Lived Experiences of Grade – 11 Stem Students in Mathematics Using Modular Distance Learning

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ABSTRACT: This qualitative study explored the lived experiences of Grade - 11 STEM students in mathematics using modular distance learning. With the aim of understanding the challenges, coping strategies, support systems, emotional factors, and perceived advantages associated with this learning modality, the research design employed a phenomenological approach. Data collection involved one-on-one interviews with 12 participants, and thematic analysis was utilized to identify common themes. The findings revealed challenges in understanding complex topics, managing the modular structure, and dealing with distractions and connectivity issues. Participants adapted through self-regulated learning, utilization of online resources, and independent learning strategies. The study highlighted the importance of teacher and parental support, effective guidance, and the promotion of positive emotional experiences. The advantages identified include access to information, flexible time management, and autonomous exploration of resources. The implications of these findings would contribute to the design and implementation of educational interventions, addressing challenges, and enhancing distance learning experiences. The study concluded by offering recommendations for educators, policymakers, and researchers to optimize distance learning programs and support student success.

KEYWORDS: Challenges, Grade - 11 STEM students, Mathematics, Modular distance learning, Self-regulated learning

INTRODUCTION

Disasters have a significant impact on traditional modes of learning, necessitating the adoption of alternative teaching methods such as Modular Distance Learning (MDL). Disasters, including pandemics, earthquakes, volcanic eruptions, flooding, and extreme weather conditions, have profound implications for education, affecting both the learning process and the well-being of students and educators (UNESCO, 2020). This problem may be doubled with the problem of mathematics learning.

The study by T. Wong et al. (2019) suggests that students experience difficulties in learning mathematics, and this is dominantly experienced by students who do not spend time effectively learning mathematics (Z. Ardi et al., 2019).

In addition, Sarah S. Wu et al. (2014) suggests that, even in nonclinical samples, math difficulties at the earliest stages of formal math learning are associated with attentional difficulties and domain-specific anxiety.

`Understanding the experiences of students in Mathematics learning using modular distance learning during disasters is crucial for developing effective strategies to ensure continuity of education and support student well-being.

This research explored the lived experiences of Grade 11 STEM students in mathematics using modular distance learning during disasters. This required the use of informants who have substantial experience with the phenomenon under investigation. Hence, the key informants of this study were high school Grade - 11 STEM students from both private and public schools in Catbalogan City Division where mathematics subjects are offered the most. Specifically, the study sought to answer the following research question: What are the lived experiences of Grade 11 STEM students in mathematics using modular distance learning during disasters?

This study incorporated the Social Constructivist Theory, Ecological Systems Theory, and Resilience Theory as the theoretical framework to understand the experiences of Grade 11 STEM students in mathematics using modular distance learning during disasters. The Social Constructivist Theory highlighted the importance of social interactions in knowledge construction (Vygotsky, 2018). The Ecological Systems Theory explored the influence of different environmental systems on individuals' experiences (Bronfenbrenner, 1979). The Resilience Theory examined individuals' ability to cope with adversity and adapt to challenging circumstances (Masten, 2018).

This study held significance in several ways. Firstly, it contributed to the understanding of the challenges faced by Grade 11 STEM students in mathematics during disasters and provides insights into their coping strategies and support systems. Secondly, the findings could inform educational institutions and policymakers in developing effective distance learning strategies to ensure continuity of education during disasters. Thirdly, the study could shed light on the resilience of the educational system in disaster-prone areas, enabling the development of contingency plans and interventions to address the unique needs of students during such situations. Finally, the research aligned with the United Nations' Sustainable Development Goal 4, which focuses on providing quality education and lifelong learning opportunities for all (United Nations, 2015).

In conclusion, this study explored the experiences of Grade 11 STEM students in mathematics using modular distance learning during disasters. By addressing the research objectives and research question, the study contributed to the existing literature, informed educational practices, and enhanced the resilience of educational systems in disaster-prone areas.

