

## Research Article

# Online Learning and Students' Mathematics Motivation, Self-Efficacy, and Anxiety in the "New Normal"

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With the pandemic's widespread effect, the "New Normal" in instruction in Philippine education embraces online learning. This study investigated the effect of online learning on students' motivation, self-efficacy, and anxiety in mathematics. The study employed quasi-experimental research, specifically a one-group pre-post-test research design. Two adapted research questionnaires on mathematics motivation, self-efficacy, and anxiety were utilized. Results show that students' mathematics motivation and self-efficacy have significantly decreased over the 6-week pilot test of synchronous online learning. Students' anxiety remained "High" before and after the implementation, indicating fear and uncertainty of the new normal in instruction. Furthermore, results found that slow and unstable Internet connection, less motivation to do self-study, plenty of activities at home, and chores were some of the main reasons students got difficulties in learning the subject matter and adjusting to the "New Normal." Results imply the improvement of online learning processes, emphasizing government projects for faster Internet connectivity. Also, emphasis on engaging classroom activities, especially in mathematics, must be established, improving learners' motivation and self-efficacy and decreasing anxiety.

## 1. Introduction

The COVID-19 pandemic has changed aspects of living, including the educational systems worldwide. The closure of schools led all face-to-face learning to suspension, compelling institutions to immediately employ online learning [1]. The shift to online learning is considered as the new normal in education. Online learning is a type of instruction mediated via the Internet [2, 3]. It could be synchronous or asynchronous where various technologies can facilitate the process [4, 5] and is alternate for students' learning [6]. Online learning is a kind of instruction that has been remarkable in the last decade [7–10]. It is cost effective, reaching more learners [11], and it is a widespread method in providing education at undergraduate and graduate levels [12]. An online learning environment provides user center features, user control, and communication, making instruction learner-centered [2]. Sun and Chen [5] emphasized that effective online instruction must depend on the well-designed course content, well-prepared and fully-

supported instructors, instructor and learner motivated interaction, establishing a sense of online learning community, and rapid advancement of technology.

*1.1. Motivation.* Student motivation is essential for success in online learning environments [13–16]. Motivation is "a theoretical construct to explain the initiation, direction, intensity, persistence, and quality of behavior, especially goal-directed behavior" ([17], p. 3). Self-Determination Theory (SDT) is a metatheory of human motivation and personal development [18]. It combines several minitheories explaining a detailed understanding of human motivation and functioning [19]. SDT's six minitheories account for human behavior across life domains, including work, relationships, education, religion, health, sports, and even stereotyping and prejudice [19]. SDT is based on the main assumption that people have inborn needs for competence, autonomy, and relatedness to other people and search for activities satisfying these needs [18], cited in [20].

The following are assumptions of SDT. First, motivation in a certain activity is determined by the (perceived) degree to which the activity offers feelings of competence, autonomy, and relatedness, including the current strength of these needs (subject to individual and state differences). The second assumption is that intrinsic motivation should be differentiated from extrinsic motivation. Intrinsic motivation is the better type of motivation for securing personal well-being and advancing personal growth. SDT also postulates that extrinsic motivation can be divided into four subtypes, including activities performed purely satisfying an external demand (external regulation) and activities performed to achieve fully internalized instrumental outcomes, and that is integrated into the repertoires of behaviors satisfying psychological needs (integrated regulation), “introjected regulation,” and “identified regulation.” Lastly, SDT assumes that perception of autonomy, and thus, also the “quality” of motivation, increases from situations of “external regulation” through to activities under “integrated regulation” [18, 21], cited in [20].

Motivation is a prerequisite element for student engagement in learning [22]. Research shows that a motivated learner has the inner strength in learning and adjusting to the school context demands [23], is more likely to be actively engaged, and displays improved performance, persistence, and creativity [24]. Online learning cannot be a possible substitute if these learners are not motivated enough [25], for lack of motivation is a reason for student attrition in distance education (Smith et al., 2005; Visser et al., 2002, cited in [26]). Lim and Kim [27] emphasized that motivating students in distance education is challenging, especially in circumstances where interaction is low, like self-directed online instruction. However, if the teachers are enthusiastic, sincere, and approachable, students’ motivation for online courses will be established. Teachers must design relevant learning activities such as online discussions to realize their goals, aspirations, and interests [28].

