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Modular and Online Learning Satisfaction in Mathematics Amid COVID-19: Implications for New Normal Teaching Practices

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ABSTRACT

During COVID-19, ensuring that students were fulfilled with the quality of learning they received posed issues, especially for students learning mathematics in a modular and online setup. The purpose of this study is to determine the modular and online learning satisfaction in mathematics of the student- respondents, in the context of the COVID-19 pandemic. A descriptive cross-sectional research design was employed to provide a snapshot of the two hundred forty-six (246) junior and senior high student- respondents' modular and online learning satisfaction in mathematics, along with the measured parameters. Based on the results, the respondents indicated that they were satisfied with the implemented modular learning in mathematics during the pandemic. On the online learning aspect, the respondents expressed a moderate level of satisfaction with their online learning experience. Educational institutions must innovate and keep up with the new normal teaching practices to ensure that the quality of education is sustained over time. Recommendations were also provided to assist the entire academic community in understanding how students approach the mathematics subject in the modular and online learning contexts.

INTRODUCTION

The Coronavirus disease (COVID-19) produced by the SARS-CoV-2 virus posed difficulties in providing basic education, with students barred from attending in-person classes in order to prevent the spread of the virus. Educational authorities around the world implemented various learning modalities to ensure the continuity of education and to address the difficulties experienced by both teachers and students who were used to the conventional face-to-face classroom setting (Agaton & Cueto, 2021; Ferri *et al.*, 2020; Patra *et al.*, 2021). In the Philippines, modular and online learning modes were the most preferred alternatives since face-to-face classes were strictly prohibited during the pandemic. While online learning was typically conducted through *Google Meet, Zoom*, and *Cisco Webex* video conferencing software, several learning management systems (LMS) like *Google Classroom, Edmodo*, and *Moodle* platforms were utilized to deliver students' modules and assigned tasks. These alternatives allowed students to keep up their education despite the pandemic but ensuring that they were fulfilled with the amount of learning they received during the pandemic created problems, particularly when it comes to understanding mathematics lessons conveyed in a modular and online setup.

Whether students are taking mathematics classes offline or online, self-paced learning represents a major shift in the way that mathematics is taught in the new normal education. Understanding mathematics is undeniably one of the disciplines that students find challenging throughout the pandemic because it demands them to dedicate more time and practice to master the underlying mathematical concepts and procedures. The subject's natural complexity also makes it difficult for most students to understand it quickly, even when taught in a face-to-face setting (Attard & Holmes, 2020; Quinn & Aarão, 2020). Due to the pandemic, the students were left with no other options but to learn mathematics at their own pace with minimal supervision, which for them exemplifies a significant change and adds a new level of difficulty. Gafoor and Kurukkan (2015) also pointed out that students' lower self-efficacy is closely correlated with their perception of mathematics as a difficult subject, rather than their dislike of the subject. In addition, Wang (2013) indicated that the students' lack of exposure to mathematics and study habits also have an impact on their motivation to learn the subject.

Furthermore, the importance of the students' roles in paying closer attention to their learning processes was highlighted more as a result of the pandemic-related learning; thus, they struggled to cope with the new learning system, as they were used to face-to-face interactions with their teachers prior to COVID-19. Despite several studies being done both domestically and internationally that focused on students' perceptions of blended learning, lived experiences, COVID-19 fear, and how it affects their academic progress, the students' satisfaction with online and modular learning, particularly in mathematics amid the pandemic, has not been fully ascertained in terms of some identified parameters measured in this study. This present study could contribute to the corpus of knowledge regarding the use of online and modular learning in mathematics and likewise provide implications for the new teaching practices in the post-pandemic period. The study further intends to help the teachers, parents, administrators, and other interested parties

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better understand how students approach mathematics in modular and online settings.

