

Metaverse Integration in Airline Service: A Study of Practical Enhancement

Aeeun Jeon¹, Yoona Lee^{2*}

¹*Department of Aviation & Tourism, Hanseo University, Seosan, South Korea,
140368@daum.net*

²*Department of Airline Service, Hanyang Womens University, Seoul, South Korea,
yoona2189@naver.com*

This study aims to investigate the educational value and significance of a Metaverse-based practical class, i.e., the 'Aviation Transport Service Practical Practice I, II' course, for students majoring in airline services. The use of Metaverse technology in this application was also examined. The students targeted were students majoring in airline service at S University, which is located in Seongnam-si, Gyeonggi-do. A study was conducted for a year, ranging from the second semester of 2022 to the first semester of 2023. A sample of 60 students who took this course was selected to investigate their level of satisfaction with the Metaverse-based practice class. The purpose of this survey was to evaluate how the proposed instructional strategy, administered using the Gather Town, ZEP, and ZEPETO platforms, affects students' engagement and learning outcomes. Previous studies have shown that the proposed educational strategy, by using the Metaverse, can enhance students' learning participation and outcomes as well as deepen their understanding of the airline service industry. Collaboration and active participation among students were fostered by interactions through 3D immersive environments that mimic real-world scenarios, which helped develop communication and teamwork skills. These results confirm that the Metaverse is a valuable tool that can provide an engaging and immersive learning environment for students majoring in airline services. This study presents a framework that can assist professors in developing effective and practical learning experiences using the Metaverse, and it also offers a method that can provide an engaging and efficient learning experience for both students and professors by actively integrating the Metaverse in practice classes. In conclusion, this intervention is expected to be highly beneficial. This study represents a significant contribution as it is the first to examine the effectiveness of a Metaverse practice course for students pursuing a major in airline service.

Keywords: metaverse; airline service major; airline service education; practical class enhancement; case study.

1. Introduction

Following the outbreak of COVID-19 in 2020, the adoption of untact lifestyles has accelerated digitization, thus resulting in the emergence of the Metaverse era through technological advancements in virtual spaces. Moving beyond being a mere trend, the Metaverse has come

to attract attention in various fields, including economics, society, culture, remote education, and virtual training, due to its potential to transcend spatial and temporal constraints. Consequently, the Metaverse has become a novel paradigm of experiential space that connects human interactions, spaces, and time (Kim, 2023). Given the characteristics and effects of the Metaverse, Metaverse-based education is becoming increasingly popular in the field of edutech. This educational approach involves creating 3D visual spaces within online virtual worlds, thus enabling indirect social interactions through avatars, and supporting smooth communication among participants. This approach is a digital education method that offers unique learning experiences by transforming the learning environment (Jo, 2022). It enables continuous avatar-based interactions within online virtual environments, transcending the boundaries of curriculum areas and facilitating diverse information sharing and comprehensive learning, thus gaining attention as a means of promoting interactive and in-depth learning (Kim and Park, 2022). The present study aims to analyze practical cases of airline service major students who participated in the 'Aircraft Transportation Service Practical Training I, II' course, which was delivered using Metaverse platforms, based on the above-mentioned observations. This research aims to achieve the following objectives and significance: First, this study investigates the level of student engagement and the factors that affect participation within the Metaverse environment, thus contributing to the enhancement of learning quality and efficiency. This study also aims to grasp practical learning content and activities by considering cases that illustrate the effects and outcomes of Metaverse-based practical class. Secondly, by exploring the potential and applicability of innovative educational strategies administered through the Metaverse, this study seeks to strengthen airline service major students' creative thinking, problem-solving skills, and their ability to adapt to real-world industry demands. This is particularly important in light of the airline service industry's high reliance on human-centered hospitality services. Thus, to help students achieve success in the field, it is crucial to develop effective educational methods that help prepare them with the necessary competencies. As many universities prioritize theoretical-centered instruction, this study aims to assess the potential of innovative educational approaches such as those delivered through the Metaverse (Park and Ku, 2022).

To conclude, this study aims to assess the effectiveness of practical classes administered through the Metaverse using the Gather Town, ZEP, and ZEPETO platforms, while focusing on the 'Aircraft Transportation Service Practical Training I, II' course as a case study. In particular, we aim to (1) provide an examination of whether the learning environment through the Metaverse promotes student participation and engagement, (2) present an evaluation of the effects and performance of a practical airport class using the Metaverse, (3) introduce an assessment of the perceptions and satisfaction of airline service majors regarding instruction based on the Metaverse, and (4) present an evaluation of the potential and usefulness of innovative educational strategies that use the Metaverse.

