Qualitative Analysis of Students' Online Learning Experiences after the University Reopening

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Abstract. The revolutionary challenges posed to education by the COVID-19 pandemic have brought attention to educational technology, especially online learning. As a result, many online learning platforms and digital tools have sprung up. After campus closure, many higher education institutions adopted Zoom Video Conference to replace traditional offline classes and make full use of the functions of the Learning Management Systems (LMSs) to improve students' learning effect. However, the impact of the pandemic on higher education is long-lasting. Even after college campuses reopened for the Fall 2021 semester, online synchronized courses still abound. Students still need to use these online learning tools, whether in hybrid or Hy-Flex modes. This study analyzed the impact of online learning tools on students' learning interactivity and engagement by understanding their evaluation of the online learning experience and effectiveness after campus reopening. Through the analysis of previous studies and reports, this study puts forward two hypotheses: 1) Moodle learning management system provides effective learning participation and interaction for students' online learning; 2) Zoom provides effective learning participation and interaction for students' online learning. Twenty-six students at Adelphi University were recruited to participate in the in-depth interviews about their online learning experiences. Through the analysis and interpretation of the interviews, the research results demonstrate the rationality of the hypothesis and obtain new findings of the marginalization experience of international students when they participate in Zoom courses.

Keywords: Learning Management Systems (LMSs); Moodle; Zoom courses.

1. Introduction

With the development of communication Information Technology and the popularity of mobile devices, the online learning format has been widely adopted in the education industry. Affected by the COVID-19 pandemic, universities have been forced to move all classes online—all of a sudden, a large number of online learning platforms and tools have appeared in the public's vision. Even though Krome (2020) points out that Zoom had been widely recognized in academia before the pandemic, it cannot be denied that its popularity was recognized by the public since all schools shut down in March 2020. The combination of LMSs and Zoom real-time courses has been the dominant mode of teaching content delivery in higher education institutions over the past year. That pattern persists after the campus reopened in the Fall 2021 semester. Therefore, the coexistence of in-person classes, Zoom, and LMSs make the teaching mode of higher education have different ways to combine them and diversified course forms. Therefore, it is of self-evident significance to study the online learning experience of college students in this era. This study hypothesized students' learning experience after the campus was reopened based on previous studies. Volunteers were recruited to participate in the in-depth interviews through "sample sampling" and "non-sample sampling." The study analyzes the interactivity of students' online learning based on the three types of students' interaction in learning proposed by Bernard et al. (2009): teacher-student interaction, student-student interaction, and student-content interaction. In addition, based on the three dimensions of engagement summarized by Nkomo, Daniel, & Butson (2021)—behavioral, cognitive, and emotional—this study analyzes students' engagement when they use digital platforms to study. The study results demonstrate the assumptions made at the beginning of the research design and obtain new findings of the marginalization experience of international students when they participate in Zoom courses.

2. Literature Review

2.1 Online learning

With the development of Communication Information Technology and the popularity of mobile devices, online learning based on network technology has been widely used in education in the past years. The definition of online learning and other related terms is constantly updated with technology development. In addition, the broad coverage and variety of forms of online learning make it challenging to generalize the accurate definition (Horn & Staker, 2011; Means, Bakia, & Murphy, 2014; Watson et al., 2009). Distance learning, e-learning, Web-based learning, and online learning refer to the internet-based learning mode, which is different from traditional offline learning. Learning at different times existed before the Internet became popular. Moore, Dickson-Deane, & Galyen (2011) pointed out that distance learning refers to instructors' teaching process and students' learning activities happening in different physical locations and different times. Compared with other terms, distance learning does not emphasize Internet technology as a carrier, nor does it emphasize mobile electronic devices. Regarding the relationship between distance learning and online learning, Means, Bakia, & Murphy (2014) pointed out that the two are not synonyms that can be directly replaced. Online learning is a subset of distance learning. Nichols (2003) proposed that e-learning refers to web-based technology tools for learning; however, this view has been rejected by other scholars. Ellis (2004) and Tavangarian et al., (2004) believe that the learning process of e-learning emphasizes the framework of transforming individual experience into personal knowledge. They argued that compared with e-learning, online learning requires a certain level of interaction. However, e-learning is relatively weak in interactive cooperation. Therefore, Triacca et al. (2004) believe e-learning is a category of online learning.

The view that online learning emphasizes interaction is supported by Means, Bakia, & Murphy (2014). They mentioned that online learning emphasizes that learners interact with content and/or people through the Internet to learn and suggested that online learning can be combined with traditional formal education or learners' study out of interest. Based on this description, Means, Bakia & Murphy (2014) further pointed out that online learning can be subdivided into fully online and blended learning based on the proportion of instruction and assessment in an offline and online environment. Fully online learning refers to the teaching activity being completely online, synchronous, and/or asynchronous. Blended learning (also known as "hybrid learning") is used to summarize the combination of online learning and offline learning in different proportions. In other words, blended learning is a learning model between a completely online learning environment and completely in-person learning. Allen & Seaman (2008) strictly defined four different course forms according to the proportion of content conducted in the online environment in their report on online learning in the United States from 2002 to 2007. They are traditional (0%), Web facilitated (1-29%), blended/hybrid (30-79%) and online learning (over 80%). According to the report, 9.6% of U.S. college students enrolled in at least one online course in the fall semester of 2002 (Allen & Seaman, 2008). By the Fall 2011 semester, this proportion had risen to 32% (Allen & Seaman, 2013). It is worth noting that 32% was the percentage that represented online course enrollment ten years ago. As a result of the rapid development of Internet technology, online courses have become an important part of higher education. Robinson and Hullinger (2008) demonstrated that asynchronous technology in teaching could promote students' reflection and trigger deep and critical thinking. The interactive learning platform (discussion module) provided by digital learning tools can enhance students' learning outcomes (Kent et al., 2016). Furthermore, the popularity of online learning, whether it is completely online learning or blended learning, undoubtedly makes the satisfaction and effectiveness of students' online learning experience become the focus of online learning research.

2.2 Remote learning under the pandemic

Affected by the COVID-19 worldwide pandemic, the United States imposed travel restrictions in March 2020 (Jordan et al., 2020). Therefore, as public venues, schools decided to close face-to-face

classes and transfer all courses from in-person to online (Czeisler et al., 2020). This is an unprecedented challenge even for higher education institutions, even though they have already begun to utilize educational technology tools. Universities need to move all courses online quickly, which means they need to find a technology platform to replace the "classroom" of traditional teaching and learning in a short time. Instructors need to modify their syllabuses immediately to fit the new teaching model. Not only that, but they were also required to quickly master and use these unfamiliar online teaching technologies in a short time. For students, the challenge means overcoming the equipment and technology challenges of online learning and improving self-discipline to ensure the quality of learning. In addition to technical and pedagogical challenges, the mental stress of the pandemic environment and the loneliness of learning caused by quarantine are also significant challenges for education.