Study Objectives

This study mainly focused on determining the modular and online learning satisfaction in mathematics of the student- respondents, in the context of the COVID-19 pandemic. Particularly, this study sought to address the following objectives: (1) determine the respondents' satisfaction with modular learning in terms of (a) teaching, assessment, and learning; (b) feedback on the tutor; and (c) overall modular learning quality; and (2) determine the respondents' satisfaction with online learning in terms of (a) effectiveness of the feedback; (b) timeliness of the feedback; (c) dialogue between teachers and students; (d) perceptions of online experiences; (e) teacher characteristics; (f) the feel of a learning community; and (g) computer-mediated communication.

LITERATURE REVIEW

This section presents a review of related literature that examines previous study findings, highlighting the issues, challenges, and degree of complexity of the implemented teaching and learning approaches encountered by the students during the pandemic.

The COVID-19 pandemic caused community lockdowns and physical restrictions on the education sector, including temporary school closures to contain and prevent virus transmission (Owusu *et al.*, 2020; Wajdi *et al.*, 2020; Mumtaz *et al.*, 2021). The crisis also had an adverse impact on disadvantaged students, who were deprived of access to the support systems required for distance education (Singh *et al.*, 2020; Onyema *et al.*, 2020). Widodo *et al.* (2020) recommended that as traditional face-to-face learning approaches were not appropriate for distance learning, a well-planned preparation for distance learning must be performed. This implies that higher-level authorities and school administrators must collaborate with teachers to resolve the demands in the implementation of distance education in order to speed up the provision of educational services. Electronic resources were also regarded to be necessary during the COVID-19 outbreak to maintain continuous communication between students and teachers, disseminate instructional materials, and access online platforms (Marbán *et al.*, 2021; Chukwuemeka *et al.*, 2021).

Moreover, Toquero (2021) asserted that many higher education institutions, whether private or public, were not prepared to adapt to the sudden changes in the delivery of modular and online learning. Correspondingly, De Freitas *et al.* (2015) noted that for online learning to be successful, educational institutions need to advance and become more adaptive. Further, Borba *et al.* (2016) highlighted the significant development of mobile technology in teaching mathematics, implying that mobile devices can improve students' mathematical ability. Due to the volume of learning resources that students accessed online for free, Rodrigues *et al.* (2019) emphasized the importance of using online resources for learning and the possibility of developing student self-efficacy (Dagalea *et al.*, 2022; Rodriguez & Abocejo, 2018), particularly in mathematics learning. Similar to how the teaching and learning process was being shifted online on an extraordinary and experimental scale, student assessments were also being conducted virtually (Elumalai *et al.*, 2021), with much doubt about assuring quality and whether it takes into account students' multiple intelligences (Cabuquin, 2022). This major shift to online student assessments and adjustments to grading schemes was deemed inevitable amid the pandemic (Gamage *et al.*, 2020; Binks *et al.*, 2021).

In addition, creativity and innovation for technology-based and integrated learning had previously been established and subjected to thorough examinations to ascertain its efficacy on students' learning before the COVID-19 pandemic (Kim *et al.*, 2021; Dasopang, 2021). In a similar way to a flipped classroom, blended learning combines synchronous and asynchronous learning (Zacharis, 2015; Waha & Davis, 2014; Li *et al.*, 2021) and offers a variety of online resources for students to study on their own before classes. The integration of modular learning modality via LMS platforms and the execution of distance classes via online video-meeting software platforms provide context for how blended learning modality is instigated. Students' modules were delivered through emails or online learning management systems, and online link-up sessions were also held and arranged. Borba *et al.* (2021) and Busto (2021) also noted that blended learning is a strategy that permits the same lesson to be delivered to two independent audiences-one in person and the other online. Blended learning can also be described as a broad form of teaching that combines technological adaptation with conventional in-class pedagogical approaches (Sumandiyar *et al.*, 2021; Krismadinata *et al.*, 2020).