Student motivation is widely researched across a vast range of traditional educational settings [29]. However, Berkele [30] noted that research exploring motivation to learn in online environments is limited in both number and scope. Also, distance education motivation is mainly studied at the postsecondary level, and few were conducted at the high-school level [26].

*1.2. Self-Efficacy.* Self-efficacy is also a significant predictor of successful outcomes and satisfaction in online learning contexts [31]. In online learning, self-efficacy is considered a main psychological factor in students’ success [32]. Self-efficacy is the “beliefs in one’s capabilities to organize and execute the courses of action required to produce given attainments” ([33], p. 3). It is a self-assessment of one’s ability to deal with a task [11, 34].

Self-efficacy is a social cognitive theory suggesting that motivation affects both learning and performance [35] and emphasizes how people obtain knowledge, skills, beliefs, and strategies through their dealings with and observations of someone. Bandura’s [36] social cognitive theory is central to

this area of motivational research. It is based on the basis that there is a give-and-take interactive connection among personal factors, behaviors, and environmental influences. A central point of this theory is the idea of self-efficacy. Self-efficacy is defined as the belief that one can learn or perform at a specific level to achieve particular goals. Self-efficacy is focused on an individual’s beliefs about their performance capabilities for a specific task within a particular context that has yet to be undertaken.

Bandura [33] suggested that persons use information from many sources to judge self-efficacy. These include actual experiences (successes and failures), vicarious experiences (model observation), attributions, verbal persuasion, and physiological/affective states. Experience plays a major role in evaluating self-efficacy for a task, with success generally raising self-efficacy and failure dropping it. Ability and effort attributions affect self-efficacy, with positive attributions enhancing self-efficacy more than effort attributions [29].

Self-efficacy is a strong indicator of learners’ academic performance, but it also helps students adapt and cope with the new learning environment [37] and is influenced by gender, age, and domain [34]. It is an essential factor affecting motivation and learning [38]. According to Waaktaar and Torgensen (2013, as cited in [34]), physiological factors were also assumed to affect self-efficacy. People who have high confidence in their capabilities have a strong sense of efficacy where complex tasks serve as opportunities to hone their skills [39]. Several types of research on self-efficacy in online learning environments were conducted in higher education only. Self-efficacy in online learning environments is still needed for more investigations [39].

*1.3. Anxiety.* With the abrupt change of instruction method from the face-to-face to e-learning method causing stressful workload needed, a large portion of students has experienced anxiety and depression [40]. Anxiety is a simple human emotion marked by fear and uncertainty. It generally occurs when a person feels that an incident threatens their self-esteem [41]. Anxiety is a subjective feeling of apprehension, tension, nervousness, and worry associated with the nervous system’s arousal, according to Spielberger (1983, as cited in [42]). Huberty [43] highlighted that students’ behavior, cognition, and physiology are affected by anxiety, have an impact on students’ academic performance [42, 44, 45], and are a common problem during student examinations [44].

Mathematics anxiety is a complex multidimensional construct because many factors can cause anxiety [46]. According to Lyons and Beilock [47], mathematics anxiety affects students’ cognitive functioning, hindering them from learning mathematics. Brewster and Miller [48] shared that students may feel tense and anxious when shared with numbers in a mathematics class or when told to execute mathematical calculations. This is one reason a false measurement of the individual’s mathematics ability may arise [49]. In the 2012 report of the Programme for International Student Assessment (PISA), 33% of 15-year-old students

had mathematics anxiety when executing mathematical tasks [50]. However, data presented by the PISA were based on students' self-reported feelings of math anxiety compared to their actual mathematics anxiety; hence, the actual percentage of students who have mathematics anxiety is unknown.

