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Review

A Study on the Feasibility of Utilizing the Metaverse Platform in Education

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Abstract: As digital transformation accelerated after the COVID-19 pandemic, the use of metaverse has been increasing not only in the industry but also in the educational field. To adapt to the class site, it is necessary to derive a direction through foreign metaverse platforms. The following conclusions can be drawn from this study: First, it is difficult to express individuality through avatars, and non-verbal communication for conveying messages is challenging. Platforms like ZEPETO and ifland are in 3D, whereas Gather.Town is in 2D, and even then, the design is simplistic. Second, as the platforms are not specifically designed for educational purposes, there are limitations in supporting classes. Most are created for entertainment purposes. Third, most are one-time events. Particularly in the case of domestic Metaverse educational uses, the focus has been on one-time events rather than developing content that can be continuously used in classes. Fourth, most are one-time events. Particularly in the cases of domestic metaverse education cases, one-time events dominated rather than continuously available content in class. Fourth, when introducing metaverses into education, highlighting the purpose and benefits of using metaverse technology is crucial. Fifth, creating a user-friendly interface with a clear and simple menu is essential. Sixth, strong interactions between metaverse providers, suppliers, and users are essential.In this study, an analysis of the usage of metaverse in in the educational field and the direction of studying metaverse in this context in the future has been done. It is expected that the results of this study can be used as basic data in schools and development centers or development related to education content.

Keywords: Metaverse; Education; Platform; Interaction; Immersion

1. Introduction

Our lifestyles have experienced significant changes before and after COVID-19. Beyond 'untact,' which means non-face-to-face and non-contact interactions, the 'ontact' culture—i.e., online communication and contact, video conferencing for remote classes, and telecommuting—has become commonplace. Consequently, digital disparity has emerged as a social issue [1].

In the first semester of 2020, when COVID-19 occurred, all classes suddenly converted to online formats, causing considerable confusion at the beginning of the semester. Higher education institutions, elementary and secondary educa-

tion schools, parents, and education-related institutions experienced an unexpected "webcam crisis" with soaring prices and shortages of devices such as cameras and microphones for online classes. In the second semester of 2020, offline classes were partially implemented for practical subjects that were difficult to conduct remotely. From the first semester of 2021, various efforts were made to establish a class environment that enables smooth hybrid learning. Meanwhile, as digital transformation accelerated after the COVID-19 pandemic, the use of metaverse technology has been increasing, in both industry and the educational field. In particular, as the 'metaverse,' a fusion of real and virtual spaces, is being used throughout society, higher education institutions are interested in utilizing it to create offline-like learning environments [2]. Currently, research on methods to efficiently implement metaverse-related education is required. An analysis of international case in the educational field using metaverses is initially necessary. Through this study, I explored the direction of using metaverses in education. The research questions of this paper are as follows:

<Research Question 1>: What are the cases of education using domestic and international metaverses?

<Research Question 2>: What is needed for a smooth metaverse-based class?

2. Concept and Use Case of Metaverse

2.1. Concepts and Types of Metaverse

A metaverse is a three-dimensional (3D) virtual space where reality is fused with a computer-generated environment. The term "metaverse" first appeared in Neil Stephenson's science-fiction novel Snow Crash in 1992. In this novel, people are active in a virtual world called the metaverse using avatars. Second-life websites, which appeared in the early 2000s, can be considered early versions of the metaverse [3, 4].

With the recent development of digital technologies, such as big data, blockchain, and artificial intelligence, the demand for alternative spaces beyond the physical world is increasing as people shift from offline to online environments. In particular, platform-type metaverses have become more prevalent. The mobile game "Pokemon Go," launched in 2017 and gaining worldwide popularity, is a representative example of this type of metaverse. Recent examples include "Roblox," "Fortnite," "Zepeto," and "Jump virtual reality (VR)" in Korea [5].

The Acceleration Studies Foundation, a nonprofit technology research organization in the United States, announced the 'metaverse roadmap' in 2007. This roadmap, considering two axes reflecting the degree of virtual world and reality, divided the metaverse into four categories: VR, augmented reality (AR), mirror world, and life logging. VR, a compound word combining "virtual world" and "reality," refers to a world where people can experience real life in a computer-created virtual environment. Specifically, VR indicates a 'specific environment or situation' rather than real life. It implies the technology itself that implements computer-based VR, and is 100% computer-generated (CG). Examples of its applications include VR games, which are virtual but can be experienced as reality, and virtual roller coasters. AR is a graphical technology that synthesizes virtual information or objects into an actual environment to make them appear as if they were in the real world. The technology adds 3D virtual objects to the real world and displays them to the user, effectively combining reality with CG. One prominent example is the Pokémon Go platform. Lifelogging refers to activities in which individuals organize, store, and share information that they see, hear, meet, and feel in their lives. SNS and wearable devices are examples of life-logging. The mirror world refers to a virtual world that reflects the landscape, appearance, information, and composition of the real world as realistically as possible. Examples include Google Maps and Zoom [4].

2.2. Metaverse Use Cases in Education

2.1.1. Case Analysis Method

In this study, the metaverse cases used in the education industry were investigated and analyzed. Uses of metaverse-based content include university lectures, entrance ceremonies, festivals, career counseling sessions, and job fairs. Specifically, the utilization of domestic and international education-related Metaverse content was detailed based on articles and reports.