The lack of student participation likewise caused challenges to integrating modular and online learning during the pandemic, as students were accustomed to conventional teaching methods. According to Akın *et al.* (2016), a number of issues including inadequate time management, the students' attention and degree of discipline, and the diversity of their backgrounds, affected them to participate less in class. Octaberlina and Muslimin (2020) specified that the students' learning styles were also a barrier to the implementation of modular and online learning. This could imply that the preferred learning styles of the students were incompatible with a modular or online learning approach. Students also struggled with time management (Escoto & Alfarero, 2022; Cuñado & Abocejo, 2019) as a result of the two learning modalities they were exposed to, amid the pandemic (Ahmad *et al.*, 2020). However, Ceylan and Kesici (2017) mentioned that students who participated in distance education had better academic scores than students in traditional classes. Meanwhile, students also encountered issues such as a lack of knowledge of the LMS (Gillis & Krull,

2020), distractions at home (Tu & Luong, 2021), lack of interest to answer activities in the modules (Wijanarko *et al.*, 2020), and the inability to pay attention to their virtual classes during the pandemic.

Furthermore, Abdullah *et al.* (2021) asserted that the COVID-19 lockdown had various negative effects on mental health, including feelings of isolation, despair, anxiety, and among others. Depression also impaired the student's ability to think rationally (Ede *et al.*, 2022), since the distress created by the pandemic affected their desire to learn (Sifat *et al.*, 2022) and online social media platforms did not help them to overcome the news of fatalities and sufferings (Ho *et al.*, 2022). These conditions experienced by the students amidst the pandemic indicated a serious concern about efficiency and productivity in doing school-related tasks because of the enormous emotional strain caused by the pandemic. Zhang *et al.* (2021) and Allen *et al.* (2022) added that the new way of learning greatly affects students' development and social relationships, while also disrupting their parents' productivity at work because they must constantly check their children's engagement in school-related activities.

Along with this abrupt transition in the delivery of learning is a discussion about whether the implementation of the new normal education can continue in the post-pandemic period (Mello & Grobmeier, 2021), or otherwise. The effect of this modality on the teaching and learning environment is what the educational system is most interested in finding out. Knowing how satisfied students were with online and modular learning amid the COVID-19 pandemic, particularly in mathematics, could then help the entire academic community better understand how students approach the subject in these types of learning environments.

MATERIALS AND METHODS

This section outlines the research design, research locale, respondents and sampling technique, ethical considerations, research instrument, data gathering procedure, and treatment of data.

Research Design

This study employed the descriptive cross-sectional research design intended to provide a clear picture of the respondents' modular and online learning satisfaction in mathematics during COVID-19. A cross-sectional study is a form of observational research that looks at information from a population at one particular time (Wang & Cheng, 2020). Likewise, descriptive research entails gathering data that investigate events, organizing, tabulating, depicting, and describing statistical data without any manipulation.

Research Locale

The study was carried out at a certain laboratory school in Eastern Visayas, Philippines, that provides junior and senior high school education. In the academic year 2020-2021, the school had a total of 677 secondary students, 450 of whom were registered in the junior high school program and 277 in the senior high school program. Furthermore, due to the significant health concerns that full face-to-face classes can provide, the said school implemented modular and online learning modes of instruction during the said academic year.

Respondents and Sampling Technique

The respondents of the study were 246 junior and senior high school students from the said laboratory school who were identified using Cochran's Formula for calculating sample size and were chosen using the stratified random sampling technique. This type of probability sampling was used because the study's target population included vertical class stratifications ranging from grade levels 7 to 12. Furthermore, pure random sampling was used in the actual sample selection, with 41 samples proportionally chosen at random in each grade level. Since there was only a single random selection performed and no in-depth population knowledge was required, this random sampling technique was the simplest of all the probability sampling techniques. Anyone under a population had an equal probability of being chosen as a respondent. Further, Table 1 displayed the profile distribution variables for the respondents.

