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Paradigm model of online learning experience during COVID-19 crisis in higher education

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The study presents qualitative research on university students' online learning experience process at the higher education level. It used a grounded theory through semi-structured in-depth interviews with 25 university students for framing and structuring the paradigm model of university students' online learning experiences. A paradigm model illustrating this developmental process is presented, which includes the casual and contextual conditions that caused and evolved the central phenomenon for their online learning, the strategies used by the students to overcome external/internal disturbances in continuing their learning process, the conditions that helped/hindered those strategies, and the consequences. Finally, the following meaning units were discovered through the preceding paradigm model. The students started learning with a negative impression of unfamiliar learning methods such as online learning, but over time, they improved their self-management abilities and gained a broader understanding of self-discipline. In the midst of this, competence in digital literacy according to generational differences was also discovered as one of the factors affecting learning, forming a virtual community, and increasing personal learning through online interaction. Finally, the implications of the overall learning ecology for the future role of online learning were also considered. Based on this analysis of students' online learning experiences, the direction for online learning was suggested.

KEYWORDS

online learning, learning experience, paradigm model, grounded theory, Generation Z students

1. Introduction

The term online learning was first used in 1995 and has become a major component of education worldwide, particularly in the past decade (Singh and Thurman, 2019). Because of the increasing number of online lecturers, emerging Internet technology, enormous student demands, and enhanced pedagogy, online learning has become popular in higher education (Ayu, 2020). Especially at the student level, students are taking a combination of online and face-to-face courses as their college learning experience (Allen and Seaman, 2013). In addition, online learning could guarantee teaching and learning activities without interruption during emergencies such as COVID-19 since 2020 (Ferri et al., 2020). However, due to COVID-19, all universities worldwide must implement information technology (IT) for use in online learning. According to Sari and Nayir (2020), many lecturers, educators, and students have experienced panic due to the impact of COVID-19, especially at the university level, where many lecturers, educators, and students are not prepared to conduct online education.

In particular, a large proportion of Generation Z learners are studying in higher education.¹ They are the generation group born between 1995 and 2010, and they are the most exposed and easily accessible to online learning (Nicholas, 2020). In addition, they have accumulated various online learning experiences and digital literacy in various ways and paths from an early age due to the characteristics of their generation (Yu, 2020). However, when operational technology uses programs modeled on online learning due to sudden social crises such as COVID-19, problems arise when lecturers and students are not accustomed to using profitable online learning (Bahasoan et al., 2020). Thus, studying the learning experiences of Generation Z students can help not only in understanding students' learning but also aid lecturers in deeply understanding students in online learning.

Online learning students are less likely to interact and discuss with diverse others than traditional classroom students (Dumford and Miller, 2018). Furthermore, failing technological experiences may frustrate and affect students' overall perception of online learning (Pollock and Wilson, 2002). Thus, it is crucial to explore students' current situations and issues with online learning and provide an improved experience for them. This study contributes to an expanded understanding of Generation Z students' online learning experiences in higher education. Qualitative data have been collected to display students' perceptions and expectations of the online learning experience. The purpose of this study was to construct a paradigm model based on grounded theory that could describe the process of how university students experience/make a learning process through online learning. The main research questions are as follows: (1) What kind of online learning experiences do university students have? (2) What is the process of their online learning experience? Based on Generation Z students' online learning experiences, this study sought to understand (a) the casual and contextual conditions that caused and evolved the central phenomenon for their online learning, (b) the strategies used by the university students to overcome their learning problems, (c) the conditions that helped/hindered those strategies, and (d) the consequences and outcomes. Through the research results, this study intends to provide a central phenomenon of students' online learning experiences by suggesting a deeper understanding of students and practical teaching strategies and showing the learning process perceived by students during online learning.

2. COVID-19 pandemic and online learning in higher education

Although there has previously been active discourse and conversions of digital learning in higher education, the COVID-19 pandemic has caused widespread transition in the processes that were previously largely analog to the digital realm (Schmidt-Hertha and Bernhardt, 2022). Thus, unprecedented infectious diseases have changed the environment of higher education in many countries worldwide (Neuwirth et al., 2021). In the context of

higher education institutions, online learning transformation can be considered as a summary of all the digital processes required to achieve a transition process that provides higher education institutions with the opportunity to optimally and positively apply digital technologies (Kopp et al., 2019).

Universities that have their own learning management system (LMS) have changed their teaching/learning methods based on this system, but lecturers are required to make lecture videos or many changes to their teaching methods due to the sudden non-face-to-face teaching format. In this regard, many researchers have conducted various studies on the transition to online learning in this social crisis, analyzing the conditions and problems of university online learning in a pandemic situation, and research to find improvements have appeared (Bao, 2020; Hall et al., 2020; Mickey et al., 2020; Rotas and Cahapay, 2020; Toquero, 2020; Neuwirth et al., 2021). However, in many studies related to online learning in the era of COVID-19, there are still many obstacles for learners and instructors to overcome. As a representative example, Adedoyin and Soykan (2023) presented seven major challenges to online learning during the period of COVID-19. Among their suggestions, there are several points to note regarding this study. The first point is the technology aspect, that is, technical devices that can access and operate online learning and technical problems with the online environment. The second is a socioeconomic factor regarding the lack of online devices due to the inequality of students' socioeconomic status and the problem of deterioration of students' learning for those who cannot afford Internet broadband connections (Rotas and Cahapay, 2020). The third point is the difficulty in controlling the external personal environment in the learning processes, where the unexpected appearance and interruption factors, such as family, friends, and pets, can interrupt or divert the attention of online learners. The fourth point is the problem of digital competencies that differ between students and lecturers, and students with low digital competency are problematic in providing and receiving effective learning (Toquero, 2020). This is a phenomenon that is sufficiently related to the phenomena that can occur in the process of transitioning to online learning in the period of COVID-19 covered in this study. However, the last thing we should consider is the question of compatibility. This represents an objection to compatibility in the fields of sports science, engineering, and medical sciences, where hands-on practical experience is essential (Leszczyński et al., 2018). It was pointed out that, although many parts of the process of practice that are essential to university students were being used as substitutes, there are still limitations to effectively and efficiently applying it. To do this, it is necessary to work on upgrading the online learning program (Boczkowska et al., 2018).

In addition, according to a study by Allsopp (2020), university students show strong dissatisfaction that learning problems cannot be solved immediately due to a lack of communication between instructors and students, which leads to students' learning failures and dropouts. In addition, in a study by Alawamleh et al. (2020), students also showed problems with a lack of interaction, a sense of isolation, and a decline in learning motivation following the sudden, forced transition to online learning. In addition, in a study by Rotas and Cahapay (2020), which analyzed the online learning experience of Filipino university students, it was found that learners experienced difficulties in class immersion

¹ Generation Z is called the Digital Natives or the net generation; they grew up in a world shaped by the Internet (one device can do everything) (Seemiller and Grace, 2016).

while revealing their learning burden, the lack of scaffolding with instructors, and negative feelings about online learning situations. Moreover, external constraints in students' online learning experiences also presented problems with technology and environmental constraints that can support or operate online learning (Adnan and Anwar, 2020). Therefore, since such online learning will continue and expand not only during the COVID-19 period but also in the post-COVID era, analyzing students' online learning experiences from the perspective of higher education is very necessary to find the direction and improvements that online learning should take in the future.

