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The Voices of College Students in Learning Math Online, During the Covid Pandemic: The Hurdles, Upper Hands, and Takeaways

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Abstract: This descriptive phenomenological study looks into the lived experiences of teacher education college students on what it is like to learn math online during the COVID-19 pandemic. Due to the pandemic, online math learning may pose even more significant challenges. Hence, the researchers conducted the study to better understand and support the students in these challenging times. They interviewed 16 college student participants, who consented to participate in the study, to share their actual experiences - the challenges, struggles, and opportunities - in learning math online during the pandemic. The interview transcripts were analyzed following Colaizzi's method. Results revealed the following themes: (a) The hurdles: poor internet connection, unconducive learning space, difficulty in understanding the topics, financial problems, and health problems; (b) The upper hands: ease of access to varied resources, staying at home, and flexibility of the teaching and learning process; (c) The key takeaways: improved time management, self-discipline, resourcefulness, and growth mindset. The researchers recommend that the management of educational institutions consider the students' demographic data, financial level, available resources, and mental and emotional health while designing and implementing online programs. Further, future research may be conducted on the teachers' concerns that may influence students' online learning experiences with Math and other disciplines.

Keywords: *Lived experiences, mathematics online learning, pandemic, phenomenology.*

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Introduction

As the Covid-19 pandemic put the entire globe at a standstill, most schools abruptly shifted to online learning modalities and modular learning (Ignacio, 2021; Tria, 2020). The sudden closure of schools, lack of necessary equipment or materials to engage actively in courses, inability to access online materials from the comfort of home, and being stuck at home for a long time have psychologically impacted students and their families (Apriyanti, 2020). Although professors and educators were constantly working hard to improve their instruction in online classes, most students still preferred face-to-face classes, interacting in a class setting with an instructor and classmates (Almarashdi & Jarrah, 2021). Another consideration is the insufficient technology infrastructure available in many educational institutions.

While several studies have focused on the perceptions of faculty and administrators, little research has been conducted on students' perspectives on the quality of online learning, specifically in mathematics. The literature review highlights various studies conducted on the experiences of students learning math online during the COVID-19 pandemic. The qualitative study using content analysis conducted by Rotas and Cahapay (2020) discovered university students' challenges during remote learning, such as unstable internet connectivity, inadequate learning resources, vague learning content, overloaded lesson activities, limited teacher scaffolds, and poor peer communication. At the same time, Apriyanti (2020) compared math learning outcomes among Senior High school students in Indonesia during the COVID-19 pandemic- before and after online learning through a quantitative case study. Results yielded that students learning outcomes and positive responses to math were higher before the COVID-19 pandemic than after the online math learning modality. On the other hand, Radmehr and Goodchild (2022) conducted a case study that examined the experiences of mathematics lecturers and students in higher education during the pandemic. The study revealed that students felt socially isolated, missed their friends and classmates, lacked the structure of attending university and following a daily

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schedule, missed having physical teachers to ask questions, and missed live presentations of math concepts by lecturers. They also reported a lack of motivation to seek help, complete assignments, take responsibility for their learning, and have difficulty adapting to online learning. Almarashdi and Jarrah (2021) conducted quantitative-descriptive research that revealed high school students' fatigue with online learning due to excessive screen time and a desire for interaction with teachers and classmates. Students in their study rejected distance learning for the future, particularly for mathematics, and faced more challenges with learning math online than other subjects. Mamolo (2022) conducted a quasi-experimental study in the Philippines, which demonstrated a significant decrease in students' math motivation and self-efficacy during a six-week pilot test of synchronous online learning. The study also identified slow and unstable internet connections, low motivation for self-study, numerous home activities, and household chores as the main reasons for students' difficulties in learning math. Calder et al. (2021) conducted a case study that revealed initial frustrations with online learning due to personal circumstances, such as having children at home and a lack of interaction with classmates to clarify and discuss their thoughts.

Mukuka et al. (2021) also conducted a descriptive study indicating that most students lacked sufficient access to Information and Communication Technologies (ICT), electricity, and internet services. Most students believed math is best learned through face-to-face interactions between teachers and students. Kansime and Batiibwe (2023) conducted a mixed-method study that found strong Wi-Fi connections to be the most significant predictor of adaptation to online learning. The study also revealed that a lack of technological knowledge hindered the learners' effective participation in online math lectures. Finally, Timario and Lomibao (2023) utilized focus group discussions and thematic analysis to study students' experiences in taking math courses online. Their study identified themes such as creative approaches to learning math in flexible learning modes, utilization of educational technologies, recognition of teachers' efforts, self-motivation and engagement in math learning, and peer collaboration in completing math tasks. Barrot et al. (2021) cited several factors, including noise, sitting, lighting, and even the color and size of the room, which might alter one's ability to learn online.