METHOD

Research Design

This study is qualitative research using the transcendental phenomenological research design to describe the lived experiences of STEM students using modular distance learning in learning mathematics subjects. Husserlian transcendental phenomenology focuses on describing human experiences by setting preconceived ideas aside and viewing a phenomenon objectively, allowing the true nature of a phenomenon to emerge naturally with and from its background (Moustakas, 1994). This research design is useful in describing the lived experiences of high school STEM students in learning mathematics using modular distance learning during safety and health-related issues such as pandemics, typhoons, landslides, volcanic eruptions, heavy rainfall, and flooding. This would enable researchers to describe the phenomenon based on the experiences of the key informants.

Instrumentation

In this study, an interview protocol was used to elicit relevant information from the students about their lived experiences while learning math in a modular approach during the pandemic. The interview guide was a semi-structured type with open-ended questions. A semi-structured survey questionnaire was applied since it allows all participants to answer the questions confidently through a face-to-face, Zoom video conference or phone call whichever is possible to elicit responses.

Validation of Instrument

The questions were constructed by the researcher, thus, the interview guide questions underwent validation by three experts to ensure the validity, accuracy, and gender sensitivity of the research instrument. The research instrument was also subjected to a dry run by the researcher. Then, a final refinement of the research instrument was done based on the suggestions of the experts and the results of the dry-run interview.

Sampling Procedure

This research explored and described the lived experiences of Grade - 11 STEM students in using modular distance learning while learning mathematics subjects. This required the use of informants who have substantial experience with the phenomenon under investigation. Hence, the key informants of this study were high school Grade - 11 STEM students from both private and public schools in Catbalogan City Division.

The key informants were chosen using purposive random sampling from all the senior high schools in Catbalogan City Division that offers Science, Technology, Engineering, and Mathematics (STEM) Strand, both public and private schools. Specifically, the informants are Grade - 11 senior high school students since Mathematics subjects are only offered in Grade - 11 as specified in the suggested academic track for Science, Technology, Engineering, and Mathematics (STEM) strand scheduling of subjects (DepEd, 2019). The informants, then, were from 2 public senior high schools and 1 private senior high school namely Samar National School (SNS), Eastern Visayas Regional Science High School, and St. Mary's College of Catbalogan (SMCC) respectively. Regarding potential sample size, qualitative research methods are concerned with the idea of quality versus quantity (Padgett, 2008; Patton, 2002). In the current situation, heterogeneous participants were utilized by the researcher in terms of academic performance and sex to explore the similarities and differences in the experiences while taking into consideration the saturation of the participants.

To ensure that the Data Privacy Act of 2012 would not be violated when recruiting participants, the researcher assigned codes instead of names for both schools' and participants' identification. Letters A, B, and C were assigned to the 3 participating schools randomly while numbers were used for the students.

After the conduct of the study, the researcher processed the data by deleting identifiable responses of the respondents like their email and contact number. After the processing of the identity issues, the researcher saved the file on the drive with encryption and permanently delete the Google form used in the online survey. Also, the zoom recording of the respondents' response validation was also permanently deleted after the coding to make sure that no trace of the respondents' identity is left.

All the data gathered were encrypted and saved in the researcher's google drive in which this drive is also encrypted. Saved copies on the researcher's personal laptop were encrypted to secure the file from being accessed.

Data Gathering Procedure

The researcher sought permission from the school heads of the chosen research participants. Then, it was followed by the sending of the Sample Interview guide to the subject teachers or advisers. The interview protocol was used to gather insights from the key informants. Data gathering was done through an in-person interview, virtual interview or phone call.

After the researcher sought permission, the data gathering was done in a room inside the school for in-person interviews.

The researcher started with one representative per category on scholastic performance and school, then followed with the next representative until the data were saturated.