To contribute to this field, we review the existing literature related to the use of the Metaverse in education. This body of literature includes research on various educational applications involving Metaverse platforms (Kye, et al., 2021). students' perspectives on the educational utilization of the Metaverse (Talan and Kalinkara, 2022). the development of Metaverse education platforms (Na, et al., 2022) and Metaverse implementation in nursing education (De Gagne et al., 2022). Regarding the specific context of airline service majors, existing research

reveals that ongoing studies are focused on understanding student perceptions and behaviors. For instance, recent investigations conducted by Jeon and Lee (2023) have delved into airline service majors' perspectives on practical Metaverse classes.

However, there have been few practical case studies testing the use of the Metaverse for training in airline service majors, and research exploring diverse platforms is particularly limited. The current study aims to offer strategies that can empower airline service majors to adeptly chart their career paths, enhance employment prospects, foster educator-student interaction, and ensure a seamless learning journey. These strategies hold significant implications for the airline service industry, addressing its unique demands and dynamics. This study also underscores the potential of practical Metaverse classes leveraging platforms like Gather Town, ZEP, and ZEPETO to augment the preparation required for careers in airline service-related domains.

This study makes a significant contribution to the field by informing the judicious use of diverse Metaverse platforms tailored to specific learning activities. By presenting both scholarly and practical implications, this research provides invaluable guidance for crafting educational strategies attuned to the era of educational technology. These findings are poised to serve as a crucial reference that benefits not only airline service majors but also students across other hands-on disciplines, within the ever-evolving realm of educational technology.

2. LITERATURE REVIEW

2.1 Metaverse Dimensions and Impact

First introduced in the 1992 novel “Snow Crash” by author Neil Stephenson, the Metaverse is a fictional computer world in which all aspects of real-world life are possible, including laws and customs that are impossible in the Metaverse. The concept of Metaverse is a combination of meta, meaning “transcendent,” “abstract,” and “hypothetical,” and universe, meaning “real world”. It can also be thought of as a broader concept that encompasses the existing virtual augmented reality. In this world, the “I” in the virtual or digital world replaces the “I” in reality. In the virtual world, individuals embodied in the form of avatars can communicate like humans, engage in economic activity, and create and engage in a new world that is connected to the real world (Park and Son, 2009).

The concept of the Metaverse has been introduced to the public through several movies. Among them, Ready Player One, released in 2018, is a good representation of the relationship between reality and Metaverse, and it focuses on virtual reality. Ready Player One is a good representation of the virtual and real worlds in the process of competing with others to solve the quest in a three-dimensional virtual game called “Oasis” against the backdrop of a devastated Earth in 2045. In this Oasis space in the movie, avatars have the freedom to assume any form, pursue their desires, and reflect economic dynamics inherent to the Metaverse (Chungcheongbuk-do Education Research and Information Institute, 2021). As such, the Metaverse refers to a world in which reality and virtuality coexist and evolve together, and in which economic, social, and cultural activities take place to create value (Lee, et al. 2021).

ASF (Acceleration Studies Foundation), an American technology research foundation, argued that the Metaverse is a fusion of “physically sustained virtual space” and “virtually augmented Nanotechnology Perceptions Vol. 20 No. S3 (2024)

reality" (Smart et al. 2007). They announced a Metaverse roadmap in 2007 and based on the external-internal horizontal axis and the augmented-simulation vertical axis, there are four types of Metaverses: virtual worlds, mirror worlds, and augmented reality and life logging.

First, the virtual world refers to a world that resembles the real world or is implemented as an alternative to the real-world using computer graphics technology and digital data technology. Second, the mirror world refers to the construction of the real world as digital information and the virtual world as it is. Third, augmented reality adds networked images or information to real environments or objects, and it can be said to be a form in which virtual and real information are closely combined (Acceleration Studies Foundation, 2007). Fourth, life logging is a kind of Metaverse that involves reporting and recording the user's status, and it includes wearable devices and networks such as the Apple Watch, Samsung Health, and SNS such as Instagram or Facebook (Min et al., 2023)

At present, different authors use diverse definitions of the Metaverse, which contributes to a lack of consensus. It often denotes the integration of real-world activities within virtual spaces (Jeong et al., 2021). Nida Narin (2021) focuses on academic studies aligning with technological advancements like 3D, AR, and VR over the past two decades. These studies, which have mainly been conducted at the prototype level, hold potential for significant contributions in design and processing with the right technical infrastructure. Nanna Xi et al. (2022) analyzes the impact of extended reality on workload in entering the Metaverse. After conducting a between-subjects experiment involving participants in a shopping-related task, they find that AR significantly affects overall workload, particularly mental demand, and effort, while VR does not significantly influence workload sub-dimensions. Chun and Lee (2023) study the effects of Metaverse tourism experience elements on tourists' behavioral intention and the moderating role of Metaverse involvement. Their results suggest that those who are less acquainted with Metaverse tourism display heightened interest in learning and aesthetic elements. Further, despite limitations in reality, tourists exhibit behavioral intentions when perceiving value in Metaverse content.