In providing a comprehensive understanding of mathematics anxiety, theories from education, psychology, and neuroscience have progressed [51]. Despite the current advances, Brewster and Miller [48] shared that the deficit theory by Tobias [52] is one of the widely utilized theories describing mathematics anxiety. The deficit theory claimed that poor performance in mathematics possibly resulting from learning disabilities such as dyscalculia [53], attention deficit hyperactivity disorder (ADHD) [54], and students' prior poor performance in mathematics [55] can lead to mathematics anxiety. If the learners' mathematics anxiety is associated with the deficit theory and the learners do not receive mathematics intervention, their learning declines exponentially in the following years compared to the students' age-appropriate peers [48].

Anxiety becomes even more of a concern when students take online classes [9]. Students with a high level of anxiety have reduced memory span, loss of concentration and lack of confidence, and insufficient reasoning power [42]. Thus, Abdous [56] highlighted that course expectations and requirements should be clarified to ease this transition of face-to-face instruction to online learning. The self-confidence and preparedness of online students to an unfamiliar learning environment should be boosted. Furthermore, online instructors should consider integrating learner-centered approaches and planned interventions to lessen student anxiety resulting in higher student satisfaction [57]. Although there are several technologies and internet-related anxieties studies, they are relatively scarce [58]. Further study of online course experience on satisfaction and anxiety is necessary [59].

Hence, it is challenging to ascertain how synchronous online learning in the country as the "New Normal" in instruction in this COVID-19 crisis affects students' mathematics motivation, self-efficacy, and anxiety. Specifically, this research aims to answer the following questions:

- (1) What is the level of students' mathematics motivation, self-efficacy, and anxiety before and after exposure to the online mode of instruction?
- (2) Is there a significant difference in students' mathematics motivation, self-efficacy, and anxiety before and after exposure to the online mode of instruction?
- (3) What were the difficulties encountered by the students in the conduct of synchronous online classes?

## 2. Methodology

*2.1. Research Design.* The study utilized quasi-experimental research. Specifically, a one-group pre-post-test design was employed. The group utilized is students who chose the synchronous online mode of learning in general mathematics via a Google Meet platform. According to Cook and

Campbell [60], quasi-experimental research is similar to experimental research but is not true experimental research. The independent variable is manipulated, but participants are not randomly assigned to conditions or orders of conditions. In the study, significant differences between students' pretest and posttest scores in mathematics motivation, self-efficacy, and anxiety were ascertained.

*2.2. Research Participants.* This study involved grade 11 senior-high-school students in Visayas State University Integrated High School, Baybay City, Leyte, the Philippines, of school year 2021. One group composed of 31 students from Science, Technology, Engineering, and Mathematics (STEM) section A, and Accountancy, Business, and Management (ABM) sections served as participants. The study participants are students enrolled in the synchronous mode, where the class discussion is via Google Meet.

All these grade 11 students, regardless of what strands, must take general mathematics as one of the core subjects in the K-12 curriculum. The students had no previous online learning opportunities. It is just in the pandemic.

Different strands were scheduled with different meetings in the normal face-to-face setup. However, because of the small number of students who chose synchronous learning online, two strands were grouped into one. The STEM and ABM students are grade 11 students under the K-12 curriculum. This curriculum requires students to take grades 11 and 12 before proceeding to their university lives. General mathematics is included in the compulsory subjects for these students. In the senior-high-school program, the students are required to take the 15 core subjects included in the curriculum regardless of what strand.

Before the conduct of the research, informed consent was employed. Students were informed about the research and that the results gathered do not have a bearing on their grades. Also, they were assured that the results obtained would be strictly confidential and for research purposes only.

*2.3. Research Locale.* This study was conducted at Visayas State University Integrated High School (VSUIHS), Baybay City, Leyte, eastern part of the Visayas Region in Central Philippines. The researcher secured a permission letter from the principal before the conduct of the study. The researcher informed the principal of the rationale of the research, and then, he signed its approval.