Data Analysis

The researcher employed a one-to-one interview method to collect data from the participants. The interviews were recorded and transcribed to ensure accuracy. The data were analyzed using thematic analysis, which involved identifying common themes and patterns across the participants' responses. The data analysis process involved several steps, including creating a code list, developing initial themes, transitioning themes into more refined and focused themes, and creating final themes that provide a comprehensive understanding of the data. The first step was to create a code list, which involved identifying key concepts or ideas that emerge from the data. The next step was to develop initial themes by grouping related codes together and creating broad categories or themes. The themes were then transitioned into more refined and focused themes by identifying sub-themes that fall within the broader themes. Finally, the themes were further refined and synthesized to create final themes that provide a comprehensive understanding of the data. This process was iterative and involved revisiting and revising themes as the data was analyzed further.

Ethical Considerations

A letter of consent was issued to proceed to the actual data collection procedure to confirm that this study adhered to the ethical requirements for the protection and safety of the participants. The researchers subsequently sought a Certificate of Ethics Approval from the Samar State University Institutional Research Ethics Committee (IRERC), which reviewed whether this study adhered to ethical considerations.

For the whole duration of the study, the researchers will make sure to take full responsibility for all participants, and equitably take actions, regardless of what these participants' affiliations are. Rest assured that the participants are given informed consent regarding the entirety of the stages involved in the study through a letter of consent that was enclosed given by the researcher to collect data. The participants were also informed about their rights, which include the ability to choose whether to participate in the study, as well as the ability to withdraw from participating in the study at any moment without being questioned.

The identity of the schools was confidential by using codes such as School A, School B, and School C.

RESULTS AND DISCUSSION

Participants

Participants of this study comprised 12 students in Grade - 11 STEM both from public and private schools in Catbalogan City Division. The sample included an equal mix of males and females and different levels of academic performance from above-average performers to below-average performers. All participants had prior experience with modular distance learning, which gave them an in-depth sharing of their experiences with the distance learning modality.

Data Collection and Analysis

The researcher employed a one-on-one interview method to collect data from the participants. Each interview lasted approximately 15-30 minutes and was conducted using an audio recorder. The interviews were recorded and transcribed to ensure accuracy. The data were analyzed using thematic analysis, which involved identifying common themes and patterns across the participants' responses. The data analysis process involved several steps, including creating a code list, developing initial themes, transitioning themes into more refined and focused themes, and creating final themes that provide a comprehensive understanding of the data. The first step was to create a code list, which involved identifying key concepts or ideas that emerge from the data. The next step was to develop initial themes by grouping related codes together and creating broad categories or themes. The themes were then transitioned into more refined and focused themes by identifying sub-themes that fall within the broader themes. Finally, the themes were further refined and synthesized to create final themes that provide a comprehensive understanding of the data. This process was iterative and involved revisiting and revising themes as the data is analyzed further.

Results and Discussions

The table below presents the themes, sub-themes, and quotations from the one-on-one interview with the 12 Grade – 11 STEM students. The table is followed by a discussion of themes and sub-themes from the thematic analysis.

Table 1. Thematic Map of the Lived Experiences of Students in Using MDL
Themes were identified through one-on-one interviews with Grade – 11 STEM students in their Math experiences through MDL.

Themes	Subtheme	Statements
1. Challenges of Modular Distance Learning	i. Challenges in Understanding	"*I am having a hard time understanding each lesson because they is no discussion happening.*" (P1) "*it is very hard to understand some topics without teachers and comprehending the content it is quite challenging since you are the only one studying.*" (P7) "*… its challenging because some students even I myself can't comprehend the lessons that well…*" (P5) "*I will barely understand some topics…*" (P8)
	ii. Challenges in Mathematics	"*It was hard to understanding subjects with variety of complex topics yourself. We all know mathematics is a complex subject and it really needs a teacher's guide…*"(P8) "*I am not very good when it comes to number and Math's unless there is teacher or instructor to teach me how to do it hence during distance learning it was a bit hard.*"(P12)
	iii. Challenges in Modules	"*At first honestly it was fine but after a few weeks I have noticed that the activities in every module was a lot and answering all of it was tiring…*"(P12) "*the hardest part of learning math during modular approach sir kay sometimes liwat may mga aranseran like kuan an lesson mayda examples na dere related ha lesson asya malilipat ka han technique na gagamiton. Medyo confusing an mga examples ha module sir.*"[Translation: The hardest part of learning math during modular approach, Sir, is that sometimes there are discrepancies, like when the lesson has examples that are not related to the topic, and it can confuse us.](P6) "*Sometimes modules are stacked. Different subjects giving modules at the same time.*"(P7)
	iv. Challenges at Home	"*… there are many distractors in house*"[Translation: there are many distractions at home.](P9)