Fortunately, most higher education institutions realized the rapid transfer of courses from in-person to online in March 2020 (Crawford et al., 2020). As universities already have experience using LMSs, LMSs have become one of the primary platforms for teaching activities during the pandemic. In addition, real-time online teaching is carried out through some online conference platforms (Zoom Video Communications, Google Meet). This combination of LMSs and online conference platforms has become a new teaching model commonly used in higher education institutions during the pandemic (Krome, 2020). Hew et al. (2020) defines this learning model as the online flipped classroom, in which students obtain learning materials through the LMSs and learn by themselves before the course, and then participate in online-synchronized classroom discussions. This teaching model exists in most college courses. In addition, online asynchronous courses are also a teaching mode widely adopted during the pandemic, which is mainly based on LMSs but does not use virtual conference platforms.

With the gradual re-opening of the universities, some courses have returned to the in-person format. However, as the pandemic persists, higher education institutions are more flexible in teaching methods. Classes can be conducted in classrooms, or in online synchronous, online asynchronous, hybrid, and Hy-Flex formats. Hybrid and Hy-Flex are well-known and accepted during the pandemic compared to the previous three modes. Hybrid format refers to sessions that are partly offline and partly online during each semester. The online parts can be conducted using synchronous or asynchronous methods. On the other hand, Hy-Flex means that throughout the semester sessions, instructors teach the class in the classroom, while students can choose to attend classes on campus or via a real-time conference platform. Almost all of these more flexible teaching modes use the LMSs to varying degrees. Therefore, LMSs and real-time virtual conference platforms have become powerful knowledge delivery platforms and carriers during the pandemic.

2.3 Moodle Learning Management System (LMS)

Learning Management System (LMS) is defined as application software (Mpungose & Khoza, 2020). Pappas (2020) points out that the LMSs can be applied to different fields, including education, business management, and industry. LMSs are widely used in education (Van den Akker et al., 2012) and are broadly adopted in higher education due to their rich functions and ease of use. LMSs can be used as a data repository for storing learning resources such as articles, videos, and audio (Davis et al., 2009; Lamichhane et al., 2007; Mpungose & Khoza, 2020). In addition, the LMSs can also provide tracking and analyses of students' learning, help students get timely feedback, and provide a platform for students to interact with teachers and peers. All these characteristics meet the requirements of higher education institutions for teaching activities.

According to Davis et al. (2009), Blackboard and Saba are the first Learning Management Systems to appear in universities. They are considered the beginning of LMSs in higher education. Yasar & Adıgüzel (2010) criticizes the idea that the traditional teacher-centered model cannot maximize the advantages of the LMSs. The traditional teaching model emphasizes that teachers provide lectures and students passively receive knowledge, which runs counter to the emphasis of LMSs on timely feedback, interactivity, and adaptability (El-Sabagh, 2021). Anderson & Dron (2017) expressed

similar concerns about LMSs and lecturer-centered teaching. However, the advocacy of student-centered teaching mode and the acceptance of flipped classrooms make the functions of LMSs continuously expanded. With the information technology revolution bringing significant progress to the Internet and the storage space being released, the LMSs have been equipped with the promotion function and information storage capability. The LMSs can not only meet the essential online courses functions such as providing students with learning materials, submitting homework and getting feedback, and online testing, but also provide students with collaborative and interactive tools for learning (Rhode et al., 2017). Because of this, LMSs are widely used in higher education institutions.

Among many LMSs, Moodle Learning Management System (Moodle LMS) has become a popular learning management system in higher education institutions (Egorov et al., 2021; Elabnody, 2015; Pappas, 2020). Moodle LMS is an open-source course management system (Means, Bakia, & Murphy, 2014, pp. 54), founded by Martin Dougiamas in 2001 (Aldiab et al., 2019). The open-source nature of Moodle means that organizations using this management system can customize and install it according to their needs (Mpungose & Khoza, 2020). This enables the LMS to better match the different needs of the institutions and reduces the university's expenditure on technology maintenance.

Previous studies on Moodle LMS mainly focused on the essential functions of Moodle (Shurygin & Krasnova, 2019); students' use of Moodle and its learning effect (Horvat et al., 2015; Ramrathan, 2017); the research of curriculum design using Moodle from the perspective of teachers (Samerkhanova & Balakin, 2020; Wen & Yang, 2020); and the technical skills for teachers when using Moodle (Garrison & Vaughan, 2008). However, there is little research on students' user experience, satisfaction, and factors affecting students' use of Moodle. Therefore, when analyzing college students' experience using Moodle, students' learning interactions, satisfaction and challenges with using Moodle and the factors that affect students' evaluation should be the focus.

2.4 Zoom Video Communications

Due to the pandemic, schools were closed, and Zoom Video Communication became a widely accepted platform for real-time online teaching in higher education (Serhan, 2020). Most traditional offline courses have been transferred to Zoom to ensure that teachers can deliver and communicate with students in real-time. The use of Zoom changed the format of teaching to remote. Alavi & Leidner (2001) and Joia & Lorenzo (2021) identified this form of teaching as Technology-mediated Learning to describe the learning environment in which students interact and communicate with instructors and peers through technological media. Zoom seemed to become known to the university and its members overnight. However, Krome (2020) pointed out that Zoom had been well known and recognized by academia for its interactive collaboration characteristics before the pandemic. This view coincides with Sutterlin (2018), who has elaborated and analyzed the functions of Zoom in detail. Before the COVID-19 pandemic, this report hints at the power and data-carrying capacity of this virtual meeting platform.

Zoom is a real-time, internet-based online conference platform that enables simultaneous web video/audio meetings across computers, tablets, and phones. In addition, its screen sharing function and breakout rooms maximize user communications and content presentation (Sutterlin, 2018) and interactive discussions. Moreover, these functions and features primarily meet the needs of higher education in the course delivery. In addition, Zoom's easy-to-operate feature reduces the technical literacy required for students to learn in an online environment (Krome, 2020). On the one hand, Zoom was applied as a platform for real-time course content delivery to replace traditional offline lectures. On the other hand, Zoom, a powerful learning platform for the online flipped classroom, implements timely communication between students, instructors, and classmates (Hew et al., 2020), for example, as the discussion platform for students in group discussion and the office hours meeting platform for communicating with professors. Furthermore, Zoom's meeting recording function provides a remedy for students who miss out on lessons. Even students who attend class can make up for lost knowledge or deepen their understanding of content by repeatedly watching videos. These

features and its relatively large data capacity have made Zoom widely adopted by higher education institutions.

Studies and reports on Zoom focus on the analysis of the effectiveness of using Zoom in the educational environment and for lecture purposes (Barbosa & Barbosa, 2019); insights and non-academic analysis on the use of Zoom (Koenig, 2020); and the various functions of Zoom (Sutterlin, 2018). Even the investigations on the effectiveness of students' use of Zoom are mainly based on the literature review (Krome, 2020). The broader adoption of Zoom as a teaching platform in higher education during the pandemic requires additional empirical research and case studies by researchers to evaluate the use of this platform. At the same time, for educators, understanding and utilizing Zoom is not only a task during the pandemic but also a technological upgrade beyond the pandemic environment. As mentioned by Krome (2020), making full use of Zoom's advantages can improve students' learning effectiveness to a greater extent.