However, as students adjust themselves to online learning and reorganize and recognize the learning environment over time, they voluntarily prepare for learning and use their own strategies to solve the learning disturbance (Lasfeto, 2020). Furthermore, according to Adedoyin and Soykan (2023), online learning caused by the pandemic has provided opportunities for technology and research innovation, which include (a) the need to provide a model to accommodate the modern changes in online learning, (b) the need for educational institutions to provide opportunities for reviewing the digital transformation process, (c) the need for designing a more scalable and personalized online learning design model, (d) the need for designing an online learning model that reduces the instructor's workload, and (e) the need for redesigning the learning process. In addition, it was revealed that this crisis has led to a new review of the access and use of online learning according to students' socioeconomic imbalance (Ogunmokun et al., 2021).

Another thing we focused on was the investigation of the online learning experience according to the characteristics of the subject of this study. The university students are from Generation Z and are digital natives (Hameed and Mathur, 2020), and unlike other learners, their generational characteristics indicate that their familiarity with online learning and digital devices/environments, the level of digital processing, and the availability of information online are high. This can be attributed to having a lot of influence due to their capabilities in handling and dealing with the problems of online learning (Yu, 2020). Even though they were confused about online learning at the beginning, students are using their digital literacy to form a new life rhythm/cycle for learning stabilization during the pandemic period.

In this regard, looking at the online learning experience in higher education from a narrative perspective goes beyond simply identifying factors that have positive and negative impacts on students' learning and provides more insights into online learning. Furthermore, it is possible to determine the various possibilities and effectiveness of online learning needed to secure the correct understanding of the various learning strategies. Through these processes, we had the opportunity to gain answers to various aspects of questions about online learning based on students' experiences.

3. Methodology

This study aimed to reveal the experience process of online learning that has led to the involuntary transition of Generation Z university students due to the COVID-19 crisis. Thus, a

qualitative approach was considered for an in-depth analysis of how they formed the recognition and resolution process of various conflicts and confusion they experienced through their online learning experiences. In this study, qualitative research tended to focus on the phenomena of learning that occurred in the context of the COVID-19 crisis and how students understood and constructed meanings concerning their experiences. For this research, the grounded theory method was used in this study to understand the online student's experience process through a more in-depth analysis by establishing a relationship between experience formations (Hallberg, 2006) and also by providing a conceptual framework through it. In addition, this study chose Strauss and Corbin's grounded theory method to provide a detailed explanation of the formation process between experiences and not simply describe the phenomena of their learning experiences.

3.1. Grounded theory approach

According to Strauss and Corbin (1990), the grounded theory approach is designed to help produce "conceptually dense" theories consisting of relationships between concepts representing patterns of action and interaction between social units for various social phenomena (Strauss and Corbin, 1994; Sarker et al., 2000). This is a qualitative research methodology based on the symbolic interaction theory, which states that human behavior is formed through various interactions with others, identifying problems shared by members in specific phenomena and analyzing in-depth social and psychological processes and interrelationships with elements (Corbin and Strauss, 2015). Therefore, we believed that exploring the learning experiences of Generation Z students in a grounded theory method in this study would help us understand the context of their learning paths in a specific and multidimensional manner.

3.2. Data collection

Interviews were conducted with students enrolled at the University of Tuebingen to select research participants from those who had been undergoing online learning for more than four semesters. We selected students who had experienced online learning for approximately one to three semesters before COVID-19 and had experienced online learning for at least one semester after the outbreak of COVID-19. This was set up for a sensible distinction and comparison between pre-COVID-19 and post-COVID-19 online learning experiences.

Accordingly, from September 2020 to April 2021, a total of 25 college students who were undergoing online learning were enrolled through in-depth interviews until data saturation. In particular, they were born between 1997 and 2002, and on average, the participants were aged 22 years, and the birth period with the highest percentage of participants was in the 2000s. In addition, we selected participants from various majors to obtain wide-ranging narratives. In particular, participants in social science, nature science, humanities, and engineering were selected, and this included subjects that required practice (e.g., laboratory experiments and courses with many uses of visual materials).

For accurate data analysis, interviews were recorded with the consent of the study participants, and the language of the study participants was transcribed. We then went through the process of confirming their words again. All participants' information was kept confidential.

3.3. Data analysis

The data of this study were analyzed according to the procedures of open coding, axial coding, and selective coding suggested by the grounded theory method. [Strauss and Corbin \(1990\)](#) refer to the following three coding procedures: open coding, axis coding, and selective coding. In open coding, while reading the transcribed data in lines, the phenomena experienced by the study participants were understood, named, and conceptualized according to their meaning and categorized by comparing similarities and differences through continuous comparative analysis from the perspective of attributes and dimensions ([Strauss and Corbin, 1990](#)). Examining the data to decompose the data and generate the code was done using a sentence or a paragraph or an overall analysis of the entire data. Second, axial coding refers to analytical activities for “connection between categories and sub-categories” developed during open coding ([Strauss and Corbin, 1990](#); [Seyfi et al., 2019](#)). In other words, we reconstructed the decomposed data using “a coding paradigm that includes casual conditions, contextual conditions, action/interaction strategies, and consequences.” Therefore, at this stage, a paradigm model was constructed to understand the relationship between categories. The last selective coding involved identifying “core categories” (central phenomena that need to be theorized) and linking different categories to core categories using paradigm models (consisting of conditions, contexts, strategies, and results). This integration often takes the form of a process model with the association of action/interaction sequences. Therefore, at this stage, a comprehensive core category that could explain this was derived by integrating the overall categories of online students' learning experiences. In addition, it went through a procedure to revise the results of the primary study analyzed in the process of the study after receiving continuous confirmation from the study participants. Coding was done by the first author and co-authors and reviewed by other grounded theory experts. Finally, participants were asked to read the interview and provide feedback on errors.

3.4. Paradigm model

Grounded theory is an iterative and inductive data collection method based on individual and group interviews, which seeks to elaborate on key phenomena and relate them to potential causes, consequences, and contextual conditions affecting them ([Strauss and Corbin, 1998](#); [Churchill et al., 2007](#); [Seyfi et al., 2019](#)). In 1990, Strauss and Corbin proposed the use of “paradigm models” or “coding paradigms” at the stage of axial coding when reviewing empirical data ([Strauss and Corbin, 1990, 1998](#), p. 164). Here, the paradigm model provides an organizational framework to

help capture the dynamic traits of events/phenomena ([Strauss and Corbin, 1990](#)). Thus, the model systematically links the causal conditions, contextual conditions, strategies, and consequences to phenomena ([Strauss and Corbin, 1998](#)). The goal of axial coding is to facilitate the connection of subcategories with each category. As [Strauss and Corbin \(1990\)](#) pointed out, the focus in axial coding is to specify categories (phenomena), the context in which they are embedded, the action/interaction strategies they process, and the results of such layers ([Seyfi et al., 2019](#)). Moreover, [Strauss and Corbin \(1990\)](#) argued that using paradigm models is similar to the way most people think of the causes and effects that most people rely on to explain why and how phenomena occur, allowing most people to use natural thought processes to “capture as much complexity and movement as possible in the real world” ([Strauss and Corbin, 1990](#); [Seyfi et al., 2019](#)). Therefore, this study also proposes a paradigm model to understand what kind of interaction the students of Generation Z had through their online learning experiences based on their generational educational competencies and the cultural context of the German university system.