Nowadays, Machine learning networks are utilized for segmenting features, extracting essential information, and categorizing diseases in plants, animals, and fish (Cho et al., 2024; AlZubi, 2023; Wasik and Pattinson, 2024). Additionally, they are extensively utilized in the manufacturing industry (Porwal, 2024).

2.2 Case Studies in Education Using the Metaverse

Kwangwoon University created a virtual classroom on the "MOIM" Metaverse lecture platform for 1,200 students enrolled in 43 subjects, such as Realistic Media Theory, American Politics, Hip-Hop Production, and Introduction to Construction Management. When using this platform, students can participate in virtual classes as avatars, and the platform encourages active communication between professors and students while also producing unique educational benefits, such as enhanced student interest and concentration in class (Blockchain Valley, 2021). Dongguk University used the 'U-story' platform to realistically recreate Dongguk University's Jeonggakwon. The 'Metaverse Jeonggakwon' was used for meditation classes aimed at managing mental health (Daily Economy, 2023) Kyunghee University used the Gather town platform to conduct orientation for new students in the Graduate School of Drug Regulation, and this was followed up with a virtual reality class titled "Patient Case

Study." The class focused on drug therapy for 5th year students in the Department of Pharmacy. The lecture centered on a case study that aimed to derive an appropriate treatment plan by applying medications, clinical nutrition, test results, and comorbidities to virtual patients. The forty-eight students in the class were divided into four teams, and various activity methods, such as case analysis and discussion, were used (Daily Pharm, 2021). LG U+ has created a specialized metaverse campus called 'Virtual Campus' for Yonsei University, which it is currently employing as an educational platform to surpass the constraints of online education using LG U+'s university-specific metaverse platform 'Uverse'. The virtual campus involves a digital recreation of the campus by constructing 3D models of the characteristic edifices at Yonsei University's Sinchon campus, including the main gate, Steam Hall, Appenzeller Hall, Underwood Hall, and open-air theater. On this campus, students can utilize numerous features, such as engaging in real-time communication with professors, checking course status and schedules, following a game quest-style curriculum roadmap, and purchasing Yonsei University-related products. In doing so, Yonsei University is delivering a creative learning opportunity that combines the actual world and virtual space by establishing a virtual campus via the Metaverse (Herald Economy, 2023).

This research also examined previous studies on Metaverse education, with a specific focus on academia. Kim (2023) conducted a case study on university campuses utilizing Metaverse technology at major South Korean universities. A Metaverse university campus serves as a virtual reality and internet-based communication tool that is tailored for the technologically accustomed MZ generation students. Kim (2022) conducted a perception study on Metaverse utilization among higher education learners and identified various benefits, such as enjoyment, a sense of belonging, satisfaction from novel endeavors, concentration, interaction, substantial feedback, and flexibility. Lim et al. (2021) revealed a significant relationship between interest, developmental differences, and social interaction within Metaverse environments. Considering these findings, immersion, presence, interaction, technical aspects, and other recurring factors across various studies could exert either positive or negative effects on Metaverse classes. Therefore, this study aims to examine the practical implementation of Metaverse practicum classes, while specifically focusing on airline service majors, with the ultimate objective of comprehending student perceptions and insights.

3. RESEARCH METHOD

This study aims to investigate practical classes for airline service majors delivered using the Metaverse and analyze their perceptions. The Teaching Strategies are based on important components such as setting goals, selecting appropriate Metaverse platforms, configuring the environment, explaining how to engage, designing learning activities, evaluating learning outcomes, and following up. The details of the class are as follows.

3.1 Research Design and Participants

This study presents a case study on the implementation of a practical class in the Metaverse, specifically of the mandatory courses, "Aviation Transportation Service Practice I, II" that are offered to female students majoring in Airline Services at a 3-year college in Gyeonggi Province, South Korea. The training involved 60~70 students from two different classes, with

the ages ranging from 22 to 24. These courses are typically taken during the second semester of the second year and the first semester of the third year, spanning a duration of one year. The face-to-face classes were conducted in the second semester of 2022 for sophomores and the first semester of 2023 for juniors, thus introducing the students to practical classes using the Metaverse for the first time. Each course is worth 3 credits and lasts for a total of 15 weeks, including midterm and final examinations.