2.5 Factors in evaluating the online learning experience

Students' experience of online learning is influenced by various factors and dimensions. In evaluating online learning, students' online learning experience and the learning outcome become the main focus of research. Comfortable, satisfying, and inspiring learning experiences motivate continuous learning and improve student learning outcomes. However, the assessment of student learning results is difficult to quantify. Different from the standardized tests in K-12 education, higher education is more diverse in the way students are evaluated, making it somewhat more difficult to assess the direct effects of digital tools usage. Therefore, researchers often analyze students' assessments before and after participating in online learning (Egorov et al., 2021). This research approach is primarily based on students' self-reports and observations of their academic performance. Alternatively, researchers can use the quasi-experiment research method, conveying the teaching in different ways between the experimental group and the control group, and subsequently comparing and analyzing the learning performance of the two groups of students (El-Sabagh, 2021). In addition, scholars also attempted to analyze the adaptability and learning performance of students of different ethnic groups to online learning by identifying the demographic information of students (Xu & Jaggars, 2013).

In these studies related to student learning outcomes, student engagement in learning and the classroom has become the focus of most studies. Nkomo, Daniel, & Butson (2021) defined three dimensions of engagement: behavioral, cognitive, and emotional. Among these three dimensions, emotional engagement emphasizes students' emotional reactions in the learning process. These emotions include students showing their interest in learning, anxiety, and whether they feel they were supported and included in the class. In addition, Linnenbrink-Garcia et al. (2011) added the aspect/concept of social-behavioral engagement, which is based on general behavioral engagement. The increase of this dimension emphasizes the importance of social interaction in students' learning process. Dumford & Miller (2018) mentioned eleven aspects that influence student engagement, including student behavior, interaction with peers and faculty, and supportive learning environments. Goh & Yang (2021) analyzed the flow of students participating in blended learning and pointed out that improving students' e-engagement can improve students' flow when using LMS and produce positive learning effects. Moreover, it reduces students’ dull sense of online learning. Boredom is a crucial barrier to students' learning during the pandemic. A report from Harvard Language Center proposed the concept of "Zoom Fatigue" to describe students' fatigue and weariness in online learning (Ross & DiSalvo, 2020). Therefore, paying attention to students' engagement in the learning process and reflecting on methods to improve students' classroom participation is key to improving students' learning effect and experience.

The research method based on students' self-report and experience description of their online learning experience is more adopted by scholars. Krome (2020) proposes two main aspects in evaluating students' online learning: one is the analysis of the effectiveness of students' online learning; the other is a report on satisfaction with online learning. Bolliger and Martindale (2004) put

forward several factors that mainly affect students' satisfaction with online learning, including the instructor, technology, and interaction. This statement is supported by numerous studies and scholars. First, Alshare & Lane (2011) found that students' learning satisfaction was influenced by teachers' technical ability. In the online environment, the interaction between students and faculty is limited by time and space, making students encounter obstacles when seeking instructional support. In such a learning process, clear instructions and timely feedback from teachers will affect the evaluation of students' satisfaction with online learning. Second, with the popularization of technology, students' challenges on the technical level have been relatively diluted. Students' perceived usefulness of technology can promote students' ability to use digital tools and increase their effectiveness (Goh & Yang, 2021). However, during remote learning in the epidemic, a survey of 3,037 students showed that students' satisfaction with online learning was still low due to a lack of adequate technical support and frustration caused by technical challenges (Firdoussi et al., 2020).

Among the three main influencing factors, interaction has been valued by many scholars. Means, Bakia, & Murphy (2014, pp. 30) cited a research result from Bernard et al. (2009), who divided students' learning interaction into three types: teacher-student interaction, student-student interaction, and student-content interaction. Bernard et al. (2009) believe that the interaction between students and content has the most potential among these interactions. Although the interaction between students and content largely depends on the support of technology, it also needs the guidance of teachers, communication and collaboration with peers. This is an integrated process, not a single process carried out independently. The interaction generated by this process is crucial because it can influence students' evaluation of their learning experience and help students engage in learning and study groups, thus helping students better benefit from the constantly constructed learning process.

In addition, a friendly and supportive learning environment, students' self-efficacy in participating in remote learning (Lee & Choi, 2011; Shen et al., 2013), and students' past experience using educational technology will affect students' evaluation. In a study comparing students' satisfaction with online learning before and after the epidemic, Karada, Su, and Kocaturk (2021) evaluated students' satisfaction with online learning from the learning effectiveness perspective and found that students' satisfaction and recognition with online education was low. Students consider remote learning as an alternative to traditional offline classrooms and a complementary product to formal education. In this study, students' past online learning experience affected students' current use and evaluation of digital tools.

Based on the analysis of previous research and reports, this study focuses on the students' learning experience after universities reopened their campuses. While the pandemic is considered a challenge to the education system and teaching model, it is also considered a heuristic educational technology revolution (Seke, 2020). The emergence of various format curricula and educational technology tools prompted this study to further explore students' learning experiences in online, hybrid, and Hy-Flex environments. This study conducted a questionnaire survey at Adelphi University (United States) and recruited volunteers for in-depth interviews. Through the in-depth interviews with current university students, the researcher attempted to understand students' learning experience after the campus reopened. The research focuses on students' use of Moodle LMS and the learning experience of using Zoom to participate in real-time classes. By analyzing the students' engagement and interaction in these two platforms, this research tries to provide practical suggestions for enhancing students' online learning. Through the analysis and summary of previous research results, this study puts forward two hypotheses:

1)Moodle LMS provides effective engagement and interaction for students' online learning.

2)Zoom provides effective engagement and interaction for students' online learning.

3. Research Methods & Data Analysis

3.1 Data collection

This study aims to evaluate students' experience of using online learning tools when the campus reopens and to try to provide suggestions for improving students' learning effectiveness and experience. As a result, the researcher used students at Adelphi University in the United Stated as a sample for the study. Founded in 1896, Adelphi University is a private comprehensive university with a main campus in Garden City, New York. Currently, there are more than 8100 students enrolled at Adelphi University (Adelphi University, 2021).

This study used a questionnaire survey and in-depth interviews to collect data. Volunteers took part in the survey by scanning QR codes on posters posted on the information boards in the main buildings on Adelphi's Garden City campus. The posters were shared on the Garden City campus in November 2021. A total of nine posters were posted in eight teaching buildings and one dormitory building on the campus. The questionnaire was designed through Google Forms and mainly collected the demographic information of volunteers. In addition, in the questionnaire, volunteers were asked to answer the total number of courses they participated in the Fall 2021 semester, as well as the format and technology platform they used. Finally, the volunteers were asked to participate in further in-depth interviews. In order to encourage students to participate in the study, modest rewards were offered to volunteers who were willing to participate in in-depth interviews. Starting from November 15th, the researcher checked the participation of the volunteers every day. In addition, the researcher sent an email titled "Interview Time Confirmation" to the participants through the email address left by the volunteers after they submitted the questionnaire and made an interview appointment with the participants.