Ethical Considerations

Table 1: Distribution of the respondents according to their profile variables

Profile Variables	Frequency	Percent
Age		
Above 17 years old	56	22.76
15-17 years old	97	39.43
12-14 years old	93	37.80
Sex		
Male	119	48.37
Female	127	51.63
Grade Level		
Grade 12	41	16.67
Grade 11	41	16.67
Grade 10	41	16.67
Grade 9	41	16.67
Grade 8	41	16.67
Grade 7	41	16.67

Note: No. of cases = 246

The information gathered from the respondents was carried out in full confidentiality and was only used to achieve the objectives of the study. The respondent's participation was voluntarily given, and they were free to withdraw at any time without incurring an impact on their academic standing. The study's integrity and accuracy were upheld by not manipulating the data, which also placed a high value on the respondent's privacy and

profile. The availability, location, willingness, and internet connectivity to access and participate in data collection were all thoroughly considered.

Research Instrument

The study utilized an adapted scale survey- instruments on Student Experience on a Module Survey and Satisfaction of Online Learning instrument developed by Wylie (n.d.) and Davis (2014) in the 5-point Likert scale (1- Strongly disagree, 2- Disagree, 3- Neutral, 4- Agree, and 5- Strongly agree) which was then interpreted correspondingly in this study as "1- Not satisfied, 2- Slightly Satisfied, 3- Moderately Satisfied, 4- Satisfied, and 5- Very Satisfied". The first instrument comprised 3 sections namely the teaching, assessment, and learning with 9 statements, feedback on the tutor (9), and overall modular learning quality (5), with a total of 23 statements used to determine the modular learning satisfaction of the respondents. Meanwhile, the second instrument comprised 7 sections namely the effectiveness of the feedback with 3 statements, timeliness of the feedback (3), dialogue between teachers and students (3), perceptions of online experiences (3), teacher characteristics (3), the feel of a learning community (3), and computer-mediated communication (3), with a total of 21 statements used to measure the online learning satisfaction of the respondents amid COVID-19.

Data Gathering Procedure

The effort to gather data from respondents without needing to interact physically or face-to-face due to the pandemic did not stop this study from moving forward. Prior to data retrieval, permission was humbly requested from the head of the concerned school through a request letter, describing the purpose of the study. When approval was obtained, it was ensured that the respondents were not forced to participate in accordance with informed consent. Moreover, the data for the study was gathered at the end of the second quarter of the semester of the academic year 2020-2021, using an online text-editing and storage platform, specifically *Google Forms*. The link to the survey embedded in *Google Forms* was sent to the respondents' respective email addresses with the assistance of their teacher-advisers. The survey-questionnaire was administered with enough time for the respondents to answer. The data was then carefully examined shortly after it was collected.

Treatment of Data

The gathered data in this study were summarized and presented in textual and tabular formats. Similarly, frequency counts, percentages, and weighted means were utilized in describing the respondents' levels of modular and online learning satisfaction in mathematics amid COVID-19. MS Excel spreadsheet software was likewise utilized in processing the collected data.

RESULTS AND DISCUSSION

This section shows the textual and tabular presentations of the respondents' satisfaction with modular and online learning along with the specified parameters.

Table 2 presents the mean distribution of the

Table 2: Mean Distribution of the respondents' modular learning satisfaction

Modular learning indicators	WM	QD
Teaching, Assessment, and Learning		
1. "I am satisfied with how the mathematics module materials were presented as it helped to maintain my interest."	3.72	S
2. "The study workload on this mathematics module fitted my personal circumstances."	3.54	S
3. "I am satisfied with the structure of the mathematics module because it allows me to interact with my peers while learning."	3.42	S
4. "Resources I accessed through Google classroom helped me to understand the core concepts of the mathematics module."	3.77	S
5. "I am satisfied with the opportunities I had to attend tutorials (either face-to-face or online)."	3.39	S
6. "Sufficient opportunities were provided to check my understanding of the module, for example by completing exercises and problem sets."	4.23	VS
7. "The instructions on how to complete the assessed tasks were easy to follow."	4.20	S
8. "The module materials were clearly related to the assessed tasks in this module."	4.38	VS
9. "There was enough time in the study planner to prepare for the end-of-module assessment."	3.61	S
Feedback on the Tutor		
10. "Contact from my tutor at the start of the mathematics module helped me get started with my studies."	3.84	S
11. "I could get in touch with my tutor when necessary."	3.48	S
12. "I am satisfied with the support provided by my tutor on this mathematics module."	3.93	S
13. "My tutor encouraged me in my studies."	4.27	VS
14. "My tutor used a friendly/personal tone in feedback on my assessed tasks."	4.02	S
15. "My tutor's feedback on assessed tasks explained the mark that I received."	3.94	S