Table 1: Course Details and Enrollment Summary Table

Major	Classification	Course Name	Class Hours	Grand and Class Division	Class Credit	Class Time	Number of Students
Airline Service	Course for One's Major	Aviation Transportation Service Practice I	2022, Second Semester of Sophomore	2A	3	3 hours (15-week Course)	31 students
				2B			35 students
		Aviation Transportation Service Practice II	2023, First Semester of Junior	3A	3	3 hours (15-week Course)	35 students
				3B			35 students

3.2 Selection of Metaverse Program

This study used three different Metaverse platforms, namely Gather Town, ZEP, and ZEPETO, to deliver the 'Aircraft Transportation Service Practical Training I, II' course. These platforms provide several features that are useful in providing a practical class for the airline service field, such as interactive communication between users, the sharing of learning materials, and the offering of various virtual environments. The selection of these platforms was based on their suitability in providing effective learning experiences within the context of the course.

Firstly, Gather Town utilizes a 2D-based platform that enhances concentration on course content through its straightforward and focused structure. The platform allows for avatar interactions to take place in close proximity, thus facilitating virtual face-to-face interactions and enabling integration with external sites to share learning resources and activities (Lee, 2022). Secondly, ZEP provides a simplified 2D graphical interface that offers user convenience through easy map creation and object placement. The platform integrates features such as OX quizzes and games to stimulate learners, thereby enhancing their immersion and participation in the learning process, as noted by Kim (2022). Thirdly, ZEPETO, which was introduced as a social application in 2018, functions as a digital space in which avatars can engage with each other. Learners can engage in interactive communication through voice, text, and emoticon functions. Its diverse range of features, such as AR content, social networking capabilities, and mini games, also cultivate an environment for tailored cultural activities, as stated by Song (2022).

These varied Metaverse platforms provide unique features that are customized to encourage

active engagement and sustained interest among learners. By demonstrating the potential advantages and functionalities of these Metaverse platforms, the current study seeks to improve students' participation and learning experiences in the 'Aircraft Transportation Service Practical Training I, II' course by exploring the various opportunities available.

3.3 Data Collection and Analysis

To assess the perspectives of airline service majors regarding practical classes delivered using the Metaverse, an online survey was administered to students enrolled in the course. The survey was conducted during the final week of the course, specifically on June 13, 2023, within the classroom environment. The survey was distributed to a total of 66 students: 31 students in Class A and 35 students in Class B. Although 66 responses were initially collected, six were subsequently excluded due to insincere answers and incomplete questionnaires containing numerous missing values. Therefore, responses from 60 participants were considered for analysis. Prior to the survey, participants were informed that participation was voluntary and solely for research purposes. The survey included four questions, each of which was rated on a 5-point Likert scale ranging from 'Strongly disagree' (1 point) to 'Strongly agree' (5 points). These questions aimed to gauge the level of satisfaction with and perceptions of the Metaverse-based practical classes. The collected data were evaluated accordingly using Microsoft Excel. To collect the sample of students, an online survey questionnaire was used, and the survey was delivered through an online link, while a QR code was given to those who had completed the course. As an incentive, an e-gift equivalent to KRW 2,000 was provided to participants who completed the questionnaire.

4. RESULTS: TEACHING STRATEGIES AND EFFECTS

4.1 Case Study on the Metaverse Practice Class

4.1.1 Realism

The professor here used the Gather Town Metaverse platform in an attempt to realistically replicate the school environment and provide students with a novel learning experience. To achieve this objective, we created a variety of maps that include classrooms, subways, playgrounds, cafes, and libraries. Moreover, because students are separated into classes, Class A and Class B were given separate classes to ensure that each group could participate in learning activities in their own classroom. Students' responses to practicing using this realistic Metaverse map were inquisitive, engaging, and resulted in a distinctive learning experience. Students show interest in learning through the Metaverse, since it is an experience, they do not come across every day, and using the map similar to the actual school environment provides a realistic and enriched learning experience. This innovative approach has significantly increased motivation and engagement in learning by replicating the way students interact with the learning environment.



Figure 1: Professor-Created Metaverse Classroom on the ‘Gather Town’ platform

4.1.2 Interactivity

In the Metaverse course, students use avatars to engage in activities such as taking pictures and interacting with professors and peers via chatting. This allows for seamless communication among participants and creates intimacy among professors and students, as well as among students themselves. By engaging in these activities in the virtual world through their avatar, students feel at ease, improve interaction, and develop a sense of connection.

