is deniable and the application of Metaverse technologies in business courses is expected to continue developing exponentially in the future. On the one hand, scholars agreed that the introduction of Metaverse technologies in business education may improve learning experience and enable them to learn business knowledge in a more authentic way. On the other hand, it's believed that immersive reality has the capability to facilitate a dynamic learning experience that enhances students' motivation and

engagement in the pursuit of knowledge, thus fostering the development of lifelong learning skills. Other studies have emphasized the benefits of acquiring firsthand practical business skills of the business world through Metaverse-based learning, which ultimately enhances students' competitiveness in the future workplace. In other words, Metaverse technology makes the theoretical knowledge of business courses no longer disconnected from practice, which is deemed to be a crucial issue in the teaching of different business disciplines.

From the selected articles, it can be found that different higher education institutions and different business classes adopt different Metaverse technologies and platforms. Basically, AR and especially VR technology were integrated into interactive workstations, smartboards, and video display walls in business classrooms. CoSpaces platform, stereoscopic 360 degree learning environment with Oculus VR, Google Cardboard platform and MAYA software which can collect relevant information and conduct 3d modelling also being applied in business teaching at universities in different countries all over the world.

It is also worth mentioning that some scholar have conducted further investigations and studies on different factors that can improve the efficiency of business teaching and learning when doing research on virtual learning. "sustainability" and "gamification" are two key words that are frequently mentioned in recent studies, both of which are closely related to the practical nature of business courses. Learning business knowledge is not only for students to understand the theory or test, but more importantly, technology enables them to acquire relevant knowledge in a more effective way and acquire practical skills in a virtual but close to the real space. In addition, implementing game-base technology into business teaching can make the learning process more fun and attractive, which may lead to a positive learning outcome.

Furthermore, as for the perspectives of business students on metavers-based learning, while some students expressed doubts, the majority students hold positive viewpoints. They recognized the importance of cooperation and efficiency in virtual settings. Additionally, they gain knowledge about culture, teamwork, and working in global teams. Management students appreciate the collaborative and interactive nature of VR platforms, as they improve learning outcomes and create a more engaging educational experience.

However, like a coin has two sides, the challenges and problems come along with Metaverse-based learning can not be ignored. There are a series of problems that need to be considered by educators in higher education institutions. For instance, are there any policy support or fund support from the government? Do universities have enough funds for maintenance and updating of equipment if they already have the necessary infrastructure and equipment? Without doubt, the application of Metaverse technology is not cost-effective. And the school also need to hire or cultivated some professional take responsible for the operation of related matters. Besides, teachers need to learn how to use different Metaverse platforms and design new teaching schemes as well as prepare completely different teaching resources to adapt to the new virtual learning environment. Last but not the least, how should students' learning outcomes be evaluated There is no perfect evaluation method for the time being. Therefore, what we just dicussed could become potential risks of Metaverse business education.

After conducting a comprehensive analysis and summarizing the chosen literature, it has been widely acknowledged by the majority of scholars that Virtual Reality (VR) serves as a prominent Metaverse-based learning platform or a relevant technology employed in the field of business education. Nonetheless, upon carefully synthesizing the fundamental concept of Metaverse by Davy Tsz Kit Ng (2022), it became evident that VR simply represents one of the many technologies encompassed within the Metaverse-based learning context, with several other technologies existing alongside it. Despite AR and VR, there are avastar-based system and Second Life system, learning management systems and social media, simulation and Artificial Intelligence (AI).

Despite the fact that in recent years, there has experienced a remarkable surge in the extensive and intensive exploration and investigation concerning Metaverse-based learning in business education, it is of utmost importance to acknowledge that there exists a notable extent for additional examination and variation of academic sources and research viewpoints within this domain.

5. Conclusion

To conclude, this study mainly reviews the articles related to the implementation of Metaverse technologies in business education, with the purpose to examine the effectiveness of teaching and learning. According to the 14 articles selected under the method of PRISMA, this review focuses on the issues of the metaverse platforms applied by universities or other higher education institutions, students' perspectives relate to Metaverse-based learning in business courses, and the challenges or problems that need to be addressed. On the whole, integrating Metaverse technology into business learning is the future trend, and there are increasing number of universities join this field in order to enhancing students' study experience by providing immersive and practical learning environment. And the majority of the business students believed that this way of learning is necessary and effective. Even though there are many critical questions relate to Metaverse-based learning need to be addressed, as well as more effort need to be made before fully embracing it, the effectiveness of it can be ensured at the present time.

6. Limitation and Future Research

This study is subject to a limitation in terms of the scope, as it mainly relies on Scopus, Web of Science and Google Scholar. This may have led to the omission of some influential papers involved in other core database. To address this problem, future research endeavors could expand the scope of the study.

Another limitation pertains to the preference for the English language and the type of articles chose in the collected data. Adopting a more inclusive approach that encompasses studies in various languages offer a more comprehensive understanding of the topic at hand. The study acknowledges that the exclusion of non-English studies may have restricted the diversity of perspectives and insights on the effectiveness of implementing Metaverse technology in business courses. Furthermore, this study neglects to provide an in-depth analysis of the specific pedagogical tools employed in teaching sustainability in business schools. Further investigation could delve more profoundly into the efficacy and limitations of different digital tools and virtual

reality in sustainability education. Lastly, the study's focus is exclusively on the most recent five years of scholarly works, which may fail to capture all pertinent research on the subject. Encompassing a broader time frame could furnish a more comprehensive overview of the latest practices in teaching sustainability in business schools.

The paper suggests that future researchers should conduct similar studies to provide new insights into Metaverse education in the business education context.

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