				"*… our house is at the side of diversion road and its distracting because of the noise from the vehicle*"(P10)
				"*I had no area to learn/study properly and other responsibilities were interfering with my studies. … I have little baby siblings that require time and energy to take care of …*"(P11)
		v.	Challenges in Internet Connection	"*… I struggle a bit because of the slow internet connection …*"(P1)
				"*Mahirap sa umpisa lalo na sa hindi pag kakaroon ng sapat na lakas ng internet connection…*"[Translation: Starting out was difficult, especially without a reliable internet connection…](P2)
				"*…I have to search other methods of answering the questions so I could fully understand the concept pero ang internet connection is really slow.*" [Translation: Translation: I have to search for other methods to answer the questions so that I can fully understand the concepts. However, the internet connection is really slow…](P3)
				"*slow net because of this problem I can't fully research something I want to study*"(P9)
				"*At first it was stressful sir especially because ahh I was not really familiar with the new modality and it's quite harder than usual because we had to uhm adjust to the new environment.* [Translation: At first, it
2.	Adaptation and Coping strategies during Modular Distance Learning	i.	Adaptation to the Learning Modality	"*At first it was stressful sir especially because ahh I was not really familiar with the new modality and it's quite harder than usual because we had to uhm adjust to the new environment.* [Translation: At first, it was stressful, sir, especially because I was not really familiar with the new modality, and it's quite harder than usual because we had to adjust to the new environment.] (P3)
				"*I hope I can always search for answer but Online is so manipulative, not good but we students have to adapt the situation.*"[Translation: I hope I can always search for answers, but the online environment can be so manipulative and not always good. However, we students have to adapt to the situation.](P4)
				"*It was new for me, but after few weeks I adjusted to it.*"(P8)
				"*it is not an easy and enjoyable, but I can say that I manage them all that is why I'm here now continuing my education.*"(P10)
				"*I hope I can always search for answers, but Online is so manipulative, not good but we students have to adapt the situation.*"(P4)
		ii.	Utilization of Online Resources	"*We all know mathematics is a complex subject and it really needs a teacher's guide whom we can actively ask for in order to absorb each content plus there are only limited examples on the modules good thing there is YouTube.*"(P8)
				"*... good thing that there is YouTube, it became my backup when hard times come.*" (P10)
				"*... what I do is watch some clips on YouTube that are related to the topic that I find difficult to understand.*" (P5)