Moreover, students’ participation and initiative rose by expressing emotions through various emoticons or attempting movements such as setting off firecrackers and dancing, which can be entertaining and captivating. Students were also interested in expressing their identity by modifying their avatars’ appearance or dressing them up. By taking pictures with students before and after class, the relationship between the professor and the students improved, which made the professor feel closer to the students. Hence, the interaction in the Metaverse class played a significant part in enhancing the students’ educational experience by making them more comfortable, increasing their participation, and generating enthusiasm.



Figure 2: Interaction Between Professors and Students on the ‘Gather Town’ Metaverse platform

4.1.3 Immersion

The Metaverse is characterized by an excellent realization of realistic spatial and social interaction elements, thus providing an experience similar to the real world. The instructors recognized and utilized these characteristics in selecting the ZEPETO Metaverse platform, and they implemented a map that reproduced the realistic airport environment for the class. Using only airport-related photos and videos in the traditional class method was limiting, but this time, a map of the actual airport was implemented, thus reproducing the actual situation, maximizing the learning effect, and providing a more vivid learning experience.

The 'Aviation Transportation Service Practical Practice II' class is designed to provide students with an in-depth understanding of airport services and ground duties. Learning using the Metaverse map helped the students understand and learn the content more quickly while experiencing the actual airport environment. Students also had the chance to improve their service and coping skills in diverse scenarios by participating in role-playing exercises as part of ground staff and customer interactions. Students perceived this virtual reality course as an advanced level of learning experience. By simulating and practicing in a virtual airport environment, students could develop a more profound comprehension of airport operations. Moreover, social interaction and role-playing roles within the virtual environment not only created an exhilarating learning experience, but it also helped students enhance their communication and collaboration competencies. This innovative approach demonstrates a virtual hands-on class experience that has significantly impacted students' learning motivation and effectiveness.

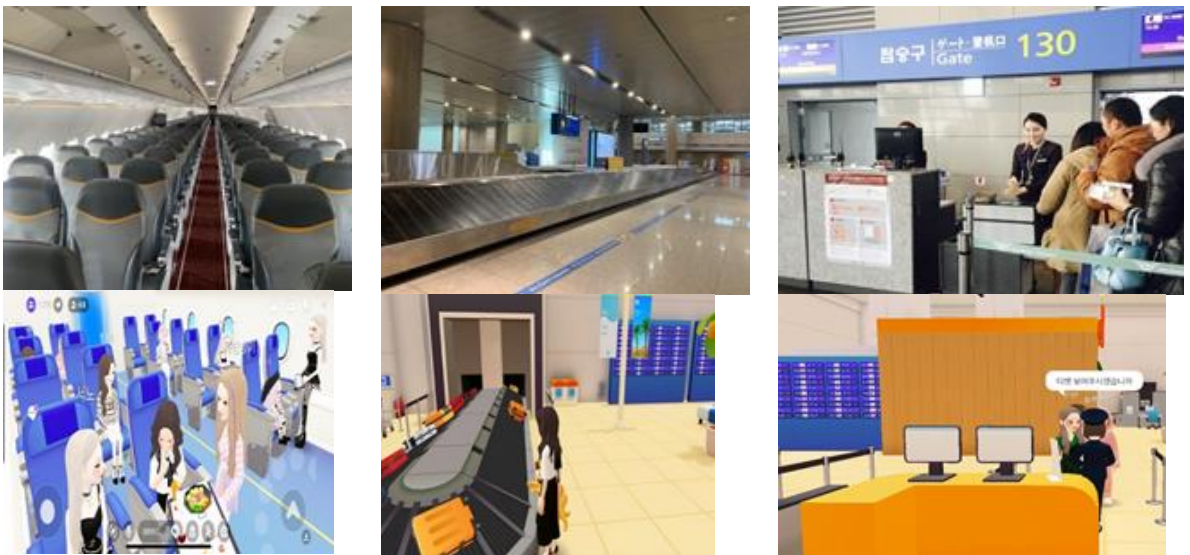


Figure 3: Practical Class on the 'ZEPETO' Metaverse platform

4.2 Various Learning Activities

4.2.1 Quiz

In this step, students complete review tasks that are based on the content studied in the previous week. As review is crucial, it is important to make use of spaces like classrooms or libraries

within the class setting. Students consider these spaces as their dedicated learning environments. As shown in Figure 1, students can attend quizzes by easily sitting in their chair and clicking laptop-shaped icons on their desks. Each week, the professor accesses this space and links the URL of a quiz, created using Google Forms, to computer-shaped icons on the ZEP's library map. This process allows students to seamlessly check their scores and review incorrect answers after the quiz.

The ZEP platform's library map also includes a timer feature that lets students monitor their quiz-solving speed and study duration. This continuous exercise improves their learning abilities. This approach can enhance the learning journey by promoting effective review and emphasizing the importance of the Metaverse map. These flexible environments offer customized learning settings that highlight the fundamental nature of education. As a result, students can actively engage with the lessons and enjoy a fulfilling learning journey.