4. Results and findings

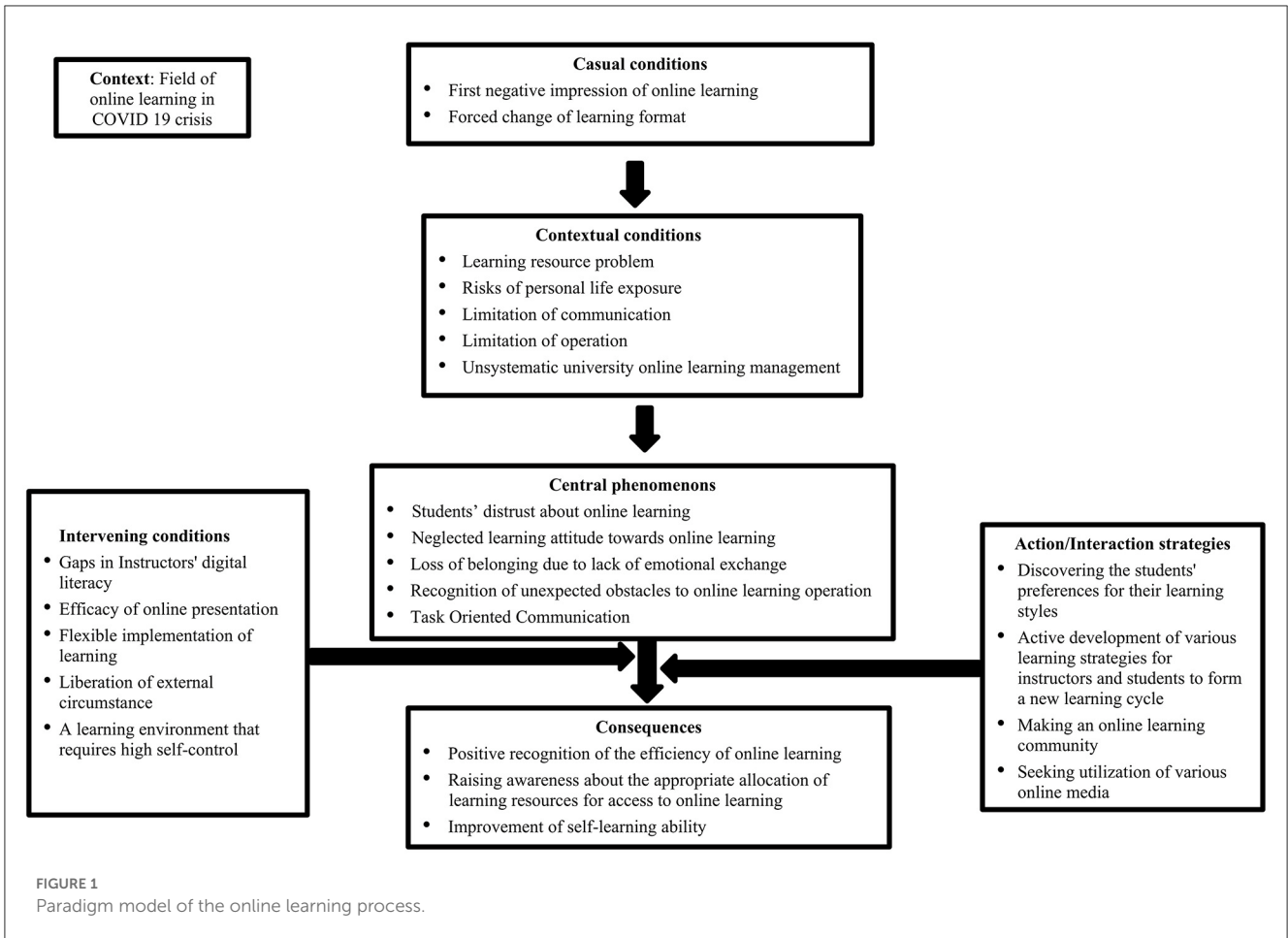
By plotting the categories created through open coding based on the paradigm model of [Strauss and Corbin \(1990\)](#), the structure of the learning experience of university students was analyzed. The paradigm model consisted of the following six elements (see [Figure 1](#)): causal conditions, contextual conditions, central phenomena, intervening conditions, action/interaction strategies, and results. Through the process of linking other categories to the central category, the relationship between the elements could be understood.

4.1. Causal conditions

Causal conditions are events that lead to the occurrence or development of central phenomena, explaining conditions as the cause that caused certain phenomena to occur or events that occur accidentally ([Strauss and Corbin, 1998](#)). In this study, “First negative impression of online learning” and “Forced change of learning format” appeared as causal conditions, and these are events that led to the occurrence and development of the central phenomenon derived in this study.

4.1.1. First negative impression of online

Participants had a “negative impression of online learning” such as rejection or concern about unfamiliar methods in the early days of learning due to the introduction of online semesters. This showed a tremendous difficulty and an odd impression in the introduction of a new learning method in universities that differed from the face-to-face education method in previous school learning.



“It was a class I had always taken in a classroom, but when it suddenly went online, everything was confusing. It seemed like everything was not properly prepared.” (Bob)

In contrast, students questioned what kind of learning goals or learning expectations the lecturer had for them when they switched to online learning and felt “confusion over the lecturer’s inaccurate expectations.” In addition, the students stated that both they and the lecturers were unfamiliar with the online learning method, and some lecturers were particularly confused during class due to unskilled digital competencies and the sudden use of online learning platforms.

“In online learning you can’t easily get to know your professor so well. So I don’t really know if they are strict or not. And what I think in online learning is not so clear what they kind of expect of the students [sic]. Whereas, in like, life learning before Corona times, I think the professors were more clear about their expectations to you.” (Anne)

4.1.2. Forced change of learning format

In particular, as the learning process progressed, they also experienced various changes in the early stages of online learning, especially regarding “Negative experiences of online assessment,”

“Use of old learning content,” and “Uncomfortable performing team projects.”

Negative experiences with the online assessment showed that, unlike previous classroom tests, immediate corrections were not made when students needed help during the test, indicating that students were worried and afraid of Internet errors during the online test. It also wasted a lot of time because professors had to give a lot of additional explanations due to the complicated online test. As for the assessment method before online learning, it was easy for students to distribute time by receiving the test paper at a glance, but in the case of online assessment, there was an inconvenience that the lower limit of the test was cut off because students had to solve one question and press the ‘next’ button to move to the next page.