*2.4. Research Instruments.* Two instruments were employed in collecting the data. The Science Motivation Questionnaire [61] was adapted into the Mathematics Motivation Questionnaire, and the Mathematics Self-efficacy and Anxiety Questionnaire [62] were utilized. The researcher adapted the motivation, self-efficacy, and anxiety questionnaires. These instruments were written in English. The instruments were evaluated for face and content validity by Ph.D. experts in Teacher Education and Mathematics Education. The pilot testing was administered to check for practicality and

usability of the instrument and gather points for improvement in disseminating the instrument in the final conduct.

*2.5. The Mathematics Motivation Questionnaire [61].* This instrument was used to gather the level of students' mathematics motivation. This instrument is a 5-point Likert-type instrument where students will assess their level of agreement in every statement. Twenty-five statements referring to students' motivations originally in science but adapted into mathematics are presented in this questionnaire. Below are the motivation levels with the interpretation (Table 1).

*2.6. The Mathematics Self-Efficacy and Anxiety Questionnaire [62].* This instrument was utilized to gather the level of students' mathematics self-efficacy and anxiety. Fourteen statements referred to students' mathematics self-efficacy, and 15 statements for anxiety. This instrument is a 5-point Likert-type instrument where students assess their level of agreement in every statement. Below are the self-efficacy and anxiety levels with the interpretation (Tables 2 and 3).

The pilot testing was administered to dry run the said instrument. It was carried out to see some concerns from the students who were pilot tested and, of course, for the improvement in the administration of the final research.

*2.7. Research Procedures.* The researchers adhered to all ethical procedures before and during the conduct of the study. Permission to conduct the research and utilize the STEM A and ABM sections were obtained from the Principal of VSUIHS. After permission, the researcher conducted the study. This study involved a pretest and posttest for all students. This employed the two adapted questionnaires. The pretest was administered before the online classes started. The posttest was administered after the sixth week of implementation.

During the 6-week duration, the synchronous meeting was carried out once a week every Thursday, 9–12 AM. One hour for clarifications on the learning tasks was allotted every Monday, 10–11 AM. In this schedule, the students shared their difficulties. Overall, the synchronous meeting has a total of 4 hours per week. It was adjusted on the course's pace, unlike the normal face to face. The adjustment made is on the content included in the curriculum, and the way it was discussed was lecture-discussion. The 3-hour online learning was a lecture-discussion about the general mathematics content included. It started with the lesson objectives, followed by a review of the previous topic and a discussion of the new topic. Since the class discussion was via Google Meet, students asked anytime they had some clarifications. Only the essential competencies were included in the discussion.

The course instructor, who was also the researcher, collected and analyzed the data. In the distribution of the

TABLE 1: Description and interpretation of the different levels of mathematics motivation.

Score	Description	Interpretation
4.51–5.0	Very high	Always feel motivated towards mathematics
3.51–4.50	High	Often feel motivated towards mathematics
2.51–3.50	Moderate	Sometimes feel motivated towards mathematics
1.51–2.50	Low	Rarely feel motivated towards mathematics
1.00–1.50	Very low	Never feel motivated towards mathematics

questionnaire, Google Forms were utilized. Students involved were instructed to respond as honestly as possible based on their feelings.

*2.8. Data Analysis.* After the data collection, data were analyzed using SPSS Version 22.0 with a  $p$  value set to 0.05. Mean and standard deviation were employed to describe students' level of mathematics motivation, self-efficacy, and anxiety before and after they were exposed to the online learning mode. A paired  $t$ -test was utilized to evaluate a significant difference in students' motivation, self-efficacy, and anxiety before and after the exposure to the intervention. The assumptions for normality were met for the paired  $t$ -test.

Students' difficulties in online learning were gathered via Google Forms. Open-ended questions were sent, and students responded. This was performed after the 6-week duration of the experiment. The students were given 4 hours to give their responses to the questions. They were instructed to be as honest as possible with their responses.