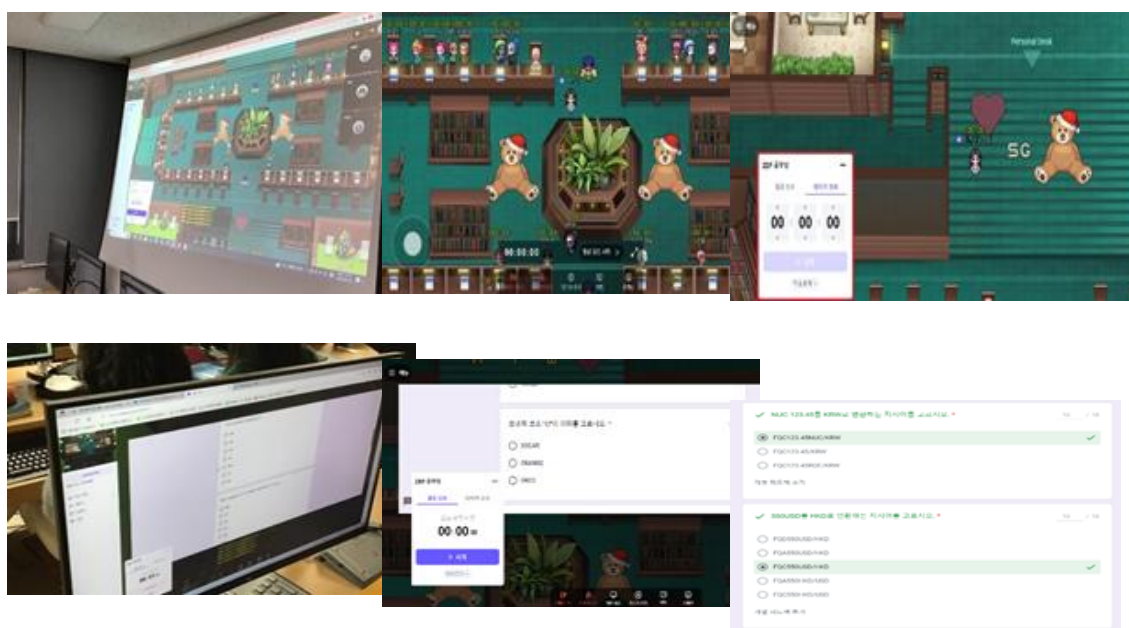


Figure 4: Quiz Using Google Form on the 'ZEP' Metaverse platform

4.2.2 Lecture

After the review quiz, the teacher begins the week's class. Since classes are held in the computer lab, all students can view class materials on their computers. The teacher can share their screen while conducting the class, thus allowing students to listen to the class while looking at the screen. When a teacher shares a screen, the spotlight function should be used so that learners can hear the teacher's voice and see the screen wherever they are. If a teacher uses a dual monitor, it can be useful to simultaneously see the students' avatars' locations and the screen being shared.



Figure 5: Lecture Presentation on the 'ZEP' Metaverse platform

4.2.3 Golden Bell Game and Team Discussion

The professor conducted a 'Golden Bell' game for each team to assess the learning of that day's lesson, 40 minutes before the end of the class. Unlike the Google Review Quiz that was administered before class, this activity required the team members to discuss and solve a given problem. The notepad function for sharing information among team members was limited to those sitting at the same desk; team members sitting at other desks were not able to see information from each other.

The students were presented with a Golden Bell Problem, and the instructor asked them to write the correct response. The purpose of this approach differed from the Google Quiz, as it was intended to facilitate interaction among the students and help them understand each other's strengths and limitations. This approach enabled students to showcase their ability to collaborate and communicate effectively within a team, ultimately resulting in a more productive learning experience.