		"… so what I do is watch YouTube or look up the questions online." (P11)
iii.	Learning Strategy	*"… they would provide examples and links to video tutorials in the module."* (P12)
		"Yes, nagagawa ko ito sa pakikinig ng maayos sa mga video lesson ng guro na nagging kaagapay sa mga modules namin, pag babasa ng maayos ng mga tanong, at pag gagawa ng sarilng notes para sa mga susunod na mga gawain." [Translation: Yes, I am able to do this by listening carefully to the video lessons provided by the teacher that supplement our modules, reading the questions thoroughly, and making my own notes for future assignments.] (P2)
		"If makuri pwede ak anay mag YouTube tutorial para ako mabaro anay ngan para liwat sir ma expound pa an mga lesson ha module." [Translation: If I have trouble, I can watch YouTube tutorials to better understand the lesson in the module.](P6)
		"I can answer some of the modules in my spare time. The good thing sir also is that I can message my teachers through messenger, or I watch videos on the internet."(P7)
		"I read first the topic and answer the questions."(P1)
		"not entirely all sir, I had help with the others like for example there are times na I educate myself first like through internet before I answer because there are times na I don't understand the module so I study first online through YouTube or google" [Translation: Not entirely, sir. I received help from others. For instance, there were times when I had to educate myself first through the internet before answering because there were topics in the module that I didn't understand. So I studied online first through YouTube or Google.](P3)
iv.	Independent Learning	*"Yes, I usually looked everything up the internet. Other times if I know how the equation worked, I'd do it on my own."* (P3)
		"two tips I would like to share to any of my relatives do your activities before the deadline and as much as possible do not grind" (P10)
		"math is sometimes difficult but with being resourceful and time wise, you can achieve your goal; and by goal I mean answering all of the activities in your math modules. I wish teachers would share links to video discussions/tutorials aside from the examples on the module" (P12)
		So there are times that we really need to ahh self-teach which is also kind of difficult because we all have different levels of comprehension. So there are other people na they find it hard to you know independent when it comes to studying."[Translation: So there are times when we really need to self-teach, which is also kind of difficult because we all have different levels of comprehension. There are some people who find it hard to be independent when it comes to studying.](P3)
		"Learning the concept on my own sir, like mayda mga topics na makuri talaga intindihon then waray teacher na ma guide ha imo tapos ha balay dere man liwat mag aram. Asya nag youtube tutorial nala pero danay makuri la gihap maintindihan" [Translation: I had to learn some

of the concepts on my own, sir. There were topics that were difficult to understand without a teacher to guide me, and studying at home was also challenging. While there were YouTube tutorials available, some concepts were still difficult to comprehend.](P6)

"… it is quite challenging since you are the only one studying."(P7)

"it makes me independent learner."(P9)

3.	Support System during MDL	i.	Support
		ii.	Guidance
4.	Emotional Factors	i.	Positive Emotional Experiences in MDL

Support:

"It was difficult to learn without instructor /discussions."(P12)

"Ako ang tipo ng istudyante na kapag kaya ko pang masulba ang sarili kong tanong ay gagawan ko nalang ito ng paraan ngunit pag kailangan na ng tulong sa mga guro ako naman ay nag bibigay ng mensahe sa kanila at binabahagi ang aking natutunan at kasama na diyan ang tiyempo sa pag tatanong sapagkat kailangan bigyan ng considerasyon ang oras ng mga guro. Ito ay naging maalap dahil sa kulang sa resources at ganun na rin sa kulang ng gabay sa mga guro at parents."[Translation: I am the type of student who tries to find solutions to my own questions, but when I need help from my teachers, I reach out to them and share what I have learned, including the time I spent asking questions because I understand that teachers' time is valuable. This has been a difficult journey due to the lack of resources and guidance from teachers and parents.] (P2) *"sometimes, I am not a fast learner so when I encountered an activity that I can't handle then my close classmate will do help me out from it."*(P10)

Guidance:

"Ito ay naging maalap dahil sa kulang sa resources at ganun na rin sa kulang ng gabay sa mga guro at parents."[Translation: This has been a difficult journey due to the lack of resources and guidance from teachers and parents.](P2)

"So unlike before parang if there's something that we don't understand its easy to approach the teacher unlike now na there are different factors like for example internet connection for our researching, schedule noong teacher for which they could be busy to answer questions" [Translation: So unlike before, it was as if when there was something we didn't understand, it was easy to approach the teacher. But now, there are different factors like, for example, internet connection for our research, and the teacher's schedule, which could make them too busy to answer questions.](P3)

"It is hard to understand without a teacher personally teaching you because you cannot ask questions."(P7)

Positive Emotional Experiences in MDL:

"Mahirap sa umpisa lalo na sa hindi pag kakaroon ng sapat na lakas ng internet connection, pero hindi naman dun nagtatapos ang experience na yun, naging challenging siya sa magandang paraan dahil natuto akong magkaroon ng pasensiyang intindihin ang mga lesson at natuto akong intindihin ang sitwasyon at mga inaaral ko dahil doon ay naging mas madali na ang distance learning saakin. Ako ang tipo ng istudyante na kapag kaya ko pang masulba ang sarili kong tanong ay gagawan ko nalang ito ng paraan ngunit pag kailangan na ng tulong sa mga guro ako naman ay nag bibigay ng mensahe sa kanila at binabahagi ang

aking natutunan at kasama na diyan ang tiyempo sa pag tatanong sapagkat kailangan bigyan ng considerasyon ang oras ng mga guro. Ito ay naging maalap dahil sa kulang sa resources at ganun na rin sa kulang ng gabay sa mga guro at parents."[Translation: Starting out was difficult, especially without a reliable internet connection, but the experience didn't end there. It became challenging in a positive way because I learned to be patient in understanding my lessons and how to comprehend the situation and what I was studying. This made distance learning easier for me. I am the type of student who tries to find solutions to my own questions, but when I need help from my teachers, I reach out to them and share what I have learned, including the time I spent asking questions because I understand that teachers' time is valuable. This has been a difficult journey due to the lack of resources and guidance from teachers and parents.](P2)

"*I have the hold of time and no pressure ha pagtapos han mga modules especially kon makuri an topic. If makuri pwede ak anay mag youtube tutorial para ako mabaro anay ngan para liwat sir ma expound pa an mga lesson ha module. Usa pa sir is nagging independent learner ako during this pandemic which is good sir kay nabaro ako pa garam on my own.* " [Translation: I have control over my time and don't feel pressured when finishing my modules, especially when a certain topic is difficult. If I have trouble, I can watch YouTube tutorials to better understand the lesson in the module. Also, I have become an independent learner during this pandemic, which is good because I was able to learn on my own.](P6)

ii.   Emotional Strain

"the advantage of MDL is the chances of having quality time with family."(P10)

"*I like how I get to experience the challenge of mathematics at home that I

somehow also share it to my siblings. But overall, all of those things left a happy memory.*" (P5)

"*it was tiring annoying horrible and I could feel myself lose a part of me little by little. It was difficult, no one taught me to do anything and each day was a struggle*"(P11)

"*there were actually a lots of challenges sir like we were in the process of adjustment so bagan iba sir an approach bagan mas makuri an comprehension yana especially because we are easily diverted because of technology diverted and amon attention*" [Translation: There were actually a lot of challenges, sir, particularly in the process of adjustment to a new approach which made comprehension more difficult, especially since we are easily distracted by technology, diverting our attention.](P3)

"… *I don't have the motivation or interest to study unlike with face-to-face.*"(P9)

"*challenges in focusing on my studies plus I am shy to ask my teachers when I can't understand the lesson.*" (P10)

"*it is not an easy and enjoyable*"(P10)

5. Advantages of MDL	"*I don't see any advantage. It's like were spending money to print a lot of modules but in the end we are not learning something.*" (P1) "*No advantages for MDL, just complying without further a due.*"(P4) "*Math is necessary but sometimes these equations cause depression.*"[Translation: Math is necessary, but sometimes the equations can be overwhelming and cause stress.] (P11) "*There are advantages naman like easily access a lot of information through the internet and also I have a lot of free time here at home*"(P3) "*I have the hold of time and no pressure ha pagtapos han mga modules especially kon makuri an topic. If makuri pwede ak anay mag youtube tutorial para ako mabaro anay ngan para liwat sir ma expound pa an mga lesson ha module. Usa pa sir is nagging independent learner ako during this pandemic which is good sir kay nabaro ako pa garam on my own.*" [Translation: I have control over my time and don't feel pressured when finishing my modules, especially when a certain topic is difficult. If I have trouble, I can watch YouTube tutorials to better understand the lesson in the module. Also, I have become an independent learner during this pandemic, which is good because I was able to learn on my own.] (P6) "*I had some alone time. I was holding my time.*" (P11) "*I had the liberty to choose the time whenever I will do or answer my modules and they would provide examples and links to video tutorials in the module.*" (P12)