An in-depth interview is the primary data collection method of this study. All the interviews were conducted on Zoom. After confirming the interview time, the researcher sent the volunteers a Zoom link. In order to ensure the confidentiality of each interviewer's identity, the interviewee can only enter the Zoom interview room after being admitted by the researcher. In addition, to maximize the volunteers' comfort of expression, neither the researcher nor the volunteers need to turn on the video during the interview. The interviews in this study were mainly audio interviews. However, out of respect for the respondents, the researcher would turn on the video if respondents wanted to conduct a video interview.

The in-depth interview is divided into three parts. First, the researcher and the participant confirm the questionnaire's content and have a relaxed conversation. In this way, this study tries to help the volunteers minimize the tension and embarrassment caused by strangeness to support the volunteers in better explaining their online learning experience. In the second part, respondents describe and evaluate their online learning experience. In this section, volunteers will describe the use of e-learning techniques for each course separately. The researcher took brief notes and asked the volunteers questions based on their statements. In addition, volunteers were asked to evaluate the different educational technology platforms based on their user experience (whether they were easy to use, whether they improved the learning efficiency of learners, etc.). The evaluation was scored according to the Likert scale, with a score of 1 representing a terrible experience and a score of 5 representing a very satisfactory experience. Participants reflect on their experiences and evaluate the platform during the interview. This assessment set up in the interview rather than the questionnaire aims to help participants reflect on and review their experience using educational technology by explaining their previous experiences to ensure that more accurate data can be obtained. The last part of the interview is a situational selection and expound. Participants were told that they could take in-person classes on campus or Zoom classes online regardless of the pandemic, then asked which learning format they would choose, and why. Although this is a virtual situation analysis, this study believes it is worth discussing because the volunteers may provide valuable responses that can influence the future development of higher education.

Since the researcher needs to proceed with an in-depth discussion based on the volunteers' responses to questions, each volunteer has a different online learning experience and diversified explanations; the in-depth interview took about 15-20 minutes. Interviews were recorded by voice with the volunteers' permission in this study. To avoid data leakage, all study recordings were stored on a tablet computer with a highly secure password by the researcher. English as the primary communication language in the interviews. However, due to the university being diversified, some of the volunteers are international students, with English as their second language. Therefore, in order to maximize the accuracy of the expression of every participant, the international students can use their first language in the interview process depending on themselves. Out of respect, the researcher will communicate with the international students before the interview and give them enough space for expression and language choice.

Participants were recruited using a combination of "probability sampling" and "improbability sampling." This study advocates diversity and representativeness of data, so the researcher also used a snowball approach in the recruitment process, trying to recruit students of different races and regions. Interviewees can recommend or introduce relevant target groups to participate in the data collection of this study.

In recruitment posters and questionnaires, the researcher stated the purpose, methods, and ethical issues involved in the research. Participants were explicitly informed that "submitting the questionnaire means agreeing to participate voluntarily in the data collection and analysis of the study." In addition, before the interview, the volunteers would sign the informed consent orally again. Participants were informed that even if they signed the informed consent form and voluntarily participated in the study, they could still refuse to answer interview questions during the interview and had the right to suspend or terminate the interview.

A total of 31 valid questionnaires were collected for this study, among which 26 volunteers were willing to participate in in-depth interviews. After the interview, the researcher immediately reviewed the interview recordings and conducted preliminary screening on whether the respondents belonged to the research scope and the availability of the data. Finally, data from 26 valid interview audio recordings were obtained.

3.2 Data analysis method

In this study, questionnaires and in-depth interviews were used to collect data. Specifically, the questionnaire was used to collect participants' demographic information, and the audio data generated by the in-depth interview was used to analyze students' experiences using the online learning platform. Therefore, qualitative analysis is the data analysis method of this study.

First, volunteers' course formats and the use of platforms in the 2021 Fall semester were collected through a questionnaire survey to provide an essential knowledge background for data analysis. Furthermore, the data of participants who are willing to accept in-depth interviews will be analyzed for this study. Therefore, the demographic information of twenty-six valid data was quantitatively analyzed and compared in this study. In the demographic information, the researcher analyzed the volunteers' gender, race, degree, study stage, course formats, and online learning platforms they used and plotted relevant demographic information tables. In addition, the Likert scale was used in this study to evaluate participants' assessment of platform user experience during the interview stage. Therefore, the researcher collected the data and drew relevant information charts in data analysis.

Qualitative analysis methods are applied to analyze interview recordings. At the end of each interview, the researchers conducted a preliminary definition and analysis of the interview. First, the researcher divided the participants into undergraduate, graduate, and doctoral students based on their demographic characteristics. As the volunteers in this study did not involve doctoral students, the "doctoral group" was deleted at the beginning of the data analysis. In addition to the first classification level, the researcher classified the volunteers according to their nationality. Then volunteers were divided into "Native American Students" and "International Students." Therefore, each recording is

named "Recording order, current education, and student's identity," for example: "#1_Graduate student_International Student".

The researcher took simple notes during the interview and initially analyzed the recordings after the interview. The researcher used Speech-to-Text software to convert the interviewees' recordings into text for analysis. These recordings were imported into the tool, which generates text files. The text files were stored synchronously on the researchers' computers and tablets with the same file names as the recording files. In order to avoid errors in translation tools and ensure the validity of the data, the researcher needs to proofread and modify the text according to the original recordings. Furthermore, considering that some international students wanted to communicate in their native language during the interview, the researcher needs to translate the text into English for analysis based on the recording before analysis.

The analysis of the interview data was divided into three stages. The first stage is the open coding stage. After reading the interview transcripts, the researcher coded each respondent's response to each question, adding necessary annotations. For example, when asked how they used the Adelphi Moodle LMS, the participant replied, "In one asynchronous course, we use Moodle a lot. We need to get study materials from Moodle. These materials are usually readings and sometimes videos made by the professor. Then we need to answer the short essay question proposed by the professor on Moodle's forum. Sometimes Moodle forum discussion is mandatory; we need to reply to the content shared by classmates. All of our assignments were submitted on Moodle. However, the feedback from the professor was not timely. I have not received any feedback on the assignment I did a month ago. Also, we need to take exams on Moodle." According to this participant, the researcher coded "Moodle," "asynchronous courses," "access to learning materials," "participate in forum discussions," "exams," and "low interactive experience." In addition, the researcher will annotate the code as needed. For example, "low interaction experience" notes that the professor's feedback is not timely. Students are not able to understand their learning level, and students express frustration."