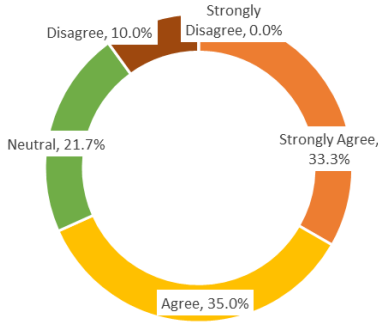
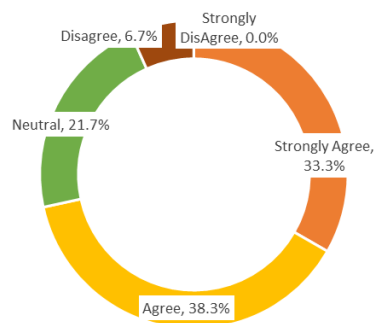
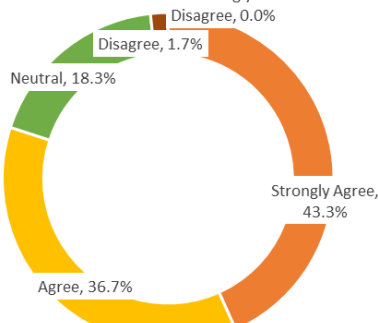
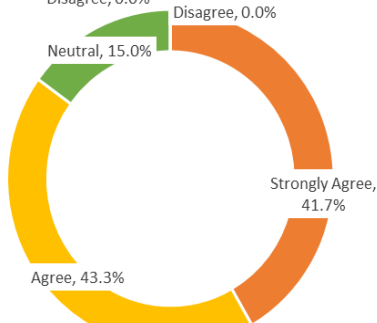
Figure 6: Golden Bell Game and Team Discussion on the 'ZEP' Metaverse platform

4.3 Evaluation of the Effect Of Metaverse Practical Class

After the airline service majors experienced the 'Aviation Transportation Service Practical Practice I, II' class using the Metaverse, the satisfaction with the Metaverse practical class was analyzed as follows. Q1. Regarding the question, "I want to listen to lectures taught by Metaverse in the future.", 20 people (33.3%) strongly agreed, 21 people (35.0%) agreed, 13 people (21.7%) responded neutrally, 6 people (10.0%) disagreed, and 0 people (0.0%) strongly

disagreed. Q2. As for the item, “I am willing to recommend it to other students if they ask me if I would like to take a course run through the Metaverse.”, 20 people (33.3%) strongly agreed, 23 people (38.3%) agreed, 13 people (21.7%) were neutral, 4 (6.7%) disagreed, and 0 people (0.0%) strongly disagreed. Q3. As for the item, “Overall, I am satisfied with the lectures delivered through the Metaverse.”, 26 people (43.3%) strongly agreed, 22 people (36.7%) agreed, 11 people (18.3%) were neutral, 1 person (1.7%) disagreed, and 0 people (0.0%) strongly disagreed. Q4. As for the item, “I was satisfied with being able to do various activities in the Metaverse.” 25 people (41.7%) strongly agreed, 26 people (43.3%) agreed, 9 people (15.0%) were neutral, 0 people (0.0%) disagreed, and 0 people (0.0%) strongly disagreed.

Table 2: Questions and Graphical Representation

Q1. I want to listen to lectures taught by Metaverse in the future.	Q2. I am willing to recommend it to other students if they ask me if I would like to take a course run through the Metaverse.
 Strongly Agree, 33.3% Agree, 35.0% Neutral, 21.7% Disagree, 10.0% Strongly Disagree, 0.0% Legend: Strongly Agree (orange), Agree (yellow), Neutral (green), Disagree (dark green), Strongly Disagree (brown)	 Strongly Agree, 33.3% Agree, 38.3% Neutral, 21.7% Disagree, 6.7% Strongly Disagree, 0.0% Legend: Strongly Agree (orange), Agree (yellow), Neutral (green), Disagree (dark green), Strongly Disagree (brown)
Q3. Overall, I am satisfied with the lectures delivered through the Metaverse.	Q4. I was satisfied with being able to do various activities in the Metaverse.
 Strongly Agree, 43.3% Agree, 36.7% Neutral, 18.3% Disagree, 1.7% Strongly Disagree, 0.0% Legend: Strongly Agree (orange), Agree (yellow), Neutral (green), Disagree (dark green), Strongly Disagree (brown)	 Strongly Agree, 41.7% Agree, 43.3% Neutral, 15.0% Disagree, 0.0% Strongly Disagree, 0.0% Legend: Strongly Agree (orange), Agree (yellow), Neutral (green), Disagree (dark green), Strongly Disagree (brown)

5. DISCUSSION

This study was the first study of Metaverse integration into airline service education conducted as a case study of practical class enhancement. Its significance follows.

First, in response to the question, “I want to listen to lectures taught by Metaverse in the future,” a significant majority of the participants expressed a strong interest in future Metaverse-based lectures. Approximately 68.3% of the respondents, of which 33.3% strongly agreed and 35.0% agreed, expressed enthusiasm for the continued use of Metaverse technology in their educational experiences.

Second, in response to the statement, “I am willing to recommend it to other students if they ask me if I would like to take a course run through the Metaverse,” a significant proportion of respondents indicated a willingness to support the use of Metaverse in education. With a combined agreement rate of 71.6%, 33.3% strongly agreed, and 38.3% were inclined to recommend Metaverse-based courses to their peers. These results reflect a positive perception of the educational value provided by the Metaverse.