“Previously, it was easy to distribute the time [sic] by taking a paper test in the classroom at a glance after receiving the test paper, but during the online test, it was difficult to distribute the time [sic] because it was a system that went to another page when I pressed the button. So I was more nervous and had a hard time concentrating.”(Canon)

Second, regarding the content used for online learning, the sudden transition to online learning has led professors to use previously unupgraded materials/content since they were unable to prepare suitable materials for online learning in advance. As a

result, students expressed regret that they did not have the latest information and insights. In addition, if students had to carry out their team project online, they felt difficulty in scheduling time appointments because they had to discuss and meet with their group members online as well as because of external factors that required them to take care of their Internet environment.

“Then I think the content should be the same, but if the teacher reopens the class, the teacher will definitely have some new understanding and insights after so many years (...). Yes, one is the issue of updating. Maybe the teaching content did not say anything particularly new, and it seems to be similar.” (Habor)

These phenomena in the initial learning experience process influenced the occurrence and pattern of the central phenomenon, and this perception was found to gradually change as the learning process progressed.

4.2. Contextual conditions

Contextual conditions were “the particular set of conditions within which the action/interactional strategies are taken” in relation to managing the core phenomenon (Corbin and Strauss, 1990). Unlike causal conditions that can produce an effect, contextual conditions are those that influence the production of an effect (Abowd et al., 1999). The contextual conditions of the online learning experience included “Learning resource problems,” “Risks of personal life exposure,” “Limitations of communication,” “Limitations of operation (in the learning system),” and “Unsystematic university online learning management,” which means those factors could influence the central phenomenon experienced during the online learning process.

4.2.1. Learning resource problems

Online learning is defined as instruction delivered on a digital device to support learning (Clark and Mayer, 2016), which means that there was a high demand for good-quality digital devices when the massive shift to online learning happened. In addition, when students were attempting to complete and submit their assignments online, they had to depend highly on digital products and software.

“In the past, I could just draw a picture on paper and submit, but now it’s cumbersome because I have to draw it on the paper and scan it again, and upload it to my computer.” (Emma)

When professors and students were talking online, communication costs increased because they both needed to use extra words to describe problems. In addition, due to some monitor problems, such as polarized and small-sized words, sometimes students could not obtain a comfortable learning experience. As online learning creates a high demand for digital devices, if there were many problems with those devices, students would recognize them as obstacles in those online learning activities.

The problem when students submitted their assignments online was that they always had more editions than when they had just one paper material. Students were normally not sure which assignment

was the final, useful, and meaningful edition. It wasted more time to repeat work for students.

“You have different equipment and different tools to learn, but if you want to store your homework in different tools, then you think you might need to use other software.” (Jasmin)

Sometimes, regardless of whether they were professors or students, they may have a low-quality digital device, which may influence their smooth teaching and learning work. Online learning, especially, has a high requirement for networks and digital devices to ensure a high-quality online course.

4.2.2. Risks of personal life exposure

Because online learning sometimes has risks of personal life exposure, some participants felt the need to do extra work to clean up their private space and avoid embarrassing themselves. However, some students just turned off their cameras directly in this situation. When not turning on cameras, immediate, active communication was difficult, decreasing the possibility of spontaneous interactions and maybe influencing students’ study efficiency.

“If you have to turn your camera on, you also have to kind of invite your classmates into your home because they can see your room. And I’m tidying up a little bit beforehand.” (Anne)

4.2.3. Limitations of communication

Almost every participant mentioned the communication problem, and most of the experience was negative. The communication problems interviewees mentioned included “Limitations of non-verbal expression,” “Limitations of online learning discussion,” “Dissatisfaction with less interaction,” and “Limitations of immediate communication.”

First, during some online courses, lecturers presented their materials through the screen, which meant that students could only hear the lecturer’s voice rather than watch the lecturer’s emotions. There was no eye contact or body language between students and lecturers. Sometimes it was more difficult for students to have a good understanding of knowledge during online courses.

Second, online discussion activities have become less easy than offline courses. Firstly, in online courses, it was easier for participants to misunderstand each other. Furthermore, after online courses, it was not convenient for students to discuss assignments.

Third, when students and lecturers were making presentations online, they always received fewer responses from others, which meant that speakers had little motivation for studying. In addition, some majors, such as languages, needed more communication to practice and obtain knowledge.

“There were the 20 students in that course. But only professor [sic] and maybe five students turned on their camera, and another 10 or 15 students were closed [sic], turned off their camera, so I feel very lonely. Or I feel such kind of talk to the wall, not the person [sic].” (Canon)

Finally, different from the previous offline courses in a real classroom, to keep the continuity of online courses, the participants normally preferred not to ask questions, and this cut down the lecturer's teaching flow. Furthermore, some students refused to ask expanded questions related to their courses because they felt that communication in an online course was more difficult than before.

All kinds of communication problems have appeared during online learning in the pre-Covid pandemic period, and the frequency of communication and immediate communication has decreased. Students felt that gaining a better understanding of knowledge was more difficult. The communication problems were also an important point, indicating that participants were not satisfied with their current online learning. As there were fewer interactions in an online course, there was a shortage of the emotional exchanges that individuals need.

4.2.4. Limitations of operation (in the learning system)

Most universities have their own online learning system to help students with online learning, such as obtaining online learning materials. One problem with this was that those materials were not always valid, and some of them would become invalid after several days. Another irreplaceable aspect of offline learning was that online learning can only provide less practical or experimental activities. Some natural science majors, especially those who depend on doing real experiments, had quite negative feelings about this.

"The big influence on me is my experiment course, most of them have been cancelled. There is no practical activity, then I will have not my own things [sic]." (Ford)

4.2.5. Unsystematic university online learning management

As the whole of the online learning activities at the university depends on the online learning system, its management became more important. Sometimes, when students had questions or were curious about some functions, they could not obtain a timely response. This online learning management system sometimes caused a lot of problems for users.

"...and the departments in charge of technology in the school became very busy. If I have a problem with my digital problem and I ask them, the answer will not come immediately." (David)

4.3. Central phenomenon

The central phenomenon is an answer to the question, "What is the main phenomenon of the online learning process to university students?" It refers to a central event or central thought that is regulated, complemented, or resolved by an action/interaction strategy (Strauss and Corbin, 1998). The central phenomena of the online learning experience in this study were "Students' distrust of online learning," "Neglected learning attitude toward online learning," "Loss of belonging due to lack of emotional exchange,"

"Recognition of unexpected obstacles to online learning operation," and "Task-oriented communication."

4.3.1. Students' distrust of online learning

Regarding students' experience with online learning, they raised questions concerning the online learning curriculum and the improvement of their own learning and abilities. Students were tempted by various factors that degraded their learning in online classes, such as using a translator or exploring the Internet, and at the same time, they doubted that their ability and knowledge through classes would improve.