The second stage of data analysis is merging code from the open code phase. For example, in the question "Will Zoom help you better participate in the class?" Student A believed that Zoom helped her better participate in class discussions in the first stage. Her reason is that she is introverted. Compared with the traditional in-person class, Zoom gives her a sense of safety and enables her to express her views. Therefore, the participant's first-stage codes are "Zoom Effective Engagement," "Student Personality," and "Supportive Learning Environment." Student B argued that Zoom class could not maximize the learning effect. He emphasized that humans are social creatures, and our communication is not only through language but also body language. He thought Zoom limited his classroom participation. Therefore, student B's first-stage codes are "Zoom Weak Engagement" and "Lack of Social Interaction." Student C believes that he can better interact with his peers and participate in class discussions in the in-person class rather than the Zoom class. He stated that he was an international student. Since English is not his native language, he felt marginalized when he attended Zoom classes. Once he did not understand his professor's lecture or the discussion of his classmates, it was difficult for him to engage in the study. Moreover, he stressed that in offline classes, he could effectively ask other students for help or ask questions to the professor, so he thought that the participation experience of Zoom class was not good. Therefore, this participant's first-stage codes are "Zoom Weak Engagement," "Marginalization," "International Student." Student D reported that Zoom did not help him better participate in the classroom and interact with his peers. He stated that he was a very talkative person, but in Zoom's class, students needed to mute themself most of the time. As a result, he could not engage in discussions with his peers as before. Moreover, he stated that he felt very lonely studying a course where he did not know all the participants. He believes that classroom interaction and discussion with professors and classmates is the best way to improve his learning. However, Zoom cannot provide him with such support. Therefore, the first-stage codes of this student's are "Zoom Weak Engagement," "Student Personality." The researcher will merge the code in phase two based on phase one, as shown in Table 1.

Table 1. The second phase--merging the code from the open code phase

Question: Will Zoom help you better participate in the class?

First Stage Code	Relation to other codes	Merging
“Zoom Weak Engagement”	“Lack of social interaction”: Unable to communicate with classmates in body language, Zoom had a weak sense of social interaction, which affected student's participation in the class.	“Zoom impedes the effectiveness and diversity of student classroom communication.”
“Zoom Weak Engagement”	“International students”: English as a second language leads to disfluency of communication. “Marginalized”: Students experience marginalization because they find it difficult to participate in classroom discussions.	“When international students use Zoom to learn, language barriers are more obvious. This leads to their inability to participate effectively in classroom learning. They feel marginalized in class discussions and interactions.”
“Students' personality”: Students' experience of participating in online learning is influenced by their personalities.	“Zoom Effective Engagement" “Zoom Weak Engagement” “Supportive learning environment”: Students feel safe and comfortable in the learning environment.	“Students’ online learning experience and effects are influenced by their personality and their perception of the safety of the learning environment.” MEMO: The personality of students was not included as a variable in this research analysis, so the objectivity and reliability of this point of view is questionable and remains to be discussed.”

"Zoom Weak Engagement" was combined with "Lack of Social Interaction." The merged code was "Zoom impedes the effectiveness and diversity of student classroom communication." In addition, "Zoom Weak Engagement" was merged with "International Students" and "Marginalized," The merged code is "When international students use Zoom to learn, language barriers are more obvious. This leads to their inability to participate effectively in classroom learning. They feel marginalized in class discussions and interactions." It is noteworthy that many participants mentioned the relationship between their personality and Zoom experience. After combining "Students' Personality," "Zoom Effective Engagement," "Zoom Weak Engagement," and "Supportive learning environment," the merged code was "Students' online learning experience and effects are influenced by their personality and their perception of the safety of the learning environment." However, it should be cautious that in this study, although "Students' Personality" is recognized as a factor affecting the sense of online learning experience, there is no theory and sufficient data on whether students' personality

(extroverted/introverted) has a positive or negative impact on the online learning experience. Therefore, in the second phase of code merge, this code was noted to "remain to be discussed."

The third stage is theoretical coding, which summarizes the merged code and states the logical relationship. In this stage, the researcher would summarize and explain the result and causality of each question and form the final data analysis result. Finally, the researcher compares the data analysis results with the assumptions in the study's design to draw the research results and conclusions.

The researcher analyzed the interview transcript using the components of Google Drive. The researcher used the Google Document's comments and markup features to analyze and annotate the text. During the analysis, the researchers used color-coded tags to label different aspects of the code. In addition, the researcher used Google Forms to create visual and intuitive bar charts for these findings.

3.3 Results of data analysis

In the questionnaire part of this study, 31 valid questionnaires were collected. Furthermore, among the 31 volunteers, 26 were willing to accept in-depth interviews. Therefore, the data of these 26 questionnaires and 26 in-depth interview recordings were analyzed in this study.

Among the 26 valid data, there were 14 females (53.8%), 10 males (38.5%), one identified as agender and one chose to prefer not to say about gender. In terms of racial diversity of students (as shown in Figure 1), 13 students (50%) are Asian, nine (34.6%) are White, four (15.4%) are Hispanic or Latino, three are Black or African American, and one identifies as West Indian. It is important to note that race is not an exclusive choice; participants can be both white and Hispanic or Latino. Moreover, an analysis of demographic information obtained from the interviews showed that of the 26 students, 15 were American students, and 11 were international students.

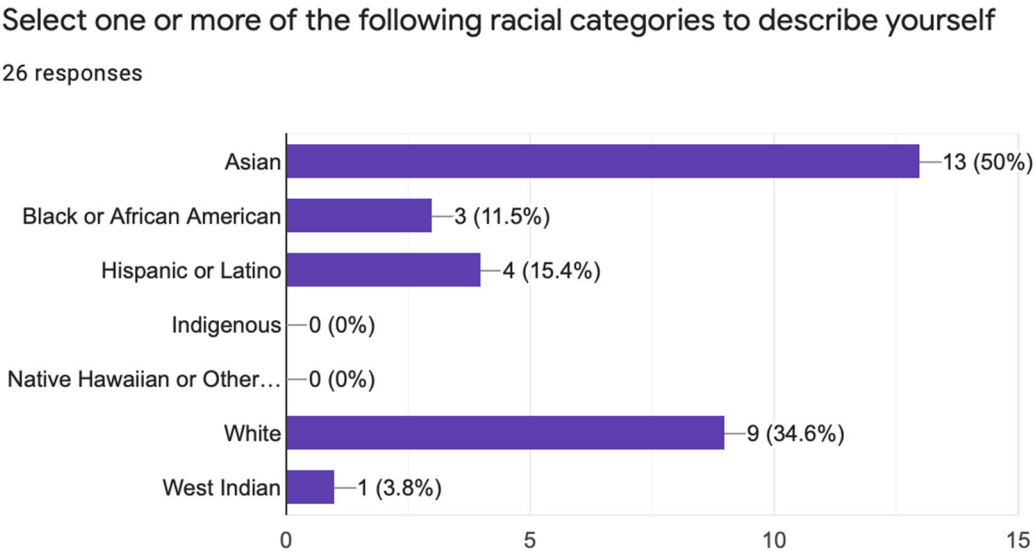


Figure 1. Demographic information of participants

Regarding their educational background information, the respondents came from 15 different undergraduate and graduate programs at Adelphi University. Among them, five are Educational Technology, four are Business Administration, and three are Mathematics; other majors had more than two participants. In addition, this study included 14 undergraduate and 12 graduate samples. In general, this study sample has certain ethnic diversity and disciplinary representation.