So far, little qualitative research has been conducted about college education students' personal experiences in learning math online. The descriptive phenomenological studies using Colaizzi's data analysis method are missing in the literature. Colaizzi's method of data analysis is considered rigorous and robust, ensuring its results' credibility and reliability (Wirihana et al., 2018). This gave impetus to the researchers, who are, at the same time, college math instructors and professors, to address this knowledge gap by embarking on the present study - a descriptive phenomenology using Colaizzi's data analysis method.

Math is generally considered a complex subject (Gafoor & Kurukkan, 2015), by many students, even during face-to-face learning, due to its hierarchical nature, which requires mastery of some prerequisite skills to be able to tackle the more abstract and higher concepts (Samuel, 2012). The researchers deemed it very important to gain a deeper understanding of the challenges and difficulties the college education students faced to offer helpful solutions and recommendations to support them better. Unless they have a good grasp of the students' experiences, challenges, and difficulties, they cannot offer appropriate recommendations - in terms of policies and best practices - to the school administration and other stakeholders to better support the students to survive, thrive, and flourish in future crises such as the COVID-19 pandemic, especially in providing them with a comprehensive online learning experience, particularly in mathematics. This study aims to capture the essence of the lived experiences of pre-service secondary mathematics teachers learning mathematics through online classes during the COVID-19 pandemic. Specifically, it seeks to answer the following questions:

1. What are the highlights of the lived experiences of Bachelor of Secondary Education (BSED) students majoring in Math in learning mathematics courses online?
2. What were the challenges the college students experienced, and how did they cope with them?
3. What, for the students, is the meaning of their experiences - of learning math courses online during the pandemic?

Administrators, teachers, parents, students, community leaders, and other stakeholders would be enlightened on the ways and means needed to help improve the learning modality's preparation, implementation, and evaluation. Additionally, this study may be valuable to the Philippines' Commission on Higher Education (CHED) and other educational institutions in considering, offering, and revising the suitable curriculum for this learning modality to produce a more desirable teaching-learning experience.

Methodology

Research Design

This study utilized the qualitative research methodology, specifically, the descriptive phenomenological design, since the researchers primarily wanted to grasp the essence of the students' lived experiences in learning math online. A descriptive phenomenological method is deemed appropriate since it seeks to capture the essence or core meanings of a phenomenon commonly experienced (Merriam & Tisdell, 2016). It concerns how people view the world in specific

circumstances and at particular times. In phenomenology, individuals describe, feel, judge, remember, and make meaning of the phenomenon they are experiencing and how they communicate it with others (Giorgi et al., 2017).

Sample and Data Collection

The participants in the current study (n=16) are second-year Bachelor of Secondary Education (BSED) Mathematics students enrolled in the first semester of the school year 2021–2022 in Cebu, Philippines. Three males and thirteen females, ages 21-24, were interviewed. These participants were the first batch to experience a fully online class in the university and had not tried face-to-face courses in a university setting. They were chosen based on the following criteria: (a) enrolled in math subjects for 2020-2022, (b) taking the subjects online, and (c) must have internet access and electronic devices and be capable of attending synchronous sessions with their instructor. Of the sixteen (16) participants, only four (4) used an internet fiber connection, considered the most reliable, while the rest used unstable options like prepaid data and prepaid Wi-Fi.

The researchers, as the main qualitative research instruments (Merriam & Tisdell, 2016), tried to immerse themselves in the phenomenon and interpreted the data collected from the interviews and observations of the participants' engagement during the online learning classes. Interviews were conducted through video conferencing tools like Zoom or Google Meet due to the strict health protocols which did not allow face-to-face encounters. The researchers utilized a semi-structured interview guide, which was validated by a panel of experts composed of a graduate research teacher, a math teacher, and a language expert. It was pilot tested on two students to determine how well the interview sessions worked together and to examine the procedure, the practicality of the steps, the clarity of the questions, and its accuracy in answering the research questions. During the interview process, which lasted 20-30 minutes each, the student participants were asked about their experiences learning mathematics online, specifically about the challenges, stories of success and struggles, ways of excelling and coping experienced in learning math subjects online during the COVID-19 pandemic.