Thematic analysis was employed in the analysis of qualitative data. Braun and Clarke [63] define thematic analysis as identifying, analyzing, and reporting recognized themes based on the generated data. This qualitative data analysis method is accessible, flexible, and increasingly popular [64]. In this study, students' responses via Google Forms were familiarized, and the researcher immersed himself in the gathered data. After this, initial codes were generated and explored the themes.

### 3. Results

The descriptive statistics of the students' level of motivation, self-efficacy, and anxiety before and after the online learning is shown in Table 4. Results indicate a decrease in all three variables, with their motivation having an apparent decrease from being highly motivated ( $M = 3.69$ ,  $SD = 0.54$ ) to moderately motivated ( $M = 3.42$ ,  $SD = 0.50$ ). Students' self-efficacy is still "Moderate," while students' anxiety has been maintained as "High." However, a slight decrease of the two variables was found (Table 4).

TABLE 2: Description and interpretation of the different levels of mathematics self-efficacy.

Score	Description	Interpretation
4.51–5.0	Very high	Always believe in his or her ability to succeed in mathematics
3.51–4.50	High	Often believe in his or her ability to succeed in mathematics
2.51–3.50	Moderate	Sometimes believe in his or her ability to succeed in mathematics
1.51–2.50	Low	Rarely believe in his or her ability to succeed in mathematics
1.00–1.50	Very low	Never believe in his or her ability to succeed in mathematics

TABLE 3: Description and interpretation of the different levels of mathematics anxiety.

Score	Description	Interpretation
4.51–5.0	Very high	Always feel anxious towards mathematics
3.51–4.50	High	Often feel anxious towards mathematics
2.51–3.50	Moderate	Sometimes feel anxious about mathematics
1.51–2.50	Low	Rarely feel anxious towards mathematics
1.00–1.50	Very low	Never feel anxious about mathematics

Table 5 examines the significant difference between two measurable variables. Table 5 reveals the paired *t*-test results on the significant difference in students’ motivation, self-efficacy, and anxiety before and after exposure to the online learning mode. Results show that there is a significant decrease in students’ motivation before exposure to online classes ( $M = 3.69$ ,  $SD = 0.54$ ) and after exposure to online classes ( $M = 3.42$ ,  $SD = 0.50$ );  $t(30) = 4.33$ ,  $p = 0.000$ . Moreover, a significant decrease is found on students’ self-efficacy before exposure to online classes ( $M = 3.27$ ,  $SD = 0.65$ ) and after exposure to online classes ( $M = 2.95$ ,  $SD = 0.63$ );  $t(30) = 3.76$ ,  $p = 0.001$ . No significant difference was found before and after the exposure to online classes;  $t(30) = 0.781$ ,  $p = 0.441$  (Table 5).

Table 6 presents the difficulties/challenges encountered by the students during the conduct of the online classes. Results highlighted that all 31 students experienced a slow and unstable Internet connection, so they did not learn the topics thoroughly. Some of their responses are as follows.

“Poor Internet connection is the main barrier for us in online learning. I have tried to attend online classes with a poor connection, and it is nerve-wracking because I cannot understand thoroughly what my instructor is saying.”

“I think the difficulties that I had faced were more on the problem due to the slow Internet connection. It delays and slows down learning and making of outputs.”

Because of this “New Normal” in the education system, students get less motivated to do self-study because they will not ask their classmates or teachers during online sessions. Some said the following.

“Minor problems such as Internet problems, unscheduled brownouts, and family duties. A significant problem for me is self-learning, I cannot learn by myself, and no one in the house could teach me because of the same reason (online class); they are busy too. It is hard for me to learn; teachers should discuss lessons to make it easy for students to learn. I did not learn anything this semester, to be honest, but I superappreciate the efforts of the teachers. Students need to

have face-to-face classes to learn. Online learning is not just an appropriate mode of learning for me.”

Moreover, some students expressed dissatisfaction with the online classes for the many learning tasks and checks for submission with additional tasks at home. They said the following.