In order to understand the course formats that participants enrolled in the Fall 2021 semester, this study makes data statistics on students' course formats (as shown in Figure 2). According to the study, 80.8% (21 participants) of the 26 volunteers participated in online synchronous courses during the Fall 2021 semester, 53.8% (14 participants) had an entirely in-person learning experience during the Fall 2021 semester, and 46.2% of the students said their courses were Hy-Flex. In addition, 34.6% of

students took online asynchronous courses, and 30.8% participated in hybrid courses. All the students who participated in the in-depth interview had experience in online learning and using the LMS.

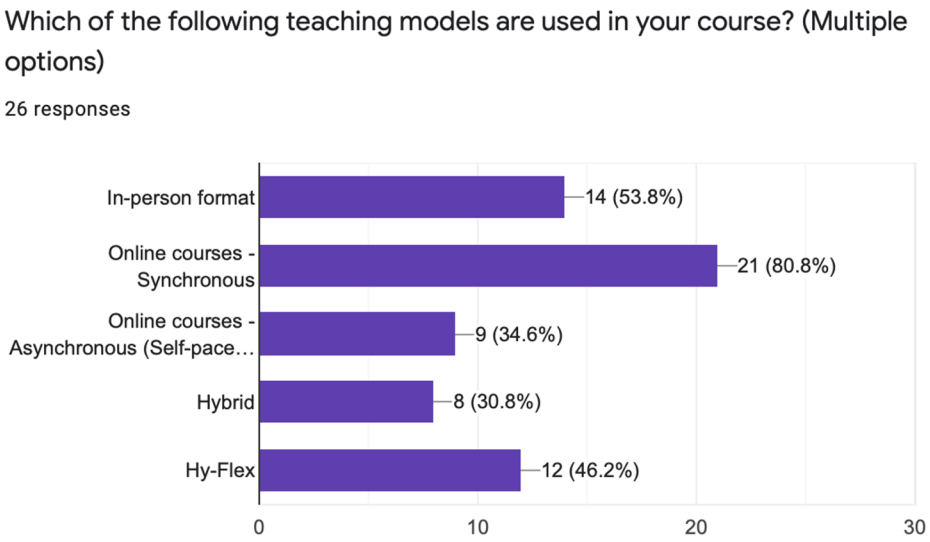


Figure 2. Participants' course formats during the Fall 2021 semester.

As shown in Figure 3, all volunteers used Adelphi Moodle and Zoom as learning tools and platforms. In addition, of the 26 Adelphi students interviewed, 13 have used Google components in their studies, 11 have used Voicethread, and 9 have used Respondus. This study focuses on students' experience using the Adelphi Moodle LMS and Zoom video conference platform. Therefore, this study focuses on how students use these two platforms and evaluate these two digital tools.

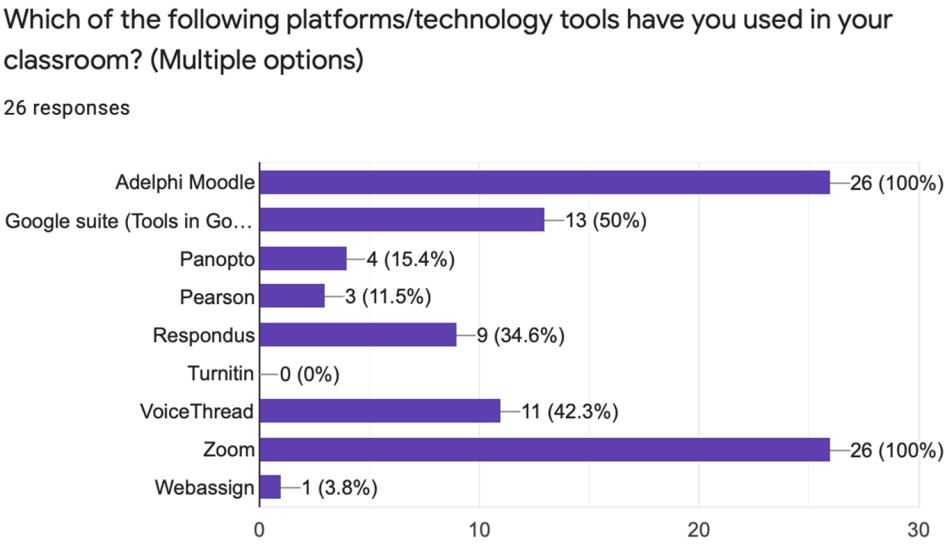


Figure 3. Educational technology platforms used by participants during the Fall 2021 semester

An analysis of the recordings of the interviews showed that the students had become familiar with the educational technology tools offered by the university through online learning over the past year. There are no technical challenges when using these tools, even for the freshman. When asked about the ease of use of the technology, all participants rated their current online learning platform as easy to use. So, in general, technology does not limit students' learning experience.

Specifically, according to the user experience statements of the interviewees, the result concluded that the primary purposes and activities of the students using Adelphi Moodle were obtaining learning materials, submitting assignments, participating in forum discussions, and taking online quizzes. Since Moodle LMS is an open resource (Means, Bakia, & Murphy, 2014, pp. 54), universities can

install resources according to their needs. Figure 4 shows the activities and related platform links provided by Adelphi Moodle LMS. URL features that link to libraries or other eBook platforms, Assignment, Forum, and Quiz were the most used of these activities.