According to Giorgi et al. (2017), in a phenomenological study, the research participants' (BSED Math students) role in the process was to describe the experience, while the researchers took this raw data and analyzed the phenomenon (online learning). The data presented in this study were based on participants' answers to the guide questions via virtual platforms. Before the data collection, the researchers gave the prospective student participants an orientation about the study, its merits, and its relevance and then solicited the students' informed consent. Once the students consented to participate, the researchers coordinated with them the preferred time and day for the interviews. The interview questions in this phenomenological study were developed by asking the grand tour question: "Can you please share your personal experiences in learning mathematics online during the pandemic?" For reflexivity, the researchers interviewed without a specific answer in mind, and there was no limit to the length of answers the participants gave. This means the researchers bracketed their experience in learning online away from the participants' answers, and they did not ask leading questions but instead focused on the student's actual experiences.

Analyzing of Data

The researchers used Colaizzi's approach, which comprises seven data analysis steps (Morrow et al., 2015): familiarization, identifying significant statements, formulating meanings, clustering themes, developing a detailed description, and producing structure, and verification.

The participants' transcripts were analyzed by the researchers for significant meanings. Meanings were formulated, and the themes were extracted. The fundamental structure of the phenomenon was identified and described. Finally, as part of the validation process and to ensure the reliability of the results, the researchers contacted the participants again. They showed the extracted themes to see if they were consistent with the participant's experiences. The modified Colaizzi's seven-step data analysis method from Geverola et al. (2022) is shown in Figure 1.