"Sometimes I use the Google Translate, because the teacher don't know about whether I use Google Translate or not [sic]. So sometimes I have doubt about whether those students are really improving their ability, or really improve their knowledge regarding that course. So we can use some trick during the course [sic]." (Audrey)

Furthermore, students questioned the curriculum and method presented by professors regarding whether it was possible to achieve learning goals and implement the curriculum through online learning. In particular, the students pointed out the limitations of online learning, such as group projects and practical experiments, which were limited to proceeding through online classes.

4.3.2. Neglected learning attitude toward online learning

As online learning progressed, students felt that lecturers/professors no longer showed as much enthusiasm for their classes as before. This indicates that their first impressions of online learning persisted under the previous causal conditions, but in this central phenomenon, it was found that the contextual condition "Limitation of operation in online learning" had a lot of influence on it. First of all, in relation to changes in the attitudes of lecturers, unlike offline classes, they shortened their class hours and provided fewer interactions, such as giving comments on students' assignments or having conversations with students before and after class. As online learning requires more strict class hours than offline classes, lecturers did not spend a lot of time interacting with students to achieve their day's learning goals.

Additionally, as students thought that the professors did not pay much attention to them during class, they hid their voices. In particular, when doing assignments, unlike the assignments in offline classes that are submitted by hand, as the method of submitting assignments was also changed in online learning, they completed an assignment by simply copying and pasting materials on the Internet without effort.

"Regarding assignments(...). I think I use more internet information when doing assignments. For offline assignments, I immediately wrote my thoughts with a pencil, but since all online assignments have to be written in Word format, I think I found and used a lot of online materials than I thought(...)"

but while doing an online assignment, I searched for online materials and made a little correction while copying and pasting them.” (Emma)

4.3.3. Loss of belonging due to lack of emotional exchange

Among the central phenomena, the majority of participants commonly experienced a lack of emotional exchanges as well as external factors that hindered the class. In particular, the lack of emotional exchanges meant a decrease in students’ interactions in class. The main difference between online learning and offline learning is that students can choose whether to show themselves in class. This includes not only physically revealing themselves through cameras but also revealing their existence through interactions such as presentations. Therefore, this resulted in a lack of emotional communication and the formation of peer relations between lecturers and students and between students. As a result of this, they were obviously losing their enthusiasm and concentration for the class, and they also showed a loss of the invisible sense of belonging formed through the class.

“If you are in an online course, you may have more communication with your classmates and professor by seeing eyes [sic]. If it is an offline course, we can continue to discuss it after class. And just like making friends online, you must have a final face-to-face process, and then if you just stay online forever, you and your classmates will definitely not develop a deeper relationship. That’s why I don’t feel a sense of emotional belonging to this class.” (Olivia)

4.3.4. Recognition of unexpected obstacles to online learning operation

Similarly, another of the biggest online learning experiences was the recognition of unexpected external disturbances. This means an external interference that has never been considered in offline learning, such as the failure/disability of the Internet connection. In online learning, where a smooth Internet environment is a prerequisite, it was difficult to immerse oneself in learning due to errors caused by different Internet environments between students and professors. As a result, it was difficult for them to keep up with the flow of learning, and the network environment had a significant impact on performance, especially as group activities such as discussions had to be carried out quickly in a relatively short time.

In addition to the external problems in conducting online learning, students not only felt the burden of preparation for classes as an internal problem and the limitations of the quality of classes but also had to devote their own time to software manipulation so that they could proceed with online learning.

“Every time I took a class, I experienced the functional limitations of online learning. Offline classes just require me to sit in the classroom, but online classes require a lot of adjustment and preparation. And I need to manage the environment so that I can continue to participate during class. For example,

finding a place where the Internet is smooth, checking whether the microphone or leaf up phone [sic] is working well, or needing to fully charge the battery of the computer or device.” (Vanessa).

Interestingly, these external obstacles to online learning increased their concentration and tension. Unlike offline learning, students were more nervous about preparing for problems such as sudden questions from professors or technical problems. In addition, students said that they were reluctant to make a presentation easily because of the function of online learning software that allows the speaker’s face to enlarge in the center when someone speaks. They expressed more pressure from the gaze and concentration of the unknown in a computer than from the gaze of others surrounding them in a physical space.

“But when I talk in front of the camera, I don’t know how the sound sounds to other people, so I was curious about it. Sometimes when people were presenting on Zoom, the presenter doesn’t know whether other people can hear their sound. They don’t know their voice is turned off.” (Jason)

Through this central phenomenon, students developed their own various action/interaction strategies based on the experience of intervening conditions.

4.3.5. Task-oriented communication

Due to online learning, the communication platform between lecturers and students has shifted to emails because it is too difficult to communicate face-to-face anymore. Compared with offline communication, online communication through email has become an untimely communication. Students felt that it always took a long time to wait for answers from their professors. In addition, because the communication cost increased, some students preferred to ask questions only when they did not understand points rather than discuss some extended questions with professors. As a result, they had difficulty expanding and forming relationships through emotional exchanges because they did not have enough emotional interaction between lecturers and students and students through classes. This left students with only essential, task-oriented communication with lecturers and classmates.

“In the past, I had classes in a relaxed state, talking to professors and friends about various things. However, since it is no longer difficult in online classes, I ask the professor only questions about assignments and exams. However, this is also inconvenient because there is no immediate answer.” (Kevin)

4.4. Intervening conditions

Intervening conditions are “the structural conditions bearing on action/interactional strategies that pertain to a phenomenon and facilitate or constrain the strategies taken within a specific context” (Corbin and Strauss, 1990). Here, the intervening conditions related to the online learning experience in this study mainly included “Gaps in lecturers’ digital literacy,” “Efficacy of online presentation,” “Flexible implementation of learning,” “Liberation of

external circumstances,” and “A learning environment that requires high self-control.”

4.4.1. Gaps in lecturers' digital literacy

Based on our interviews, from the students' perspective, there was an obvious trend, which was that younger lecturers normally had better digital literacy than elder ones. Regardless of whether they were young professors or students, they both tended to show better digital literacy and digital skills. Some students' digital literacy has even increased through this online learning period. Compared with some (older) lecturers, when facing the problem of high demand for using digital literacy during online learning, younger lecturers preferred to have a positive attitude toward using digital devices.

“I have one of my German courses, the teacher, she was an old lady. But she is not used to using Zoom, so she had always had a problem to do something throughout Zoom. So she always asked us, is there anyone who knows to use [sic].” (Yujin)

4.4.2. Efficacy of online presentation

As the online course progressed, some students mentioned that they felt less pressure when they were making online presentations. They felt that they stayed in a familiar environment and had less direct focus from other individuals. Furthermore, sitting in front of the camera, they could make notes privately to improve their speaking fluency. Moreover, with less nervousness, the presenter may share opinions with others more quickly.

“For me it was better to be able to proceed quickly because it proceeded on the online so we can share our opinion quickly. And when I'm presenting, I'm definitely less nervous than offline.” (Emma)

4.4.3. Flexible implementation of learning

Some students mentioned that, during the online learning period, their commute time to the real classroom has been saved; thus, they could make use of their learning time more efficiently. In addition, compared with offline learning, their buffer time, which was a transition from a leisure to a learning state, had also been shortened. Individuals described their feeling that more time has been saved, which could improve their learning efficiency and provide a better learning environment for them.