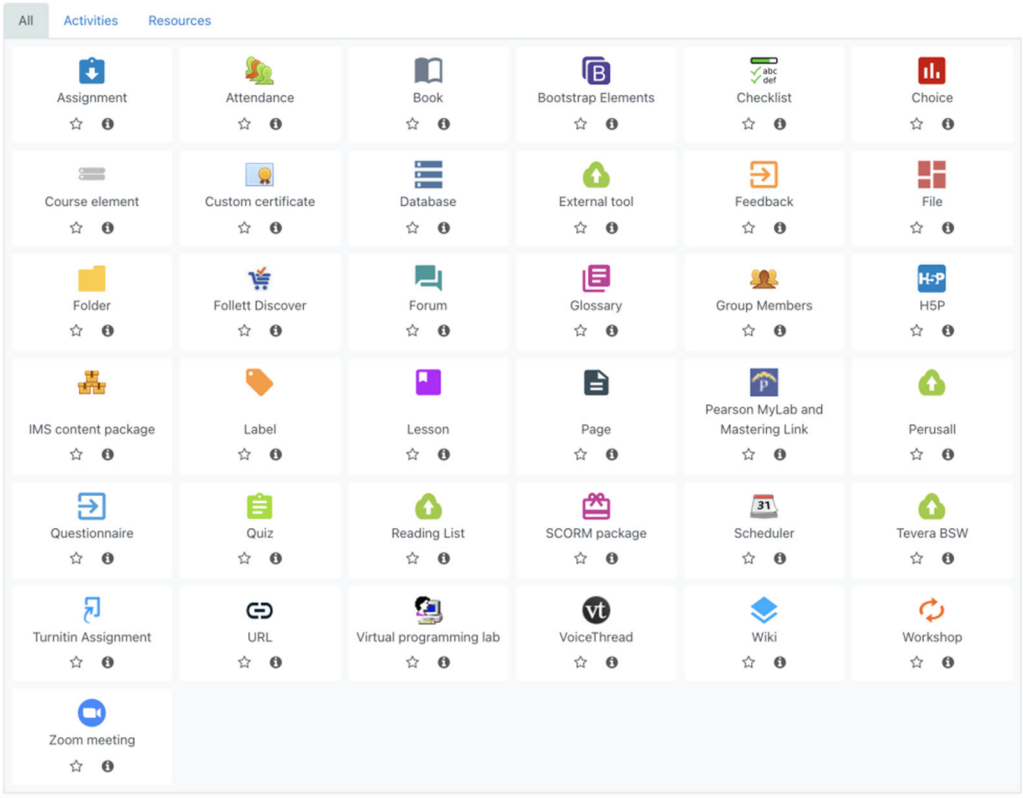


Figure 4. Learning Activities Provided by Adelphi Moodle Learning Management System

Analysis results show that Adelphi Moodle provides students with a high-quality knowledge acquisition platform. When using Adelphi Moodle for learning, the interaction between students is mainly reflected in forums. Students were asked to read and respond to their peers' posts. In this way, the interaction in the online asynchronous environment is generated. In addition, the interaction between students and teachers is mainly reflected in the forum discussion and getting feedback on assignments. Nevertheless, most students (61.53%) expressed disappointment with this interactive dimension. Participants generally indicated that professors rarely participated in the forum's discussions. Not only that, 19.23% of students said their professors did not give their feedback promptly and effectively. Finally, as far as the interaction between students and content is concerned, students are generally satisfied with their experience. Seven students emphasized that the experience and effect of using Moodle largely depend on the professor's Moodle page design. The challenge of using Moodle to gain knowledge came from the professor's course page design. Two interviewees volunteered to ask the researcher to use the screen sharing function so they could show the Moodle course page during the interview. They stated their professor had "lumped all the materials and links together without proper categorization," leading to challenges for navigation. However, in general, 26 respondents were highly satisfied with Adelphi Moodle's user experience and learning effectiveness. On the Likert scale, eight people chose a rating of five (very satisfied), while Adelphi Moodle LMS received an average of 4.27 for its user experience and learning effectiveness.

Second, by analyzing user experience and the statement of learning effectiveness of Zoom Video conference platform, this study concludes that Zoom provides effective learning participation and interaction for students' online learning. The analysis shows that when students participate in Zoom courses, they can participate in course learning more efficiently. Compared with pandemic factors, respondents generally considered the flexibility and convenience of Zoom to be the most influential factor for them to choose to participate in Zoom courses. However, 80.8% of respondents mentioned

they thought their classroom interaction was limited when participating in Zoom courses. They think it is difficult for Zoom to achieve the communication effect of a traditional in-person classroom. Zoom could not provide them with enough social interaction, and they experienced varying degrees of loneliness while studying. In contrast, five interviewees argued that they enjoyed the experience of participating in the course on Zoom, and they believed that learning on Zoom helped them better understand the learning content. Three of the five mentioned their introverted personality and believed that Zoom gave them enough safety to participate in class discussions. However, 92.31% of the respondents mentioned that when Zoom courses content is lecture-centered rather than students or discussion-centered, the courses will become much more boring. Moreover, they believe that compared with traditional offline courses, learning on Zoom is more challenging to concentrate on, and they are easily distracted by the influence of the surrounding environment.

In the analysis of all the interviews, one phenomenon stands out. Of the 11 international students who participated in the in-depth interview, eight said they felt marginalized while participating in Zoom. When asked for specific reasons, they illustrated that Zoom had increased their difficulties in language understanding. Real cases shared by respondents reveal the negative impact of this phenomenon on students' classroom engagement and interaction. For example, the volunteer stated that in Zoom class, once he failed to keep up with the pace of the discussion by the professor or his peers, it would be difficult for him to engage in the class again. However, in a face-to-face learning environment, they can ask peers or professors for help more effectively. In addition, an international student mentioned that in the in-person classroom environment, he could express his views and interact with others through body language. However, it was not easy to achieve in Zoom class.

In general, the interaction between students using Zoom realizes the interaction between students-students, students-professors, and students-content. Class members can communicate and discuss with their peers through voice and text. The professor can share the screen to present the material (slides or videos). Students acquire knowledge by watching materials shared by the instructor and lecture narration. In addition, Zoom supports students' learning needs in different places synchronously due to its convenience and flexibility. Therefore, Zoom provides effective learning participation and interaction for students' online learning from this perspective. On the Likert scale, nine people rated 5 (very satisfied), while the average score for Zoom's experience and learning effectiveness was 4.19.

In the last part of the interview, volunteers' responses during the "virtual situation discussion," were thought-provoking. When volunteers are informed that they do not need to consider the pandemic, they can choose to participate in face-to-face courses on campus or online courses on Zoom, which they will choose and explain the reasons. Of the 26 volunteers, 17 (65.38%) chose to use Zoom to participate in online courses. This result included volunteers who thought offline learning was more effective than Zoom learning. When asked why they chose the option which conflicts with their opinion, they said that the convenience and flexibility of Zoom learning far outweigh the disadvantages of the online learning environment. Moreover, three of them stated they believe that technological progress can gradually make up for the disadvantage of online learning in the weakness of interaction and engagement.

On the contrary, nine said they prefer to participate in face-to-face learning on campus. Because the learning atmosphere and environment created by the campus are critical to them, the in-person class is more conducive to their participation in communication and the sense of belonging in class. This research result shows that many students have recognized the learning mode of online learning, but their recognition is more confined to the convenience and flexibility of online learning. From the perspective of learning effect and learning experience, although they maintain confidence in the development of educational technology, most of them still believe that the in-person learning method can provide a better classroom interaction experience and learning effect.