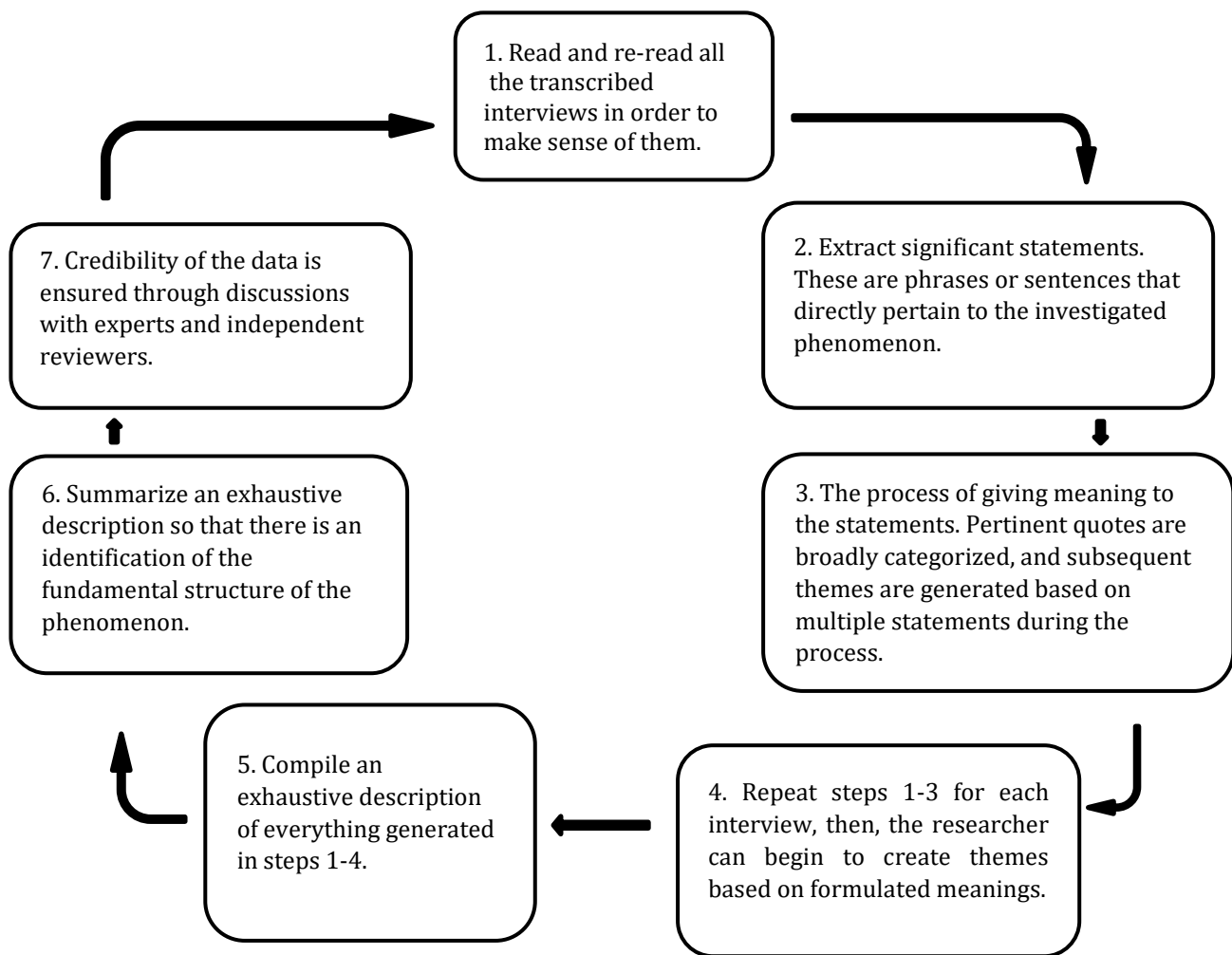


Figure 1. A Modified Colaizzi's Seven-Step Method Data Analysis

Findings/Results

Based on the interview data, the following themes emerged:

Facing the Hurdles

On the participant's lived experiences in the context of learning mathematics online, they described the following challenges and struggles:

(a) Poor internet connection. Many students (n=16) expressed that one of the struggles of online learning is attributed to the unstable internet connection that they are often experiencing. Most participants use prepaid data to access the internet, join synchronous classes and answer asynchronous activities. Since most of them rely on data and mobile phones, they have difficulty connecting whenever the weather is unfavorable since it affects their connectivity. Many participants were kicked out of video conferencing platforms like Google Meet and Zoom, while others heard static and unclear audio and video on their end. These resulted in missing some classes and activities or submitting tasks on time. Some of the students expressed that learning mathematics online is:

"... very difficult because there are times when it rained [and] our internet slows down [and] when there's no electricity, we can't join the class." - P8

"... not good because I kept getting kicked out of the meeting because of poor internet connection." - P10

(b) Unconducive learning environment. A conducive learning environment is a critical factor in students' learning. The change from face-to-face learning to online has affected the students' learning environment. The participants expressed frustration over not having an excellent place to study. Among the distractions are a noisy environment (rooster crowing, babies crying, dogs barking), household chores that need to be done, and not having adequate personal learning space. An unconducive learning environment makes the students lose focus on the discussion. Other participants expressed that they also multitask at home, so they cannot give a hundred percent and undivided attention to the discussion. Some of the students said that learning mathematics online is problematic because:

"it's noisy at home because there are a lot of animals and children crying [and] the noise adds stress" -P8

"... so many distractions during virtual meetings (noise, shouting, rooster, household chores" - P1

"...while you are having synchronous class, you are also doing household chores that make it so uncomfortable learning." - P11

(c) *Difficulty in understanding the topics.* As expressed by the participants, one of the challenges of taking mathematics courses online was the struggle to understand and fully grasp the topics presented. Some were having a hard time coping with the abrupt change from face-to-face classes. Despite having a teacher who can give discussions during synchronous sessions, they still have difficulty fully absorbing the information shown. Statements like the following are very rampant in the data gathered.

"I feel like I already know how to do it, yet during exams, I get confused." -P1

"...there were times that no matter what I did, I didn't understand the topics deeply", -P16

"...some [lessons] are very lengthy and complicated to learn alone that's why I got frustrated." -P3

"...the learning that I have is not long-lasting, not just with math, but other subjects too."-P2

"I was not comfortable because I learn best when hands-on, especially in math subjects, where my peers and classmates could assist right when I have difficulties." -P5

(d) *Financial Struggles.* Throughout the data gathered, several participants reported that they needed to spend money since they were only using data or Wi-Fi Vendo. They are unsure where to get money since some came from a family already struggling financially before the pandemic. The add-on expense for purchasing data is a massive burden on their part, leading to an even worse financial struggle. Many students ended up missing classes and activities due to this reason alone. Most students come from rural areas with minimal job opportunities for parents and students alike. Some of the students expressed their dismay over this phenomenon by stating:

"I have difficulty adjusting to online classes and I have [an] unstable financial support." -P13

"...the challenges and struggles that I have encountered are financial problems. Because I am only connecting in a Wi-Fi Vendo that costs 5 pesos per hour."-P9

(e) *Health Problems.* The pandemic was the leading cause of shifting to online learning. Undeniably, the safety of the students must come first above all, hence why they have to stay home. However, online learning also presents health issues for students. They mentioned that they occasionally experienced panic, anxiety, and breakdowns. It was also added that sometimes, their eyes hurt due to too much exposure to gadgets, while some lack a good night's sleep because they are trying to finish some online activities. Some of the students' statements supporting this theme are:

"[online classes cause] headache because of too much using of phone [and it is] painful to the eyes." - P12

" My head and eyes also hurt from staring at the cell phone because of the heat of the weather."-P8

"It is stressful because sometimes it's too late to go to sleep because there are exercises that need to be answered." - P9

The Upper Hand

(a) *Staying home.* Having to stay home during an ongoing pandemic is one of the advantages the students cited about learning mathematics online. Some said staying home while learning is beneficial because it allows them to attend to other things. Other students said that:

"...you can relax when you're under too much stress because you're just at home."-P8

"... the advantage of having these subjects taken online is that I can learn math concepts in the comfort of my home." - P10

(b) *Varied online resources.* One of the emerging themes presented by the qualitative data was that learning mathematics online allows students to access a wide range of information about the topic given by the teacher. Some resources mentioned were instructional videos from YouTube, reading materials, recorded lessons, presentations, and websites. Many students pointed out that having unlimited access to these resources is advantageous. Students who cannot join the synchronous class can still catch up with the lesson using these resources. Some of the student's statements are the following:

"... when the teacher is discussing, and you get confused with something or if you are having a hard time to cope, you can look for other references so that you can understand the topic better."- P9

"... there are a lot of online resources available nowadays, and there are even different math tutorials that can be found on YouTube that are very helpful in learning." - P13

"...the good thing about taking math online is that there are many resources that can be found on the internet, and there are applications that can be utilized to check and deepen my understanding."-P2
 (c)Flexibility. A common theme among students' answers is that one of the advantages of learning mathematics online is the extended period they have to answer exercises and activities. They cited the flexibility of the mode of learning as an advantage since they are given opportunities to research and watch supplementary videos that can aid their understanding of the topic. According to some, this was not possible face-to-face. Here are some of their statements that support this phenomenon:

"...the advantage of having online classes is that we can continue and finish seatwork and activities, and we are given extensions in submitting our task unlike in face to face where we need to submit our work within that given time or period." - P10

"... we can study wherever and whenever we want, it's a flexible learning process."- P12

" ... we can have an individual copy of the module or the topic, and we can access the material any time, we can replay the discussions about the topic (if the teacher is recording), and we can search to google the other alternatives on how to compute the equation or solve the problem." - P11

Channeling the Inside and Outside Forces

Despite the struggles encountered and the challenges faced by the students, they remain optimistic in their statements. Student P15 said, *"We must only know how to [be] a better version of ourselves in adapting to the change"*. Moreover, the researchers have identified the commonalities of their coping strategies and the factors they believe are beneficial to succeeding and excelling in learning mathematics subjects online. Here, we divide the factors as intrinsic and extrinsic.

(a) *Intrinsic factors*. These factors are determination, patience, hard work, self-confidence, flexibility, and focus. In addition, the participants believed that time management, setting goals for yourself, having a positive attitude, and being resourceful are vital to learning successfully. The following statements from the students support this result:

"Yes, many times I am uncomfortable with online learning, but I still manage it because of my dream, whatever challenge it is, you have to overcome it." - P9

"I have experienced many trials during this time... but I face it with the self-confidence to cope with all the trials that life will go through". - P8

(b) *Extrinsic factors*. These factors include a good internet connection, gadgets, and a conducive learning space. Most students also believe that proper emotional and financial support could be a great factor and motivation for success. As stated by many, support from family is something that the participants believed to be most beneficial to them. As these students expressed:

"...given our current situation that we have to stay at home while attending classes, still our parents give us time to join and attend our studies." - P16

"I receive enough moral support from family, friends, and classmates." -P3

"...they cheer me up when I feel like giving up and remind me why I started this journey."- P4

The Takeaways

Experience is the greatest teacher. This statement is a cliché, but nevertheless, it is true. The student participants of this research stated that to make these experiences meaningful, you have to learn from them and become stronger than before. Some of the positive outcomes that they have said are listed below.