There is a big difference between online and offline learning, that is, online learning is more flexible. If students take part in a prerecorded course, they can learn regardless of time and space. They can control the learning flow by themselves, stopping and repeating at any place where they do not understand very well. Students were also able to preview and review after courses since the courses could be repeatedly played and lecturers' notes could be seen online, which could lead to a high level of knowledge absorption.

“The best thing about online learning is that I can control my learning. If you don't understand something, you can review it by watching the video again. Also, I can download and study the professor's materials again at any time, so I don't have to prepare a lot myself.” (Nelly)

If some practical activities could not be achieved in reality, students may observe them online with higher quality. They could watch some exhibitions more clearly through video recordings. Students were also free to search for online resources from the Internet as supplementary learning to support their formal education in the university.

4.4.4. Liberation of external circumstances

Because online learning requires no fixed location, students could choose a quiet learning environment by themselves. There were fewer external distractions during learning time, and no noisy sounds from other classmates, compared with offline courses. Even though they had less communication with other participants, they could enable privacy by turning off the cameras in order to escape others' eyes. In addition, they were able to maintain both their health and learning process because it allowed them to continue learning while blocking external contact in a health-concerned situation such as COVID-19.

“I was afraid and reluctant to go outside because of the corona. I don't like to go to places where many people gather. But thanks to online learning, I can study safely in my room. And the good thing is that I didn't have to turn on the camera, so I even left the lecture on while I was doing other things.” (Queenie)

4.4.5. A learning environment that requires high self-control

The online learning circumstances for students were different from previous offline learning. Students focused on themselves only when facing a computer. Some students mentioned that it was difficult to concentrate during the whole online course period and easy to zone out. During the online course period, there was less interference from other students' questions to disturb the lecturers' teaching flow, and as a result, the lecturers kept teaching without a rest, and students felt very stressed at having to catch up with the learning flow. Because online learning has more freedom than offline learning, students felt that they needed more self-control to better focus on online courses and improve their learning efficiency.

“It does not have any relaxation time, the teacher keeps talking.” (George)

“The most important feeling is that I think it is necessary to have self-control ability, and then you need to really fix the time, arrange the timetable [sic].” (Habor)

Some students said that at the beginning of the massive shift to online learning at their university, they were relieved because they

had switched to a safe learning situation. Because of the COVID-19 pandemic, students were afraid of face-to-face learning, and online learning reduced their fear to some extent.

“When the first time I attended online course, I felt a little autism and too much pressure [sic].” (Tom)

Under those intervening conditions regarding online learning, students had a new recognition of it. Currently, most students of the younger generation normally have confidence in using digital devices to take part in an online learning course because they have basic competence in digital literacy. At the same time, they also prefer to make use of high-quality online resources to support their formal learning at the university. Without some external interference, they can study in more comfortable learning circumstances.

4.5. Action/interaction strategy

An action/interaction strategy refers to a strategy aimed at coping with or coordinating a central phenomenon as a response to the subject (Strauss and Corbin, 1998). This is influenced by prior intervention conditions, and the action/interaction strategies for university students' online learning experiences in this study were “Discovering the students' preferences for their learning styles,” “Active development of various learning strategies for lecturers and students to form a new learning cycle,” “Making an online learning community,” and “Seeking utilization of various online media.”

4.5.1. Discovering the students' preferences for their learning styles

To regulate and improve the preceding central phenomenon, students formed their own strategies of action/interaction in their learning process. In particular, they formed their own learning preferences. As an intervening condition, they realized the usefulness of online learning based on their experience with its flexibility and created their own way of learning for adaptation and application to it. In this process, they mediated and controlled the central phenomenon through learning styles and methods, such as selecting preferred learning-style professors based on previous online learning experiences and choosing classes based on interests, needs, or types of activities conducted online. However, while most students took advantage of this flexible practice of online learning, some students who failed to assimilate, adapt, and apply properly to online learning had a stronger attitude toward a preference of previous offline learning methods.

“After experiencing online classes a few times, I found a preferred class style. While there are professors who spend a lot of discussion time even though it's online learning, I prefer classes that give me time to continue discussing with my friends rather than just looking at things.” (Doni)

4.5.2. Active development of various learning strategies for lecturers and students to form a new learning cycle

As another strategy of action/interaction, the lecturers formed their own online teaching strategy. They attempted to overcome sudden or gradual changes from offline classes to online classes through various methods and attempts. In particular, based on their experiences of failures in some online learning, they guided students on how to cope with situations where errors occurred in advance of when classes began, and they also made a manual for error situations. Similarly, students also made a lot of effort to find a balance in the life cycle that had collapsed while experiencing the ongoing online semester. For example, they developed their own strategies on how to flexibly create time schedules for online learning or how to overcome boredom in places that required students to stay inside.

“But since the last semester and this semester have seemed to settle down relatively. So I got the feeling that professor made some kind of manual themselves. For example, in the first class, I had an orientation class. At that time, the professors said, ‘there may be an unexpected situation during class. In that case, you can go to ~~ tab here. And if Zoom doesn't work, just press this ~~ button.’ They gave us guidance in advance.” (Luna)

4.5.3. Making an online learning community

Finally, students formed their own online learning community, recognizing that online learning was possible in any space where the Internet can be used, regardless of the place and time. This is also related to the emancipation from the external environment in the abovementioned intervening conditions. In particular, open discussions were conducted through online learning that could take place regardless of the surrounding situation, and even if there was no lecturer, students exchanged feedback and had active virtual discussions. Online classes allowed them to leave their opinions and data on the network; thus, they shared and explored each other's data and developed each other's opinions and learning processes.

“But what was interesting here is that when I do assignments, I upload them to the bulletin board. Then, the other students in the class look at the assignment and rate or give me the score, how this assignment was. But in the comment, they usually gave me this kind of detailed comment. So we discussed really actively inside the virtual debate.” (Kimmy)

4.5.4. Seeking utilization of various online media

Participants began to form their own learning strategies using various online media to create their own appropriate online learning rhythm through previous trial and error experiences. In particular, as Generation Z could make good use of the fast-growing new learning aid applications and the formation of virtual discourses, they made good use of online media suitable for their own style of online learning. Representatively, they sought to try various applications for online learning, use a wide range of devices, or use online conveniences such as learning/education sites. It was

found that each individual's learning style was being recreated in an online format through their narratives.

“As online learning increases, I am using an application to organize or record what I have learned. Among several applications recommended by friends, I chose the one that was most suitable for me. And as I switched to online learning this time, I bought a tab instead of a laptop. It has the ability to take notes directly on class materials and save, share, and record them, which is very useful.” (Olivia)

Through these various action/interaction strategies for each student, they actively participated in and focused more on online learning than before, and through virtual communication and sharing with other people, they derived their own inner motivation for their own learning. Afterward, through these processes, they reached the final process of the learning experience.