Theme 1. Challenges of Modular Distance Learning

The theme of Challenges of Modular Distance Learning in mathematics emerged from the responses of Grade 11 STEM students. The sub-themes include Challenges in Understanding, Challenges in Mathematics, Challenges in Modules, Challenges at Home, and Challenges in Internet Connection. Challenges in Understanding were highlighted by participants who found it difficult to comprehend lessons without teacher guidance and interaction (P1, P7). Challenges in Mathematics arose due to the complex nature of the subject and the absence of a teacher's guidance (P8). Challenges in Modules were evident as participants struggled with the volume of activities and limited examples in modules (P5, P12). Challenges at Home included distractions, lack of motivation, and difficulties in finding a suitable study environment (P9, P11). These sub-themes, supported by the findings of Glenn Aviles et al. (2021) and Douglas G. Smith et al. (2017), highlight the importance of addressing these challenges to enhance the effectiveness of modular distance learning.

Theme 2. Adaptation and Coping Strategies in Modular Distance Learning

This theme presents the Adaptation and Coping Strategies employed by Grade 11 STEM students in modular distance learning. The analysis reveals sub-themes including Adaptation to the Learning Modality, Utilization of Online Resources, Learning Strategies, and Independent Learning. Students have adapted by adjusting study habits, routines, and developing new skills for self-directed learning (Participant 2; Participant 5). They utilize online resources such as YouTube and Google to supplement their learning and seek clarification (Participant 8; Participant 10). Students employ various learning strategies such as thorough reading, note-taking, and seeking help when needed (Participant 2; Participant 3). Furthermore, they develop independence and self-reliance as they take charge of their learning (Participant 9; Participant 2). These findings align with previous research emphasizing the importance of self-regulated learning (Latipah, E. 2015), time management (Vurain Tabvuma et al., 2021), and critical evaluation of online resources Hsieh, Y. (2017). Teachers should provide support and guidance to enhance students' learning outcomes in modular distance learning (Participant 7; Participant 3).

Theme 3. Support System during MDL

The support system during modular distance learning (MDL) plays a crucial role in students' success and well-being. The sub-theme of Support explores the challenges students face in receiving assistance and guidance from teachers (P1, P7, P12). Social support and guidance from teachers have been found to alleviate stress and promote students' motivation and academic performance (Kuo et al., 2018; Son et al., 2019). The sub-theme of Guidance emphasizes the importance of teachers' guidance in understanding modules and developing study skills (P2, P3). Clear instructions, regular communication, and teacher training are vital in providing effective support and guidance in MDL (Dintzis et al., 2016; Rana & Sahu, 2020). Addressing these challenges and providing adequate support and guidance can enhance students' learning outcomes and well-being in MDL.

Theme 4. Emotional Factors Experienced during MDL

The emotional factors experienced by students during modular distance learning (MDL) are significant and can impact their well-being and academic performance. The sub-theme of Positive Emotional Experiences in MDL highlights the sense of independence, flexibility, and autonomy students have experienced in their learning (P2, P5, P6). These positive experiences align with previous studies that have shown the positive impact of online learning on self-efficacy, engagement, and motivation (Li et al., 2018; Kuo et al., 2021). However, it's important to acknowledge that not all students may have had positive experiences, as some participants mentioned feelings of fatigue, difficulty, and lack of guidance (P11, P9). The sub-theme of Emotional Strain emphasizes the challenges faced by students, including feelings of exhaustion, distraction, and frustration (P3, P10, P11). Similar findings have been reported in previous studies that highlight the emotional strain associated with distance learning (Karasar & Simsek, 2021; Franziska Heidrich et al., 2022). To support students' emotional well-being in MDL, it is crucial for teachers to be approachable, provide guidance, and create a supportive learning environment. Flexible policies, extended deadlines, and access to additional resources such as video discussions or tutorials can also help alleviate emotional strain and enhance the overall performance of the students during modular distance learning.