(a) *Self-discipline*. Many students believed that learning mathematics online helped them become more disciplined. They take charge of their learning most of the time, and they need to discipline themselves to finish all the activities given on time. It takes great discipline not to get distracted by random things since they stay home. Student P12 said his greatest takeaway is *"... learning from it, by self-discipline, I've become a flexible and responsible learner"*. Another student (P13) said that because of learning math online, she became *"a student who will do advanced study for the discussions and will review diligently towards upcoming exams"*, while another (P1) said, *"I realized I need to study harder and practice regularly to gain mastery so that during exams, I will find the items easy."*

(b) *Time- management*. One of the positive outcomes that the students get from their experiences is learning good time management. With the deadlines going left and right, they learned that good time management is the key. Students said that some of the things they learned from the experience are to *"...make use of the time to learn and lessen the time to use for entertainment online"* (P13). The experience *"... also taught me to be studious and manage my time"* (P5). Above all, *"a student must have time management on everything he/she does because studying online is also about juggling the responsibilities of being a student and being a son/daughter at the same time"* (P13).

(c) *Resourcefulness*. Students believed that learning math online helped them become resourceful and independent learners. Often, they have to look for supplementary resources to the lesson to deepen their understanding. Sometimes, the teacher guides it, but they are on their own most of the time. One student (P13) said when there's a slow internet connection, "I find ways on how to manage it, and one way is to find a place with a good signal and buy a consistent amount of data", while those students (P2) who missed a class or activity said that "I have to search on tutorials to learn more, aside from reading the teachers materials". Another student (P5) said that the key takeaway of the experience is that "...it really sparks my innovative, creative skills. It also taught me to become media and information literate".

(d) *Resilience and Perseverance*. Students always come up with solutions to the challenges that they encounter. For example, when the signal is not as strong, they find a place with better reception; when they have a hard time with the discussion, they browse different resources or re-watch the discussion if available. One student (P2) said, "... with flexibility and perseverance, it is possible to learn math effectively online." Some of the student's statements are, "these experiences make me a better student by learning through it when I am wrong about the task, I learned, when I am correct, I also learned, it makes me realize that life is not easy, and we need to work hard" (P11).

(e) *Growth Mindset*. As Dweck (2017) defined in her book *Mindset*, people with a growth mindset think their success depends on their time and effort. People with an improved growth mindset believe their talents and intelligence may improve with persistence and effort. They welcome difficulties, persevere in the face of adversity, learn from criticism, and find inspiration in the achievement of others. Some statements from the students that demonstrate a growth mindset are as follows:

"... as long as you don't give up until the fight is over, don't give up." -P8

"I overcome all these challenges by still continuing what I must need to finish, sometimes I'm tired of it, but still I'm trying to be strong and moving forward for my future." - P11

"I was made stronger as a person, as a student despite the challenges." - P9

"I used my experiences as a motivation to succeed. All those challenges equipped me to be strong, be a problem solver, and become an optimistic person who will not give up on my dreams despite everything I've experienced." - P13

Discussion

The results of this study showed that college students learning mathematics online faced several challenges in their learning journey. This includes the inability to participate fully in online classes due to poor internet connection. The lack of a strong internet connection as one of the problems faced during online learning is consistent with the studies of other researchers (Belgica et al., 2020; Delicano, 2021; Okyere et al., 2022). This problem can have negative and lasting impacts on students' learning, particularly in subjects such as mathematics, because without a reliable internet connection, online learning would not be feasible (Belgica et al., 2020; Delicano, 2021; Kansime & Batiibwe, 2023; Mukuka et al., 2021). The results of this study and similar studies above indicate that teachers and students must have good internet connections to ensure successful online distance learning.