“The difficulties that I encounter are the activities or tasks of subjects that are simultaneous. Some activities/tasks could have been better and interesting in the physical or actual field. I am used to the regular face-to-face classes where some activities/tasks are held in school, for example, quizzes (announced/unannounced). I did not prepare myself for these circumstances in this new normal setup. Another minor difficulty is the Internet connection for the class.”

“Managing my time is hard because I have a part or role in doing in my family (household chores), work, friends, and of course myself. It is really hard to balance my time, especially in this pandemic.”

Sadly, some students expressed that they experienced anxiety and depression in this “New Normal” setup because of the many activities needed for submission. They expressed the following.

“Due to the pressure of submitting outputs on time, it led me to have depression. This semester was never easy to begin with. I would get anxious every time there was an upcoming deadline. There are so many activities in a short period, and we cannot always make our outputs because we also have to take care of ourselves. I would be facing my laptop for hours and remain unproductive the entire day. This new normal setup has destroyed my mental health, and I still have not found a way to help myself.”

Furthermore, three students expressed that they lack resources, such as broken laptops, not updated cell phones, and no Internet router. One student said, “The difficulties that I have encountered are my mental health, poor connection sometimes, and my computer is getting broken due to insufficient storage because of the video presentations that teachers always give to us. I struggled with my mental health because of the surroundings and the fear of not learning anything. Because this new normal is different and for me, it takes time to get used to. Having poor connections in our area really sucks because sometimes video calls tend to lag, but I have to deal with it. As stated above, my computer recently would not turn on, maybe because it is old. However, it was working perfectly fine before, and that was one of the significant things I experienced because I recently switched to digital modular and I get my modules digitally, and it is tough for me to work on my phone knowing that our modules tend to be passed in documents. Also, my phone is a bit old, so it is not that fast, and I really struggle

TABLE 4: Students' level of mathematics motivation, self-efficacy, and anxiety before and after exposure to the online mode of learning.

	N	M	SD	Description
Premotivation	31	3.69	0.54	High
Postmotivation	31	3.42	0.50	Moderate
Pre-self-efficacy	31	3.27	0.65	Moderate
Post-self-efficacy	31	2.95	0.63	Moderate
Preanxiety	31	3.67	0.75	High
Postanxiety	31	3.60	0.74	High

TABLE 5: Paired t-test results on the significant difference in students motivation, self-efficacy, and anxiety before and after exposure to the online mode of learning.

		Mean Difference	Df	t	Sig	95% confidence interval	
						Lower	Upper
Pair 1	Motivation pretest-posttest	0.26323	30	4.333*	0.000	0.13915	0.38731
Pair 2	Self-efficacy pretest-posttest	0.31935	30	3.755*	0.001	0.14566	0.49305
Pair 3	Anxiety pretest-posttest	0.06613	30	0.781	0.441	-0.10674	0.239

\* $p < 0.05$ .

TABLE 6: Difficulties encountered by the students in the conduct of online classes.

Difficulties/challenges of the students	F
Slow and unstable Internet connection	31
Less motivation to self-study	12
Lack of time management for	
-Many learning activities	15
-Doing household chores	5
Lack of resources (laptops/functional CP)	3
The uncondusive online learning environment	2

only to share one computer with my siblings now because mine is broken.”

Finally, they do not have a conducive place for online learning because of some students' economic status. Some stayed on their bed, making them sleepy, others in their living room with their family. They said the following.

“I get sleepy when it is class time, especially when I am near my bed when in class, that it is tempting me to lie down. Also, there are so many disturbances when studying at home rather than in school. I also find it difficult when no one is explaining the lesson.”

“Since I am learning in this informal environment, I am easily distracted, especially since I do not have sufficient space and a peaceful place for online meetings. This is one of my difficulties in learning online. Because of loud noises and music, I cannot focus on understanding the lesson. Another problem is the unstable Internet connection. It is a shame not to attend the entire hour of online classes ideally, so I decided to shift to digital modular because of these reasons” (Table 6).