16. "My tutor's feedback on assessed tasks helped me prepare for the next assessment."	3.62	S
17. "My tutor's feedback on assessed tasks helped me to learn."	3.38	MS
18. "My tutor supported me in developing professional or work-related skills."	3.40	MS
Overall modular learning quality		
19. "I have received sufficient advice and guidance in relation to my mathematics module."	4.23	VS
20. "I have a clear idea about my next module choice."	3.37	MS
21. "I am satisfied with the quality of the mathematics module."	3.66	S
22. "I would recommend self-paced learning to other students."	3.35	MS
23. "My studies have helped me develop my self-confidence."	3.47	S

Note: 4.21 – 5.00 = Very satisfied (VS); 3.41 – 4.20 = Satisfied (S); 2.61 – 3.40 = Moderately satisfied (MS); 1.81 – 2.60 = Slightly satisfied (S); 1.00 – 1.80 = Not satisfied (NS); WM = Weighted Means; QD = Qualitative Description

respondents' satisfaction with modular learning. In terms of measures for instruction, assessment, and learning, the respondents generally stated that they were satisfied with modular learning in mathematics during the pandemic. It could signify that the exercises and problem set in their mathematics modules provided them enough chances to test their comprehension, helping to keep them engaged in the subject they were learning. Their modular learning satisfaction could also be attributed to the type of support provided by their tutors or parents, who also acted as mentors to aid them in comprehending their mathematics subject.

This study backs up the findings of Tugano *et al.* (2022), who found that students were satisfied when they received individualized mentorship along with a timely response to their questions, as well as the monitoring of their progress and feedback mechanisms (Saraspe & Abocejo, 2020). The outcomes of the study conducted by Abbasi *et al.* (2020) also showed that the respondents were satisfied with the promptness of the teachers' responses, the quality of the feedback on their assessments and assignments, and their ability to adhere to the deadlines and timetables for their coursework.

In terms of their overall mathematics modular learning quality, the respondents stated that they were very satisfied with their mathematics teachers' advice and guidance on how to complete the activities indicated in their mathematics module, as evidenced by the weighted mean of 4.23. On the other hand, as shown by the weighted mean of 3.35, the respondents stated that they were only moderately satisfied when it came to supporting self-paced learning to other students. This may be because the subject seems to be complex when learned by the respondents independently, at their own pace, and with minimal teacher supervision, particularly during a pandemic. In a similar vein, learning mathematics via modules would demand more time and practice on the part of students in order for them to master the underlying mathematical concepts and procedures. Because of the subject's complex nature, most students have difficulty comprehending it quickly, even when taught face-to-face (Attard & Holmes, 2020; Quinn & Aarão, 2020).

According to Bustillo and Aguilos (2022), the integration of learning through a modular approach during COVID-19 to continue the students' learning process, created challenges for both the students and academic institutions. The majority of students struggled to finish their assignments because of the many obstacles they faced along the way (Moawad, 2020).

These include issues with insufficient learning materials, a lack of understanding of the module's contents and assessment instructions, an unfavorable learning environment, too many remote learning activities, and mental health issues. Tugano *et al.* (2022) also noted internet connectivity as a critical concern in modular learning, since students still accessed the internet to find reliable information, tutorial videos, and online lectures that would help them answer problems found in their mathematics module. Resolving issues on internet access and bandwidth requires priority attention in order to alleviate the present challenges that students encountered while learning amid the pandemic.