The participants of this study also cited their failure to focus on the lessons online because of the unconducive learning environment at home. This result parallels the findings of the study of Belgica et al. (2020), which states that for most students doing online classes, the environment has significantly contributed to its effectiveness. Students who study in a pleasant and conducive learning environment, for example, free from noise, well-ventilated, and proper lighting, are more motivated and engaged and show a greater overall capacity and ability to learn more. In addition, the study of Baticulon et al. (2021) revealed that household chores and other tasks make students lose focus on the teacher's discussion, especially since parents see the presence of their children at home as an opportunity to get help with the chores while other parents must work and leave their older children to care for the younger siblings while attending classes. Furthermore, similar results were found by Mamolo (2022), showing that slow and unstable internet connection and plenty of activities and chores at home were some of the main reasons students got difficulties learning the subject matter, while Okyere et al. (2022) cited unstable internet service and inadequate learning environment as the challenges of online learning.

Because of the challenges brought by poor internet connection and lack of a conducive place to study, findings revealed that students encountered difficulty in understanding mathematics topics delivered online. This research also found that most online math students forget the concepts more quickly than in face-to-face classes. Participants reported that the teacher's presence and collaboration with peers also played an essential part in successfully learning the subject. Accordingly, the sudden transition to online learning makes the situation more challenging for many. These results are consistent with the study of Delicano (2021), who cited the studies of Oh and Jonassen (2007) and Ward et al. (2010) and stated that students find online classes insufficient and students often have difficulties in comprehending and learning online. L. Johnson (2020) suggested that the best way to learn mathematics is to engage with the subject, start mastering the basics, develop number sense, have a goal, answer practice exercises, keep track of math vocabulary, understand the concepts, and get help when needed.

This study also revealed that students sometimes fail to attend classes due to financial struggles. It is consistent with the study of Rotas and Cahapay (2020), who cited financial struggles as one of the challenges students face online. The participants of this study suggest that this difficulty must be given enough consideration in making policies related to continuing education despite the challenges of face-to-face interaction, especially in universities where most students are from low-income to middle-income families. It is challenging for students to choose a distance learning mode since the decision lies on most higher education institutions (HEIs) and not on them. They will be forced to immerse themselves in a modality they are unprepared for mentally, physically, and financially. Some of these students' families earn below the minimum wage and are just getting enough to put food on the table. Any other expenses beyond the necessities are not on their priority list. Some students are even working while studying to be able to buy internet data for online classes.

Moreover, students have reported that they have been experiencing a range of health issues brought on by prolonged exposure to gadgets during online classes. According to the majority of the participants, they find it difficult to see the teacher's presentation and whiteboard notes when they attend classes using only their phones. The small screen makes it difficult to see from afar, so they have to move it closer to their eyes, which could cause long-term and adverse effects on their health. This finding is similar to the study of Almarshdi and Jarrah (2021), which revealed that they were tired of online learning because of the extended screen time spent in front of their digital devices. Staring at a mobile screen for an extended period can cause a lot of health issues, including but not limited to the physical strain on the body and eyes, unhealthy sleep patterns, sleep deprivation, higher risk for obesity, vulnerability to chronic health conditions, deteriorating cognitive ability, and more (Nakshine et al., 2022).

The analysis of the students' lived experiences also revealed that to learn mathematics online successfully, they must learn how to cope. Participants mentioned intrinsic motivations like having a positive attitude and being resourceful and extrinsic motivations like emotional and financial support from family and friends. This is in conjunction with the results of the phenomenology study conducted by Timario and Lomibao (2023), where students mentioned social support from teachers and classmates and being resourceful as part of their coping strategy.

Despite the difficulties encountered by the students, an analysis of their lived experiences revealed that there are several advantages, too. This includes the safety of staying home during lockdowns and not having to travel to school, the availability of varied online resources that can help the students, and time flexibility in answering exams. These findings are similar to the study of Ward et al. (2010), as Delicano (2021) mentioned, where ease and flexibility of access are advantages of an online classroom compared to a traditional classroom setting. Similarly, flexibility and student independence are the positive features of online learning compared to traditional classroom setup (Al-Adwan et al., 2013; Belgica et al., 2020; Delicano, 2021; Means, 2010; Van Doorn & Van Doorn, 2014). In addition, Zhang et al. (as cited in Delicano, 2021) stressed that online learning allows students to learn independently without needing to go to school, be physically present, and crowd in the classroom. This case is considered the safest way to minimize face-to-face interaction among teachers and students, thus limiting the spread of the virus, especially during a crisis like a pandemic.