4. Findings & Discussion

The results of this study support the two hypotheses from the beginning of this study and provide a new finding. First of all, the analysis of the interview and the quantitative evaluation based on user experience and learning effectiveness of Adelphi Moodle LMS through the Likert scale show that Adelphi Moodle LMS provides effective learning participation and interaction for students' online learning. Moreover, it has a positive effect on students' learning. Through diversified learning activities, students can interact with peers, instructors, and content in different dimensions and levels. Research shows that most students' activities on Adelphi Moodle mainly focus on obtaining learning resources through files or links, submitting assignments, participating in forum discussions, and taking quizzes. These essential activities provide students with various levels of interaction and participation. Especially considering that most of the participants' courses have Zoom classes and in-person classes, Adelphi Moodle LMS plays the role of a learning supplement tool in students' learning. In such cases, where students already have other ways to interact with peers or professors, LMSs often build on the interactions students have already established and deepen their involvement in the course and learning. This feature coincides with Ramrathan's (2017) analysis of the use and learning effect of Moodle. However, students did not achieve student-centered learning at Adelphi Moodle LMS. According to the participants, their use of Adelphi Moodle LMS was more determined by the professors. Faculty have the power to determine what types of learning activities students use or participate in. Unfortunately, this also means that students cannot explore and learn more deeply on Moodle by themselves. Yasar & Adıgüzel (2010)'s criticism of the use of LMSs centered on teacher design has not changed.

In addition, the promotion of Moodle to students' learning results largely depends on the design and use of Moodle by faculty. In addition to instructors being able to determine the types of activities students participate in, the design of the Moodle page by instructors has a significant impact on students' learning experience. According to the Instructional Technologist at Adelphi University Faculty Center for Professional Excellence, Adelphi Moodle offered professors seven options in terms of course formats. They are MSHI topics format, flexible sections format, single activity format, social format, collapsed topics, topics format, and weekly format. Instructional Technologist introduced the most widely used forms at Adelphi University are: the topics format and the collapsed topic. There is a significant difference in the way information is presented. When professors do not classify and manage teaching activities and learning materials reasonably, the topics format is more likely to cause students to be unable to navigate or even overwhelmed when they use it, as the volunteers mentioned during the interview. Therefore, this study suggests that when using Adelphi Moodle to design courses or as a learning aid tool, faculty should effectively manage and classify resources and information, stratify information as much as possible, and use hyperlinks instead of directly displaying all information on the first page of Moodle courses. From the interactivity perspective, Moodle can create more activities or external links that promote interaction, cooperation, and discussion between students and students or between students and instructors. In order to increase the interaction of Moodle and help students better engage in learning using Moodle.

In terms of the evaluation of Zoom, the results support the second hypothesis; that is, Zoom provides effective learning participation and interaction for students' online learning. According to participants' statements, the influence of Zoom on students' learning interactivity shows a positive trend in general. Although participants generally believe that compared with the traditional offline course discussion, the interactive effect and participation of Zoom class are weak. Nevertheless, they still recognize the effectiveness of Zoom's capabilities for classroom discussion, communication, and collaboration. However, at the same time, research results show that "Zoom Fatigue" (Ross & DiSalvo, 2020) appears when students participate in a Zoom course. Especially when the course is lecture-centered, students are easily distracted and challenged to engage in the course learning.

It is worth noting that even though Zoom's discussion and the interaction effect is not as ideal as that of offline courses, 17 of the 26 volunteers are still willing to participate in Zoom courses without considering the epidemic situation. When asked for the reasons, they stated that the convenience and

flexibility of Zoom learning far outweigh the disadvantages of the online learning environment. In addition, three participants expressed confidence in technological improvements to enhance the interactive and cooperative nature. This reflects college students' confidence in online learning and the development of educational technology, but at the same time, it also implies people's segmentary understanding of online learning. Flexibility and convenience have long been considered advantages of online learning. This study recognizes the two advantages of online learning. However, the advantages of online learning on learners' knowledge exploration, deep learning, interdisciplinary field learning, 21st century skills acquisition, and knowledge re-creation have been ignored. On the one hand, the teacher's lack of mastery in technological pedagogical content knowledge (Mishra & Koehler, 2006) leads to the deficiency in the design of online courses and learning activities. On the other hand, the public's perception of online learning is still influenced by the concept of complementation and substitution of offline teaching (Karada, Su & Kocaturk, 2021).

The study results led to a new finding, namely the marginalization experience of international students when participating in Zoom courses. From the perspective of culturally responsive teaching, Smith (2020) puts forward several themes that teachers should be alert to in the online teaching process. The alienation of people of color is included. This means that the marginalization experience of Zoom courses mentioned by international students in this study has a certain universality. This marginal experience is not the result of using a particular learning platform. The reasons for this phenomenon need to be analyzed, and the significance of this analysis is far-reaching. With the progress of globalization, international students are prevalent in universities worldwide. And considering the popularity of online teaching and learning tools, the needs of minority groups represented by international students also deserve attention in curriculum designing and technology development.

5. Conclusion

This study aims to analyze the impact of online learning tools on students' learning interactivity and engagement by understanding their evaluation of online learning experience and effectiveness after campus reopening. Through the analysis and interpretation of previous studies and reports, this study puts forward two hypotheses: 1) Moodle learning management system provides effective learning participation and interaction for students' online learning; 2) Zoom provides effective learning participation and interaction for students' online learning. The analysis of in-depth interviews, audio recordings, and data comparison proved the hypothesis's rationality. The study further reveals that instructors' curriculum design becomes the main factor affecting students' interactive learning and participation when students use LMS. Students tend to feel overwhelmed with Moodle courses that were not organized and classified. In addition, Zoom, as a real-time online teaching platform widely adopted by higher education, was highly recognized by most students even though it could not fully simulate offline classroom discussion, participation, cooperation, and interaction.

It is worth noting that in the research process, a group of international students' elaboration of Zoom course experience attracted the researcher's attention. International students who participated in the study shared their marginalized experiences during Zoom classes. The researcher deeply discussed this issue with the respondents and found that this phenomenon was common among international students who use English as a second language. This is a topic and direction worthy of future research. There are various reasons for the marginalization of the online learning experience of international students. By in-depth analysis of these factors, educational technology can better serve the diverse population.

This study attempts to improve the diversity and representativeness of the study sample. However, influenced by the fact that most students still participate in remote learning, the representativeness of this study is challenged. First of all, most of the volunteers in the study participated in sample collection by scanning and pasting the QR codes on campus. This resulted in a lack of data representing students who did not participate in in-person courses. In addition, most of the

respondents who volunteered for the study were interested in online education. This potential selective perspective may influence their evaluation of the learning experience and effectiveness. These factors weaken the representativeness and diversity of this study.

The significance of the study on LMSs and other digital learning tools is far-reaching. This research not only helps to improve the technical support of teaching and learning; It can also deepen the integration of pedagogy and technology, make it more suitable for emerging educational needs, and provide educational support for more diverse student groups (Karada, Su & Kocaturk, 2021). The 2020 pandemic poses a massive challenge to education technology, and it is also an opportunity to transform the teaching formats, pedagogy, and the usage of technology. Online education is no longer a supplement or substitute for traditional education. Online learning has unique advantages and characteristics that cannot be replaced—these need to be constantly tested, analyzed, and discussed in teaching practice and research.

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