Table 3: Mean Distribution of the respondents' online learning satisfaction

Online learning indicators	**WM**	**QD**
Effectiveness of the feedback		
1. "I am satisfied with my online learning experience because effective feedback related to my class work is constantly provided to me in terms of clarification for my questions about the course (e.g. assignments)."	3.61	S
2. "I am satisfied with my online learning experience because effective feedback related to my class work is constantly provided to me in terms of instruction on how to fix incorrect problems in assignments."	3.55	S
3. "I am satisfied with my online learning experience because effective feedback related to my class work is constantly provided to me in terms of sufficient explanations of my specific questions related to my class work."	3.40	MS

Timeliness of the feedback		
4. "I am satisfied with my online learning experience because timely feedback related to my class work is constantly provided in order to complete my assignments efficiently."	3.38	MS
5. "I am satisfied with my online learning experience because timely feedback related to my class work is constantly provided to improve my assignments for better grades."	3.82	S
6. "I am satisfied with my online learning experience because timely feedback related to my class work is constantly provided to me so that I am more focused on learning."	3.75	S
Dialogue between teachers and students		
7. "I am satisfied with my online learning experience because I am able to communicate effectively with my mathematics teacher throughout the semester."	3.35	MS
8. "I am satisfied with my online learning experience because I feel less distant in my online learning due to online dialogue with my mathematics teacher."	2.86	MS
9. "I am satisfied with my online learning experience because online dialogue with my mathematics teacher helps me as I learn in the online course."	3.39	MS
Perceptions of online experiences		
10. "I am satisfied with my online learning experience because my personal needs as a student are met in the online environment."	3.26	MS
11. "I am satisfied with my online learning experience because many aspects (features) of online education are enjoyable to me as a learner."	3.38	MS
12. "I am satisfied with my online learning experience because overall, I would rather take online courses than traditional courses."	3.16	MS
Teacher characteristics		
13. "I am satisfied with my online learning experience because I still get the same explanation from online teachers as I do from traditional teachers."	3.27	MS
14. "I am satisfied with my online learning experience because online teachers and traditional teachers offer the same amount of help with my learning issues."	3.85	S
15. "I am satisfied with my online learning experience because technology makes online teachers more creative in teaching than in a more traditional classroom."	3.02	MS
The feel of a learning community		
16. "I am satisfied with my online learning experience because the online environment is like a community where I can communicate with other students."	3.29	MS
17. "I am satisfied with my online learning experience because the online environment promotes sufficient sharing and caring among students."	2.58	SS
Computer-mediated communication		
19. "I am satisfied with my online learning experience because computer-mediated communication makes me feel like a real person when I communicate in an online environment."	3.77	S
20. "I am satisfied with my online learning experience because computer-mediated communication makes it easier to form meaningful relationships among students in the online environment."	2.93	MS
21. "I am satisfied with my online learning experience because it allows me to feel the presence of my teacher and other students in the online environment."	3.38	MS

Note: 4.21 – 5.00 = Very satisfied (VS); 3.41 – 4.20 = Satisfied (S); 2.61 – 3.40 = Moderately satisfied (MS); 1.81 – 2.60 = Slightly satisfied (S); 1.00 – 1.80 = Not satisfied (NS); WM = Weighted Means; QD = Qualitative Description

The mean distribution of the respondents' satisfaction with online learning is displayed in Table 3. In terms of feedback effectiveness, respondents indicated that they were satisfied with their online learning experience because their mathematics teacher consistently provided effective feedback in the form of explanations for their queries about the lesson and guidance on how to fix their erroneous computations, as evidenced by weighted means of 3.61 and 3.55, respectively. Receiving regular feedback encourages students to concentrate their time and effort more effectively and avoid future mistakes. Carless (2022) also emphasized the significance of feedback in terms of enhancing students' learning experiences, since it can be used as an engaging method of student-teacher and student-student engagement in an online environment.