Furthermore, the finding also revealed that the students in an online class appreciate the fact that they can have instructional materials like eBooks, PDFs, PowerPoint, Google Slide presentations, and video recordings that they can access anytime despite being absent from the discussions or not understanding some parts of the lessons. Participants also cited that they are given a longer time to finish the activities in their online classes than in face-to-face classes. This extra time allows them to research and improve their work before submitting it online. It also allows them to manage their time wisely to work on all the assigned activities. This is similar to the results of Timario and Lomibao (2023), where they cited access to a wide range of resources and tools and learning at the student's pace as benefits of flexible learning. This is also consistent with the findings of S. D. Johnson et al. (2000), Zhao et al. (2018), and Delicano (2021), where students perceived that their self-regulation and time-management skills had improved. According to Delicano and El-Mansour and Mupinga (2007), students can reflect on their learning in online classes. The analysis findings also showed that because of their experiences, students learned self-discipline, proper time management, resourcefulness, resilience, and perseverance and gained a growth mindset. This parallels the results of Pitogo and Ecle (2021), who cited self-discipline and responsibility as benefits of remote learning.

Conclusion

The lived experiences of students learning mathematics online are captured in the following themes: (a) the top five hurdles; (b) three upper hands, and (c) five key takeaways. Though online classes offer many aspects of learning flexibility and positive impacts, many students still prefer traditional or face-to-face discussions because they encounter many challenges in their learning journey, including the inability to focus and fully participate due to poor internet connection, financial struggles and an un conducive learning environment. As a result, they find it more challenging to learn the subject and encounter some health problems. These challenges could be attributed to their lack of experience with online learning before the pandemic. The transition to online learning from face-to-face was so abrupt that they were not given enough time to familiarize themselves with everything. However, despite that, students perceived that their self-discipline, resilience, perseverance, and time-management skills had improved.

On the other hand, online learning has several advantages over traditional learning environments from the learners' standpoint. Online learning allows students to develop greater flexibility and resourcefulness. The ease of access to varied resources also helped the students well. In other words, their experiences in online learning helped them gain a growth mindset and valuable life skills that they may apply in the profession later on.

Another implication drawn from the study is the importance of schools being more proactive and having a readily available, well-planned, and well-implemented alternative to face-to-face classes in times of crisis. Schools may implement a sustainable learning continuity protocol that will take effect in case a pandemic or another crisis may arise. Teachers, parents, students, administrators, and other stakeholders may be included in the planning and evaluating these options.

Recommendations

The researchers recommend that online classes may be improved by well-planned learning activities, proper communications, and assistance to improve access and connectivity. Using recorded lectures and math tutorials may be helpful for students who have difficulty connecting and need to refresh their memory.

School administrators and teachers may use the findings to formulate policies and devise appropriate intervention plans to help address the reported difficulties, particularly for those students in the most critical and remote areas with intermittent internet connectivity. Although there are already solutions available, it will be up to educators and school administrators to put those solutions into action in a way appropriate to their specific institutions and the circumstances of their students. It is also essential to consider the students' financial or economic hardships when delivering online courses and classes. Students' demographic data and mental and emotional health should also be considered when designing and implementing online programs.

To get a bigger picture of this phenomenon, the researchers recommend conducting future research on college math teachers' experiences teaching mathematics online. They may uncover specific teacher-related concerns that influence students' online learning experiences with learning mathematics subjects.

Limitations

One limitation of this study is the potential for sample bias due to the small sample size of only 16 participants from the same school. This may limit the generalizability of the findings to a larger population of college students learning math online during the COVID-19 pandemic. Also, purposive sampling may introduce researcher bias and limit the study's diversity of perspectives.

Ethics Statements

The researchers observed the research ethics protocols. They explained to the prospective student-participants the nature and merits of the study, assured them that confidentiality would be strictly observed, and afterward, solicited their informed consent. Only when the students consented did the researchers arrange with them the interview schedule and agree on the digital formats to use. The interview questions were semi-structured. The researchers asked permission from the participants to record their answers for greater accuracy of data-gathering. The participants were also requested to complete a written form on their demographic data. The demographic information was kept separate from the transcripts of the interviews to promote confidentiality.

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Conflict of Interest

There is no conflict of interest in this study.

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Authorship Contribution Statement

Aleguen: Conceptualization, design, data-gathering, analysis, manuscript drafting, critical revision. Bascones: Conceptualization, data-gathering, analysis, technical, editing/reviewing. Bonotan: Critical manuscript revision, editing/reviewing, supervision, and final approval.

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