2.2.2. Case Analysis

When the graduation ceremony at the UC Berkeley in the United States could not be held due to COVID-19, students voluntarily created a campus in the Minecraft game and held a virtual graduation ceremony at a playground called Blockly, which combined blocks and Berkeley. This event was broadcasted on Twitch, an Internet broadcasting platform. Although it is less lively than an offline graduation ceremony, a virtual graduation ceremony is important because it can record all situations and provide unique experiences through avatars.

The University of California (UC), San Diego, is one of the universities leading the integration of a metaverse campus. They advocate for the introduction of metaverse campuses in higher education. A real-time virtual lecture was conducted at the UC San Diego to provide a digital space for students to learn independently. Students showed a positive perception of the metaverse campus, citing a sense of immersion, which they had not experienced in face-to-face lectures, along with other advantages such as playful elements and convenience [6, 7].

As an alternative to offline classroom instructions, Pennsylvania State University in the United States provides opportunities for learners to interact with each other by conducting classes in Minecraft [4].

Examples of the use of the metaverse in comparative domestic activities are as follows:

Soonchunhyang National University developed a game called “SCNU Picks” that introduced useful information about college life to help new students in 2021. This game includes 27 AR/VR missions and useful content that students need to know to adapt to and succeed in university life [8]. In addition, Soonchunhyang University implemented a metadata map for immersion. A metaverse map and a virtual dam were created as the main stage, applied to “negative World” in jump VR. Approximately 2,500 new students participated in the entrance ceremony using this virtual setup[9].

The Foundation University is operated by a VR game company. Konkuk University utilized “Gather Town” to create a virtual version of their campus, which was promoted by student clubs [10, 11].

In terms of textbook activities, metadata technology was used for experimental subjects as alternatives. The Korea Institute of Industrial Technology conducted the first VR lab, while Seoul National University demonstrated the “Dimensional image” technology [12–15].

3. Conclusion

Higher education post COVID-19 is primarily conducted through remote education methods using real-time platforms. However, remote education has limitations in providing learners with an experience similar to the offline learning atmosphere. Metadata-based classes for remote education have recently received considerable attention to overcome this disadvantage. To adapt to this new format, deriving direction from international metaverse implementations is necessary.

The following conclusions were drawn from this study:

Study 1. What are cases of education using domestic and international metaverses?

In Students can create lecture rooms in their minds and attend classes, fostering familiarity with each other in the

virtual space and providing opportunities to interact. In addition, metaverse platforms have been used for events such as entrance ceremonies, graduation ceremonies, and festivals, as well as for teaching, experiments, and experimental subjects.

Problem Identification: Analyzing domestic and international cases of educational use of the metaverse revealed the following issues. First, it is difficult to express individuality through avatars, and non-verbal communication for conveying messages is challenging. Platforms like ZEPETO and ifland are in 3D, whereas Gather.Town is in 2D, and even then, the design is simplistic. In addition, avatar movement is restricted and must be controlled with arrow keys, which can be inconvenient until users learn the tutorial, and many quit early on.

Second, as the platforms are not specifically designed for educational purposes, there are limitations in supporting classes. Most are created for entertainment purposes. For example, on the ifland platform, private communication is impossible, only allowing for general audio, and when users are apart, they cannot hear each other, which is inconvenient.

Third, most are one-time events. Particularly in the case of domestic Metaverse educational uses, the focus has been on one-time events rather than developing content that can be continuously used in classes. Without the development of sustainable content, there are inherent limitations in achieving educational outcomes through the use of the Metaverse.

Fourth, most are one-time events. Particularly in the cases of domestic metaverse education cases, one-time events dominated rather than continuously available content in class. Without sustainable content development, there are inevitably several limitations to using the metaverse to achieve educational results.

Study 2. What are the requirements for a smooth metaverse-based class?

First, when introducing metaverses into education, highlighting the purpose and benefits of using metaverse technology is crucial. For example, learning about history through a metaverse space can emphasize its importance and maximize immersion by incorporating fun elements such as games. This approach can provide a realistic experience, allowing students to directly explore historical buildings and cultures.

Second, creating a user-friendly interface with a clear and simple menu is essential. Understanding how the technology works can help overcome any inconvenience, allowing users to focus on the content it provides. If the menu is complicated, it should be organized more effectively, and each educational institution should provide a description of the service cases.

Third, strong interactions between metaverse providers, suppliers, and users are essential. As evidenced by successful international examples, maintaining good communication and cooperation is key. Using a metaverse space can help organize the virtual environment and facilitate various activities. Additionally, expanding metaverse systems is necessary to support these interactions.

This study analyzes the use of the metaverse in the educational field and explores its future direction in this context. However, a limitation of this study is its reliance on overseas cases of metaverse usage. In the future, research should include surveys or interviews with learners who have participated in metaverse classes to assess their satisfaction and the effectiveness of learning through this medium. The results of this study are expected to serve as foundational data for schools, development centers, and developers of educational content.

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Conflicts of Interest

The authors declare no conflict of interest.

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