Third, in response to the item, “Overall, I am satisfied with the lectures delivered through the Metaverse,” a clear majority of participants expressed satisfaction with Metaverse lectures. Approximately 80.0% of the respondents, of which 43.3% strongly agreed and 36.7% agreed, reported a high level of satisfaction. This indicates that the overall quality of the Metaverse instruction was well perceived by the students.

Fourth, regarding the statement, “I was satisfied with being able to do various activities in the Metaverse,” most participants expressed a high level of satisfaction. Approximately 85.0% of the respondents, of which 41.7% strongly agreed and 43.3% agreed, were satisfied with the variety of activities available in the Metaverse. These findings suggest that students found the opportunities for engagement and interaction within the Metaverse to be fulfilling and enriching.

In summary, the survey results indicated a strong positive perception of Metaverse-based education among Aviation Services students, with high levels of interest, willingness to recommend, and overall satisfaction. The availability of diverse activities within the Metaverse further contributed to their positive experiences. The results suggest that the integration of the Metaverse into education has been well- received by students and holds promise for enhancing their learning experience in the field of airline service.

6. CONCLUSIONS

This study focused on the integration of the Metaverse in the education of airline service major students. Based on the results of this study, several significant conclusions were drawn regarding the enhancement of practical classes.

6.1 Theoretical Implications

The present study made a theoretical contribution to the field by filling in the gaps in the extant literature. This research successfully addresses four issues in the literature. In particular, this study (1) provided an examination of whether the learning environment through the Metaverse promoted student participation and engagement, (2) presented an evaluation of the effects and performance of airport practical class using the Metaverse, (3) introduced an assessment of the perceptions and satisfaction of airline service majors regarding instruction based on the Metaverse, and (4) presented an evaluation of the potential and usefulness of innovative

educational strategies using the Metaverse.

Based on the results, this research has several important theoretical implications. First, it is innovative as the first attempt at a practical class for airline service majors delivered using the Metaverse. This study examined the experiences and benefits students gain by participating in practice classes in the Metaverse environment. The unique characteristics of Metaverse-based practice classes and the resulting advantages were academically revealed. Second, we analyzed how edutech can be used to innovate in education in the era of the fourth industrial revolution. Thus, this study is expected to guide the development of new and innovative teaching methods and their application in real education sites. Overall, this study is significant as it lays an academic foundation for developing innovative educational methods while revealing the potential applicability and limitations of using the Metaverse for practical classes.

6.2 Practical Implications

First, as has been shown by this study's results, the Metaverse has been identified as a useful tool for providing an immersive and engaging learning experience to airline service majors. This study proposes learning strategies that professors can leverage within a framework to create effective and practical learning experiences using the Metaverse. This strategy helps students understand the complexities of the airline services sector and develop the skills they need to become competent professionals. Introducing the Metaverse in airline service classes can provide an engaging and practical learning experience for both students and instructors. Second, due to the reality whereby most Metaverse platforms limit the number of people and implement a fee-based policy, schools must provide active support to ensure students can use the Metaverse platform without inconvenience. It is crucial to consider policies and support measures that enhance student accessibility to use the Metaverse. Third, it would be beneficial to diversify learning activities using the Metaverse, including but not limited to quizzes, discussions, and lectures. For instance, by planning diverse activities in the Metaverse environment (e.g., virtual simulations, role-playing, and project collaborations), students' collaborative skills and creative capabilities can be further enhanced. To accomplish these goals, educators should strive to enhance the diversity and richness of learning experiences provided through the Metaverse. Fourth, it is crucial to enhance educators' curricula in using the Metaverse. Professors should be given the opportunity to undergo training to learn and apply effective use of the Metaverse platform. This will allow educators to maximize the potential of the Metaverse, ultimately providing students with an advantageous and effective learning experience.

6.3 Limitations and Suggestions for Future Research

This research had certain limitations which offer opportunities for future research. First, this proposed study relies on a specific educational environment and culture by studying case studies of students majoring in airline service at S university located in Seongnam, Gyeonggi-do. The current study centered on the case of learning utilization of college students majoring in airline service at one college in South Korea, and the findings may thus be difficult to generalize. Therefore, it is necessary to expand a follow-up study to intensively identify airline service-related practice classes using the Metaverse in other university or educational institutions. Secondly, as this research is qualitative and describes a case study of a class, it is

influenced by the researcher's subjective stance. Therefore, it is necessary for future studies to conduct objective measurements and incorporate quantitative research methods such as behavioral evaluation scales.

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