Similarly, when asked about the promptness of the feedback for online learning, the respondents indicated that their mathematics teacher also offered timely feedback, which allowed them to become more focused on learning mathematics online and to improve their

assignments for higher marks. Thai *et al.* (2017) pointed out that learning environments wherein feedback is delivered promptly would lead to higher learning performance. This supports the findings of Nadolski and Hummel's (2017) study, which stated that feedback should be given regularly and in a reasonable timeframe since the more closely the feedback relates to actual performance, the more strongly it will affect future performance, aptitude (Mingoa & Abocejo, 2021), and student motivation. However, Cheng (2017) asserted that providing written feedback is a time-consuming task and that it can be challenging for teachers to do so on a regular basis.

Moreover, classroom dialogue is a mediated communication that gives students a chance to express themselves and share their experiences in a group setting. Whether in a face-to-face or online setting, teachers interact with students to share knowledge or information that will help them better understand one another and build relationships. In this study, the respondents mentioned that they were moderately satisfied with their ability to communicate with their mathematics teacher in an online learning environment, as seen by the weighted means of 3.35, 2.86, and 3.39, respectively.

The respondents may have felt distant and less confident in their online class since they were unable to effectively communicate with their teacher in a virtual learning environment. Their response of "moderately satisfied" in terms of virtual classroom dialogue, can also be ascribed to the poor internet connectivity that prevents effective student and teacher interactions as well as the various problems they encounter when taking classes online. Further, Alawamleh *et al.* (2020) reported that online learning has a detrimental effect on interaction and its efficacy between teachers and students.

In terms of online experience perceptions, the respondents likewise expressed that they were only moderately satisfied with their mathematics online learning experience. It may be because their individual demands as a student were not satisfied in the online environment and that they found face-to-face learning to be more interactive and engaging than the online setup. Their moderately satisfying perception of online experience may also imply that they are less motivated and participative in listening to their mathematics teacher during online classes.

The respondents' inability to focus while listening to mathematics online may be due to some form of distractions like online games or utilizing other social media platforms. Furthermore, Akın *et al.* (2016) pointed out that a number of issues such as poor time management, level of discipline, and diverse backgrounds, caused the students to participate less in online learning.

With regard to the teacher characteristics, the respondents conveyed that they were also moderately satisfied with their teacher's willingness to creatively teach online and give the same amount of information about the lesson when compared to conventional classroom teaching. This may be due to the fact that during the pandemic, the educational system was not fully prepared to respond to the abrupt change in the way that learning was delivered as both teachers and students were still adapting to how the virus affected education. The students' engagement with online learning in mathematics may have also been affected by the lack of reliable and high-quality materials and resources as well as the intermittent internet service. De Freitas *et al.* (2015) highlighted that educational institutions need to innovate and become more flexible as to how they deliver instruction if they want online learning to be sustainable.

In addition, creating a productive learning environment that inspires students to enjoy exploring new things from end to end is essential (Mill, 2019). Truth be told that learning occurs not only in the classroom but also in various places and facets of one's life. Because of the pandemic, the students had no choice but to learn their lessons through modules or on an online platform. The weighted mean of 2.58 illustrates that respondents were only moderately satisfied with their mathematics online learning experience because they do not feel that the online environment fosters enough interaction among students. Most of them do not likewise see virtual classrooms as a place where students may engage and exchange ideas and experiences in the same way that they do in traditional classrooms.

Lasfeto and Ulfa (2020) pointed out that an active learning paradigm must be used to create a learning environment where students may acquire the necessary degree of comprehension since it recognizes the significance of student engagement and personality in the learning process.

With regard to computer-mediated communication (CMC), Ajabshir (2019) specified that CMC refers to various synchronous or asynchronous forms of human communication through networked computers, making it convenient to communicate across long distances and time zones, and removing the time and location barriers of in-person conversation. CMC is essential in distance learning modality, particularly in terms of communication between teacher and student and the delivery of various lectures in online sessions.