4.6. Consequences

The result of the online learning process can be said to be the final phenomenon adjusted by coping with or adapting to the central phenomenon through various action/interaction strategies for the problem that occurred as the previous central phenomenon (Strauss and Corbin, 1998). The results of the online learning experience formed through the previous processes in this study were “Positive recognition of the efficiency of online learning,” “Raising awareness about the appropriate allocation of learning resources for access to online learning,” and “Improvement of self-learning ability.”

4.6.1. Positive recognition of the efficiency of online learning

Students had recreated their perception of online learning through past online learning experiences. They initially had a negative first impression of online learning due to the sudden change and a confused learning environment as a causal condition. As a result, the central phenomenon showed doubts and distrust about various aspects of online learning, but as their experience grew, they became aware of the positive functions and aspects of online learning. As a result, students became reaware of the new ecological and methodological aspects of online learning. In particular, in the case of the emergency caused by COVID-19, as in the present, online learning has taken on a very big role and become an essential method for the continuation of learning. Therefore, they expressed a sense of relief in the learning situation due to the transition to the online format. In addition, they expressed an expectation that online learning will become a more universalized learning method than offline learning in the future.

“Even though I live in Germany, I can participate in Korean lecturers with Zoom in this way, I think that a wide variety of online learning opportunities have been opened. So, in that respect, the ecology of the current learning has changed a lot, so I think it is a very welcome change.” (Aaron)

In addition, as the importance of spontaneous learning for the self-development and self-realization of students was increasingly emphasized and enforced, the net function of online learning had been realized as a means of voluntary learning. At the same time, however, they were also concerned about inequalities in access to learning resources for online learning. This was because online learning in countries such as developing nations desperately needs more infrastructure to approach online learning.

“But I think that inequality about online access should be a big head in the future [sic]. There are certainly people with infrastructure that do not have access to online learning platforms. In that case, I think it is necessary to build a more systematic infrastructure because the un-equality in accessing such learning opportunities is more sharply divided.” (Bob)

4.6.2. Raising awareness about the appropriate allocation of learning resources for access to online learning

Through the trial and error of online learning over the past year, students had come to realize what is required of online learning and what is important for learning preparation. For many of the participants, the most basic prerequisite for the success of online learning is access to the learning field, which meant the preparation of the overall online learning environment. However, the majority of participants said that the amount of time spent on online learning depended a lot on what kind of up-to-date devices, Internet systems, circumstances, and online supplementary learning tools and materials they had to access during online learning. At the same time, as the importance of voluntary learning for online learning self-development and self-realization was increasingly emphasized and implemented, the net function of online learning was being realized as a means of voluntary learning. In this phenomenon, participants were also concerned about the inequality of access to learning resources for online learning.

“But I think inequality in online access should be a big issue in the future. There are certainly people with infrastructure that do not have access to online learning platforms. In that case, I think we need to build a more systematic infrastructure because the inequality in access to such learning opportunities is more sharply divided.” (Ursel)

4.6.3. Improvement of self-learning ability

The second result was “Improvement of self-learning ability.” As students' voluntary efforts and self-direction were more demanding than offline learning, they experienced a lot of trial and error in their online learning experiences. However, they created their own learning flow using their own various action/interaction strategies. As a result of this, they had an improvement in self-learning abilities. In particular, as they realized that online learning was more effective than offline learning in terms of immersion and concentration, they began to plan and carry out their own learning efficiently.

“Then, I feel like I’ve come to a stage where I realize my laziness and manage online classes well. As I went through such a process, I came up with a thought to myself ‘I have to do this way in order to follow the online class well [sic].’ So I make a schedule to have the same life cycle as the last offline classes and try to participate faithfully in online learning. It’s kind of my strategy.” (Bianca)

Thus, naturally, they also improved their self-autonomy ability for the learning required under previous intervening conditions. Therefore, based on various experiences and trial and error, students learned various processes to adapt, utilize, and apply online learning and experienced positive changes in learning habits with confidence in recognizing problems and finding solutions themselves. Therefore, it was shown to the students that the discovery of online learning had led to the recognition of improvements in their reflective and meta-cognitive abilities through previous learning experiences.

5. Discussion

This study looked at the experience of online learning in higher education from a narrative perspective. Through semi-structured interviews with 25 university students in a region in Germany, the process of their online learning experience was examined through grounded theory. Through a series of semi-structured, in-depth interviews with university students, a paradigm model was created that depicted the conditions that framed the learning experience process in higher education.

With the advent of a knowledge and information society as a background for raising the problem of research, it has become natural that learning is essential for humans and that it should be continued even in unexpected international crises such as COVID-19. In addition, online learning content that students can participate in anytime and anywhere, has gradually become more diverse, and the capacity for digital literacy has also increased as the generation of students has changed. From this point of view, social interest in the qualitative excellence of learning is increasing along with the quantitative growth of their generational competencies and changing online learning from the perspective of current higher education’s main learners, Generation Z students. Therefore, in this study, to find out what the nature of the learning experienced by university students was, the learning process was shown through in-depth interviews to vividly listen to the experiences of the students. As a result of the analysis, the meaning of online learning for Generation Z students can be broadly expressed in four ways.

First, students showed negative impressions of unfamiliar learning by being wary of approaching online learning. In the learning environment that had been transformed due to the COVID-19 crisis, all students started online learning with preconceived stereotypes collected through formal and informal experiences in virtual environments. In particular, due to COVID-19, the environment for online learning was further expanded. Thus, with the question “how can the role of the school, where everyone gathered in one space and took classes, be identified now?”, unlike on-campus education,

they expressed complex feelings toward online learning in a situation where individual efforts and digital literacy in individual spaces required prerequisites for learning. Not only the first impressions of online learning but also the ambiguous expectations of lecturers as students progressed in their learning placed a great burden on them. For example, when online students who had no experience or ability to manage their own learning without the control of the professor were suddenly given full self-control over their learning, they also found it difficult to manage time and assignments. Therefore, in this process, online learning should be conducted through hands-on experiences with a sense of ownership so that it can become a more learner-centered class rather than simply a non-face-to-face learning method through online media. According to Branford and his colleagues (1999), learner-centered learning also includes awareness of the unique cognitive structures and understandings that students bring to their learning context. Therefore, lecturers should strive to understand students’ preexisting knowledge, including any misconceptions that students start with in their construction of new knowledge. The learning environment should also respect and accommodate certain cultural attributes, especially the language or particular forms of expression used by students to interpret and build knowledge. As such, student-centered activities use diagnostic tools and activities extensively to demonstrate these preexisting knowledge structures to both lecturers and students (Anderson, 2004).