## 4. Discussions

*4.1. Students' Level of Motivation, Self-Efficacy, and Anxiety before and after the Synchronous Online Learning.* The decrease in students' motivation, self-efficacy, and anxiety is

due to the novelty of online learning for the students and teachers. Students think that online learning may get more fun and interesting at first, but they felt otherwise after experiencing several problems at home, especially with an Internet connection.

These results could be attributed to the novelty of the synchronous online mode of learning. Students and teachers may find it hard to adjust to their new mode of instruction from the usual face to face. At first, students may be excited to learn and experience this online learning, apparent in their level of motivation and self-efficacy; however, after the exposure, these two decreased, emphasizing some problems encountered in the process. No significant difference was found in their anxiety, highlighting that online learning neither helped students feel at ease in learning mathematics nor gave more trouble to them.

In terms of motivation, similar results are observed by Lim and Kim [27] who emphasized that motivating students in distance education environments is challenging, particularly in cases where the interaction is low, such as self-directed online instruction. This is true, especially in Mathematics classes where only the main concepts are taught in the synchronous class, and most of the challenging activities are left for the students to work at their own pace at home. This may be the main reason why their motivation has significantly decreased. Synchronous classes for 1–3 hours a week will never be enough in mathematics classes where concepts taught are abstract. However, opposite findings highlighted by Harandi [65] state that students are more likely to be more motivated when applying e-learning. Wighting et al. [66] revealed that online students are more intrinsically motivated than their on-campus counterparts. These findings may occur in other subjects where concepts are not that abstract. Also, this is true before the conduct of the study, where they are highly motivated for online learning. One of the factors that motivated the learners is the use of technology which is novel in the teaching and learning process. However, Keller and Suzuki [67] highlighted that the novelty factor is more likely to diminish as users become

accustomed to the technology. With this, intrinsic motivation, which is a requirement in online learning according to Martens et al. [68], may be reduced, especially if technical problems are encountered and with the slow and unstable Internet connection.

Results show a moderate level of self-efficacy of the students before and after the exposure to online learning. Notably, a significant decrease was observed. The results may support those of Yokohama [34] who emphasized that, from a theoretical perspective, self-efficacy can be strengthened through the experience of mastery, observing someone succeed, and social persuasion such as direct encouragement. However, all these three aspects may not have been achieved. First is the experience of mastery in the context of mathematics instruction. This may be difficult to attain, especially for students who have limited time and interaction with their classmates and instructors; hence, instead of asking for clarifications, they will not do so. The second is observing someone succeed. In the context of online instruction, it rarely happens that somebody may be observing their friend succeed. This is because online instruction is purely for teaching and learning, and if some recognition may be given, this is for students reciting a specific task. The third is direct encouragement. This is another factor that may not be obvious in online instruction. Unlike face to face, where the students collaborate and achieve a specific task, online instruction hinders this.

The literature supports the high anxiety during online learning of the students. In one study by Namaziandost et al. [69] it was shown that students in the synchronous CMC voice chat still have the same level of anxiety after the 6-week experimentation. According to Ajmal and Ahmad [70], students felt anxiety from admission, getting a prospectus for admission, depositing fees, lack of time for assignments, lack of communication, and poor feedback from the tutors. In mathematics class, possibly, the main reason for their anxiety is the subject matter itself. Given the new setting with limited communication for feedback from the instructors, students' anxiety may have worsened. Hence, Abdous [56] highlighted that lessening students' feelings of anxiety is critical to their satisfaction, achievement, retention, and future enrolment in online learning.

*4.2. Students' Difficulties in the Conduct of Synchronous Online Learning.* Results presented several students' difficulties in the conduct of synchronous online learning. The students experienced in online classes describe the current scenario that the Philippines belongs to in terms of Internet connectivity and economic status. This is happening because the Philippines' Internet infrastructure lags among contemporary developing countries in Asia, particularly in terms of Internet connectivity. The country has an inadequate average Internet speed of 2.8 Mbps, ranking 104 among 160 countries in 2015 [71]. In Reyes-Chua et al.'s [72] study, similar problems were accounted for, such as lack of resources and the difficulty of Wi-Fi connection between the students and faculty members in region 4A, the Philippines.