The respondents claimed, however, that CMC did not allow them to feel the presence of their teacher and other students to foster meaningful connections in an online setting. As displayed by the weighted means of 2.93 and 3.38, the respondents expressed that they were moderately satisfied with CMC amid the pandemic. The students' inability to access online platforms to communicate with their mathematics teacher and other students, as well as the type of gadgets they are utilizing for learning perhaps are the leading factors affecting their satisfaction with CMC.

Table 4 displays the levels of modular and online learning satisfaction of the respondents in mathematics, along with the measured parameters. As shown by the grand mean of 3.73, the respondents indicated satisfaction with the implemented modular learning in mathematics during

Table 4: Summary of modular and online learning satisfaction levels of the respondents amid COVID-19

Modular and online learning parameters	WM	QD
Modular Learning*		
1. Teaching, Assessment, and Learning	3.81	S
2. Feedback on the Tutor	3.76	S
3. Overall modular learning quality	3.62	MS
Online Learning**		
1. Effectiveness of the feedback	3.52	S
2. Timeliness of the feedback	3.65	S
3. Dialogue between teachers and students	3.20	MS
4. Perceptions of online experiences	3.27	MS
5. Teacher characteristics	3.38	MS
6. The feel of a learning community	3.09	MS
7. Computer-mediated communication	3.36	MS

*Note: *Grand Mean = 3.73 (Satisfied) **Grand Mean = 3.35 (Moderately Satisfied)*

the pandemic. Further, the grand mean of 3.35 revealed that the respondents were moderately satisfied with their online learning experience during the pandemic. Several possible factors affecting the respondents' moderate level of satisfaction with online learning include insufficiency of high-quality gadgets, interrupted mobile or internet connectivity, trouble in self-paced learning, and disruptions at home while attending classes online or answering activities in their module. Although taking online classes was the preferred alternative for learning during COVID-19, most students had difficulty obtaining internet access regularly due to a poor network connection (Leech et. al., 2022), which may have hampered their satisfaction with this modality. Li and Lalani (2020) also mentioned that when students are at home, they are oftentimes interrupted from their studies by their parents or siblings, who urged them to accomplish household tasks instead of taking online classes.

CONCLUSIONS

The study generally determined the respondents' modular and online learning satisfaction in mathematics with the intent to aid the teachers, parents, administrators, and other stakeholders in knowing how the students approach mathematics in modular and online settings in the context of the COVID-19 pandemic. Based on the results, a satisfactory level of the respondents' modular learning experience in mathematics was revealed, whereas only a moderate level of satisfaction was shown by the respondents with regard to online mathematics learning. To increase students' motivation to perform better in an online environment, teachers must employ more appropriate and interactive instructional strategies when teaching mathematics. Collaborative tasks may encourage students ' engagement during online lessons and foster social interactions, which will boost their excitement and degree of participation in the online mathematics learning process. Parents or guardians must provide regular support and supervision of the student's learning progress in order for the students to realize the importance of modular and online learning in the post-pandemic period.

Moreover, schools and the entire academic community must be adaptive and proactive in providing students with reliable learning resources and improved internet access and must keep up with the new normal teaching practices to ensure that the educational quality is sustained over time. Several reliable applications and resources for teaching mathematics online, such as Desmos, Geogebra app, Wolfram MathWorld, Khan Academy, and Math is Fun, could be integrated to increase students' interest in mathematics. Likewise, understanding how students approach mathematics in modular and online learning situations is critical as it will aid mathematics teachers to determine the optimal method for conveying the subject matter. The conduct of free and relevant onsite or online workshops and seminars for teachers must be emphasized to further refresh their knowledge and skills, increase their teaching competency, and showcase state-of-the-art teaching methods and practices suited for the new normal education post-COVID. Future research could be conducted to provide a more thorough understanding of the students' modular and online learning satisfaction in the mathematics discipline, taking into account other prominent variables that were not explored in this study.

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