Second, through online learning during the COVID-19 period, students had the opportunity to improve self-management abilities and gain a wider understanding of self-discipline. Since online learning does not allow the lecturer to directly check or supervise the students in the same space, the students themselves are required to learn autonomously. Therefore, through online learning, students experienced the formation of a knowledge structure that supported their own discourse and disciplinary thinking. Thus, this also included an opportunity to reflect on their thoughts. This was the “cognition about cognition” from the perspective of Flavell’s (1976) meta-cognitive theory, that is, the student had new cognition and evaluations of the student’s own perception of his or her own learning. There are meta-cognitive types of knowledge, including content knowledge, task knowledge, and strategic knowledge. In particular, content knowledge (declarative knowledge) is understanding one’s own capabilities, such as a student evaluating their own knowledge of a subject in a class. Studies have shown that students often mistake a lack of effort with understanding in evaluating themselves and their overall knowledge of subject concept. In addition, greater confidence in having performed well was associated with less accurate meta-cognitive judgment of the performance in online learning. In this regard, unlike offline learning, students undergo more trial and error, which enlightens them on their own. In the process, they gain more content knowledge, and they set up a strategy to solve and overcome this problem. Therefore, Anderson (2004) argued that this autonomy is a useful and necessary skill for professional thinking, but without reflective ability, it greatly limited the student’s ability to transfer their knowledge to an unfamiliar context or to develop new knowledge structures. In this respect, lecturers should provide an expanded opportunity for

students to immerse themselves in various resources of knowledge about their own needs and provide a way for them to find their own path around the knowledge of the discipline. The provision of these resources can be overwhelming, but experienced lecturers should provide the “big picture” in which students can discover and develop themselves further, focusing on their interests. This is not just a change of teaching method, but also in their evaluation method rather than the previous traditional assessment method, and also encourages students as a way to motivate themselves and evaluate their own learning reflectively. Therefore, it will be a new task for lecturers to understand what is most usefully evaluated, not how to most easily evaluate students’ abilities.

The third discovery of learning experiences was the “Formation of virtual community and individualized learning through online interaction.” What students have in common with the online learning experience is the lack of face-to-face interaction and communication opportunities. In online learning, opportunities for immediate student–student and lecturer–student interactions may be reduced or deprived due to the limitation of physical space. Generation Z students, in particular, are accustomed to prompt international interaction *via* social media and online platforms. Therefore, they prefer the method of user-generated content (UGC), which enables immediate communication, and this interactive teaching method tailored to their generational learning characteristics can provide an opportunity to increase their learning desire and participation (Tejedor et al., 2020). Furthermore, the importance of the interaction here may not only trigger the starting point of their learning but also further provide answers to the question of how it would be desirable to interact with others and the world as students grow up as individuals. Even in today’s open education, learner-centered education in a true sense is to understand what is needed through interaction in a continuous learning environment and to realistically achieve the relationship between their own needs and realization “in relation to others” (Lee, 2000). Therefore, only acquiring given knowledge from the outside has limitations in applying it to complex and pluralistic situations, solving problems, and considering one’s response to another expression for review in situations where one must have the ability to critically examine various stimuli and link them to understanding within oneself.

In this sense, what we need to explore as an educational type suitable for the present may be the meaning of individualized learning. Here, individualized learning is not learning that simply values individual differences of students from the perspective of traditional education, but means that all students are regarded as being requested to grow into individuals with one personality. In this regard, Habermas (1990) argued that the growth of an individual or personality is possible when the reciprocity revealed in communication with others is developed and refined so that one’s own viewpoint and the viewpoint of others can be exchanged without being deceived. In other words, communication with others is essential to the process of individualization. In particular, Generation Z learns various knowledge and information while connecting globally through online platforms; however, unlike on-campus classes, the environment of online learning, in which one

is less compelled to reveal and communicate with oneself, clearly expresses not only the limitations of the physical environment but also the mental habits that make it difficult for students to express their opinions. However, after overcoming this process, students expressed their own various thoughts by agreeing or disagreeing with each other’s expressions in a virtual space and elaborating their own way of expression. Through this process, they have made a transparent learning relationship with other students that cannot be seen or known to each other into an invisible virtual net. Therefore, in this respect, we will need educational intervention from lecturers to encourage the process. In addition, through such interventions, the students pay attention to each other’s reactions to develop the senses and perceptions that exist between one another. However, in this process, if students became accustomed to expressing themselves in one direction online, they will be powerless to understand and imagine the perceptions and receptivity others will have.

Finally, through online learning, students recognized “the difference in digital literacy according to the generation gap.” First, digital literacy is the ability to search, organize, and use digital information. It can be said that it is a personal competency related to the overall use of the information required in a knowledge and information society, and is a survival skill in the digital age (Eshet, 2004). Therefore, digital literacy, the largest capital in the digital society, is an essential element for improving quality of life regardless of age and generation (Jung, 2018). Students evaluated not only their own competencies for digital literacy, which is an essential element for online learning but also the recognition and evaluation of the digital literacy of lecturers of various generations. In particular, they experienced that, in online learning, where various unexpected situations occur and abundant digital skills are required, the quality of learning is different according to the competency of the lecturer (American Library Association, 2013). However, as the current education emphasizes the growth of students’ digital literacy, there is still insufficient education and information provided to lecturers. In light of the current changes, digital literacy is an element that all lecturers must have in order to conduct classes efficiently and develop themselves. In particular, in terms of lecturers, the differences in their digital literacy also shows a large scale of difference according to a diverse spectrum, from the young professors to the old who are about to retire. Basically, the digital literacy of the older professors was just the use of digital technology, the operation of basic online learning, and the level of data provision, while that of the younger lecturers was not only the operation of online learning but also reprocessing and reproducing digital learning material or information and using digital devices to interact in various ways. To promote digital literacy, both students and professors need to experience interactive teaching–learning communication and systems or technologies to enhance this need to be introduced. Since there is in academia only the system of the school and the capabilities of the lecturer to rely on, it is necessary to actively utilize the education system, system improvement, and network sharing of society and companies, and to establish a platform for interaction. Now, the lecturer must become a multi-trainer and be able to respond sufficiently to the needs of students. To improve the digital literacy of the lecturer, continuous interest, and investment,

the lecturer's own efforts and the capacity-building education to support them are necessary.

6. Conclusion

Living in a non-face-to-face era, we are experiencing innovation in all aspects of our lives, including in society, economy, culture, and education, and creating new trends. In the midst of this, a new wave of innovation is also taking place in pedagogy. Therefore, this study directly confirms the perspectives of higher education students' learning experiences rather than the researchers' perspective and provides implications in this dynamically changed social crisis online education field. However, this study has a limitation, in that it only targeted university students to find intrinsic implications for online learning experiences in higher education. At a time when the demand and market for online learning are expanding endlessly not only due to the COVID-19 situation but also to various social requests, future studies need to study more diverse groups of learners or lifelong educational institutions to see what other online learning experiences appear.

Data availability statement

The datasets presented in this article are not readily available because, in order to protect the interviewees' privacy, the interview data will not be shared in public. Requests to access the datasets should be directed at: JH, huang.junjun@icloud.com.

Ethics statement

Ethical review and approval was not required for the study on human participants in accordance with

the local legislation and institutional requirements. The patients/participants provided their written informed consent to participate in this study. Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.

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Conflict of interest

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

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