The lack of motivation to self-study may have occurred because the students do not have the whole week with their teachers and classmates to discuss topics they do not know. These could have occurred in the problem of time management because it is the first time the students have experienced online learning. In the usual face-to-face instruction, students can share and discuss their difficulties during their free time. But now, they are left on their own, at home. They are obstructed with the many learning tasks of the different subject matter, plus some of them have household chores. In the face to face, students are in their classroom the whole weekdays; hence, they are not given chores. The lack of resources such as updated laptops, cellphones, and other gadgets is also one of the major problems the country is facing. Most of the parents have just enough for the family's basic needs. Thus, their environment or online learning is not conducive because they stay on their bed, sofa, and other spots. Only one of the respondents has a study room with a desktop.

Similar findings of Baticulon et al. [73] shared student barriers to online learning during the COVID-19 pandemic. Lack of devices or limited access due to gadget sharing, unreliable, slow, or no Internet access, mental health difficulties, limited space conducive for studying, responsibilities at home, conflicts within the family, financial distress within the household, need to work for extra income, excessive cognitive load, and limited opportunities to interact with peers were highlighted.

## 5. Conclusions and Implications

This research aims to ascertain the students' level of mathematics motivation, self-efficacy, and anxiety before and after exposure to online learning. The results showed that students in the online mode of instruction got a significant decrease in their motivation and self-efficacy while maintaining "High Anxiety." These results may be attributed to the changes that the COVID-19 crisis has brought in instruction. The online mode of learning may sound sophisticated. However, students' mathematics motivation and self-efficacy decreased. This may be because the learners may find it hard to ask the teachers or their classmates if they have difficulty with the topic since all revolve in a virtual environment. Moreover, the slow Internet connection, which is a problem in the country, may have caused this decrease in motivation and self-efficacy and maintained anxiety levels.

The results suggest several recommendations for the government, administrators, teachers, and the curriculum. For online instruction to flourish, more infrastructures for faster and stable Internet connections all over the country may be built. The administrators, principals, and school officials may support and plan for varied training programs for the teachers on the use of different teaching platforms in this pandemic, especially those not very familiar with the technology. If possible, teachers may be provided with the technology they may need in their teaching and a stable Wi-Fi connection. They may also initiate regular enrichment programs to utilize new teaching strategies essential and fit in the "New Normal." The teachers may find a more

interactive means in teaching the subject matter [69], especially in mathematics, such as the use of Digital Interactive Math Comics (DIMaC) [74]. The DIMaC app is for math comics with a love storyline and general mathematics content. It has interactivity features where students answer the intentionally left bubbles to proceed with the storyline and the next topic. A need to develop and implement appropriate educational interventions to enhance students' interest, motivation, and self-efficacy to enhance mathematics performance is also essential [75]. Teachers must teach differently from the usual face-to-face instruction, maintaining the same student relationship, including regular feedback. Respect for individual differences must be highlighted.

Specific changes must be made for the curriculum, especially in the execution of teaching and learning strategies. The curriculum must be well-aligned to the students' needs this time of the pandemic. Learning and teaching strategies must cater to different types of students in the new normal, focusing on maintaining students' motivation and self-efficacy in the learning process and decreasing their anxiety. Future researchers may dwell on individual variables, including students' participation, learning styles, achievement, performance, and attitudes in the synchronous online learning mode. Furthermore, to have a holistic point of view, different subject teachers may pursue the same research on their field. To broaden the scope of the research is highly recommended.

There were two main research limitations. First, there were few participants from one school setting included in the study that may limit the generalizability of the findings. Second, the researcher was the teacher in the study. This might affect the validity of the results through its implicit influence on the participants. However, closer observation and analysis of the behavior and reactions of the participants were accounted for. Also, during the implementation of the study, the school head observed the online classroom, the discussions, and the researcher to avoid possible bias.

## Data Availability

The underlying data are in the author's records.

## Conflicts of Interest

The author declares that there are no conflicts of interest.

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