Theme 5. Advantages of MDL

Theme 5 explores the advantages of modular distance learning (MDL) as perceived by the participants. The advantages identified include easy access to information through the internet, having free time at home, control over their time, the ability to watch YouTube tutorials to enhance understanding, becoming independent learners, having alone time, and the freedom to choose when to complete modules. These advantages align with previous research highlighting the flexibility, convenience, and autonomy provided by online learning, leading to increased student engagement and positive learning outcomes (Means et al., 2016; Allen & Seaman, 2017). The participants' experiences reflect the benefits of MDL in terms of accessibility, personalized learning, and self-directed study.

Limitations

The findings are based on data from a specific group of participants, which may limit the generalizability of the results. The study focused on a specific context of MDL during a pandemic, and a typhoon while other phenomenon such as volcanic eruption, and flooding was not included for which the findings may not fully represent the challenges and strategies in other educational settings. Additionally, the study did not explore the perspectives of teachers and parents, whose insights could provide a more comprehensive understanding of the limitations and opportunities of MDL. In addition, due to the characteristics of qualitative research, the sample size of this study was limited. The participants were from Catbalogan City Division only. Non–city area was not part of the study in which the experiences may be different from those students in such area. Further research is needed to address these limitations and provide a more comprehensive understanding of MDL and its impact on students' learning experiences.

CONCLUSIONS AND RECOMMENDATIONS
Conclusions

The study highlighted the significant challenges faced by Grade 11 STEM students in math when engaging in modular distance learning (MDL). These challenges included difficulties in understanding complex topics, coping with mathematical concepts, navigating through the modules, managing distractions at home, and dealing with internet connectivity issues. Addressing these challenges is crucial to ensure students' success in MDL.

Adaptation and coping strategies played a vital role in students' experiences and outcomes. Students had to adapt to self-directed learning, limited teacher guidance, and the use of technology for learning. Effective coping strategies included utilizing online resources, seeking help from teachers and online platforms, developing self-regulated learning skills, managing time effectively, and fostering independent learning.

The support system provided to students during MDL was crucial for their success. Students expressed difficulties in receiving assistance and guidance from teachers due to the lack of face-to-face interaction. The study emphasized the importance of teacher support and guidance, as well as the provision of resources, clear communication channels, and social support to enhance students' motivation, well-being, and academic performance.

Emotional factors significantly influenced students' experiences during MDL. Positive emotional experiences included feelings of independence, autonomy, and flexibility, while emotional strain arose from feelings of isolation, anxiety, and stress. Supporting students' emotional well-being required an approachable support system, flexible policies, and social support. Recognizing and addressing the emotional challenges students face contributes to a more positive and supportive MDL environment.

MDL offered several advantages to Grade 11 STEM students in math. These advantages included easy access to information through the internet, increased free time, control over one's schedule, and the ability to utilize online resources like YouTube tutorials. MDL also provided opportunities for self-paced learning and individual exploration of resources, fostering independent learning and autonomy.

Overall, the study emphasized the importance of addressing the challenges, supporting students' adaptation and coping strategies, providing an effective support system, addressing emotional factors, and recognizing the advantages of MDL in enhancing the experiences and outcomes of Grade 11 STEM students in math. These findings provide valuable insights for educators and stakeholders to optimize the implementation of MDL in the context of mathematics education.

Recommendations

Teachers should provide comprehensive guidance and engage actively with students. Schools should optimize module designs and improve home study spaces and internet connectivity. Investment in training programs for effective online teaching strategies is suggested. Regular feedback and stress management activities could enhance emotional well-being. Maximizing MDL's advantages requires leveraging online resources and platforms and promoting student autonomy and self-paced learning.

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