



Junior High School Students' Online Learning Readiness and Mathematics Anxiety on the Use of Technology in Mathematics Learning

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Abstract

Mathematics anxiety is an uncomfortable feeling that is linked to fears and worries in dealing with specific situations related to mathematics. This study attempted to explore the association between the junior high school students' online learning readiness and mathematics anxiety on the use of technology in mathematics learning. This study adopted descriptive research design to answer the problems posed. Results showed that the students have a moderate level of both their readiness in online learning and anxiety on the use of technology in mathematics. The students' expectation toward online learning in mathematics was found to have an influence on their anxiety in the cognitive aspect. Students' expectations are also found to significantly predict their anxiety on the use of technology.

Keywords: online learning readiness; mathematics anxiety; mathematics technology.

1. Introduction

Though mathematics is fundamental for many professions, especially science, technology, and engineering [1], many students perceive mathematics as a difficult subject and grew up without enjoying mathematics at all. Mathematics is deemed as an unpleasant, incomprehensible with difficult tasks or problems, and not everyone is good at it. Such feelings may trigger certain nervousness or called as anxiety [2]. The basic problem is the high level of students' mathematical anxiety [3].

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This is an uncomfortable feeling that arises when facing mathematics problems. It is linked to fears and worries in dealing with specific situations related to mathematics. Mathematical anxiety occurs almost at all levels of education, elementary level, primary and secondary level, and university level [4]. It is believed that the use of technology in learning provides positive contribution for students. Nevertheless, the use of technology inadequately diminished students' mathematics anxiety since they are more worried about not understanding the concept of mathematics, instead of applying such technology. Given that the integration of technology into classrooms can enrich students learning and result in a positive learning environment that integrates students' interests into the curriculum, it is reported students who are common with gadgets as learning medium still have high anxiety in learning mathematics [5]. Thus, it can be concluded that gadgets do not significantly contribute to the level of mathematics anxiety. In a technology-based classroom, we should be aware that a student's unfamiliarity with technology can also generate anxiety [6].

During the second quarter of school year 2020-2021, some high schools in the Division of Occidental Mindoro, Philippines classified students depending on the mode of delivery of instruction that will be given to them. One of these schools is the Pedro T. Mendiola Sr. Memorial National High School in the town of San Jose. There were sections identified and students from these sections received online delivery of instruction which requires technology requirements on the part of both the teachers and the students. Thus, technology competency and readiness towards online learning is an essential factor for students to be involved in online learning [7].

It is necessary to investigate students' readiness in using online learning portal. It was recorded that students' readiness' may include personal and environment factors that prepare them for study in the instructional situation. They also noted that students equipped readiness in the use of technology in learning have more positive attitude towards online learning [8]. A good understanding and knowledge of students' readiness in learning as well as their confidence in one's competence is a basic need for a teacher. Mathematics anxiety needs special attention because such an anxiety can affect other learning abilities, especially learning achievement [9]. As readiness is a variable which is often emphasized and measured in distance learning, e-learning and online learning researches, this must also be realized given that this modality is new in the research locale.

With these, the researcher believed that students will be less performing in their Mathematics subject if they are confronted with threats which relate to technology anxiety. Their readiness on online learning is believed to be a strong correlating factor with the level of their anxiety on the use of these technologies in learning Mathematics. More so, as change agents in the educational institutions, teachers at all levels are significant drivers whose roles are crucial in technology integration in the classrooms. Thus, it is vital for teachers to understand these factors which are believed by the researchers as contributing factors to the end of Mathematics learning, the students' Mathematics achievement.

1.1. Theoretical Framework

This study leans on Moore's Theory of Transactional Distance which has a direct bearing on e-learning. It explains and quantifies the learning relationship between instructor and student in the e-learning situation, where there is a substantial physical or temporal distance between the two [10]. Moreover, a key concept in

understanding the role of social experiences in the development of anxiety disorders is the social learning theory (SLT). The principal founder of SLT, individuals learn new ways of thinking and/or behaving by observing how other people think and behave. Unlike the more traditional view of "behaviorism" that suggests people learn a behavior because of direct experience. If a behavior is rewarded people learn to increase that behavior. Social Learning Theory also noted that through exposure to learning experiences, people may come to "mimic" the anxious behaviors of others. SLT suggests that this learning can take place simply through observation [11]. Therefore, people may learn to avoid certain objects or situations without ever having any independent knowledge or experience. As such, they have no opportunity to form their own beliefs or opinions about the accuracy of the information they were provided.

1.2. Objectives

This research paper generally aimed to find association between the junior high school students' online learning readiness and mathematics anxiety on the use of technology in mathematics learning. Specifically, this aimed to:

- Determine the level of online learning readiness in Mathematics of the junior high school students in terms of expectations, self-direction, learning preferences, self-study habits, technology skills, and hardware/software requirements;
- Ascertain the level of mathematics anxiety on the use of technology in mathematics learning of the junior high school students in terms of cognitive, affective, and physiological;
- Test if there is a significant relationship between the online learning readiness and mathematics anxiety on the use of technology in mathematics learning of the junior high school students; and
- Analyze which among the factors of online learning readiness significantly predict the mathematics anxiety on the use of technology in mathematics learning of the junior high school students.

2. Materials and Methods

This study adopted descriptive research design to explore on the junior high school students' online learning readiness and mathematics anxiety on the use of technology in mathematics learning. To answer problems of the study, data were collected through the use of survey questionnaires which were adopted from the previous researches having the same variables under investigation. Instruments underwent validity and reliability tests. A total of 100 students were randomly selected as the sample from the sections having online mode of teaching and learning in Pedro T. Mendiola Sr. Memorial National High School, San Jose, Occidental Mindoro, Philippines. The respondents' consent was obtained prior to the data gathering using an online platform; they were also assured of complete confidentiality.

To analyze the data that were gathered, several statistical tools were used. The level of online learning readiness in Mathematics of the and the level of junior high schools students' mathematics anxiety on the use of technology in mathematics learning in terms of several indicators were analyzed using mean. The relationship between the online learning readiness and mathematics anxiety on the use of technology in mathematics learning of the students was tested using Pearson Product Moment Correlation. Finally, to determine which among the factors of online learning readiness significantly predict the mathematics anxiety on the use of

technology in mathematics learning of the junior high school students, multiple linear regression analysis was used.

3. Results

3.1. Online Learning Readiness in Mathematics

It is said that online learning method becomes a pedagogical tool that facilitates access to learning for the whole of society [12]. On the other hand, an e-ready student should be capable of efficiently and effectively applying the essential technology tools in order to satisfactorily interact with the content and engage other students [13]. Thus, it is important to determine how ready the students are in using the new learning modality.

Table 1 shows that the junior high school students have a moderate level of readiness in online learning in Mathematics (mean=3.21). This denotes that the students have a moderate level of the capability to adapt to a new learning environment, using new technologies, and be involved in self-directed learning [14, 15]. The students are highly ready in terms of expectations (mean=3.72), followed by self-direction (mean=3.53). This denotes that the junior high school students are ready in terms of understanding that learning mathematics is their responsibility. They understand that an online class in mathematics is not easier than a traditional class.

However, they believe that they can keep themselves on track and meet deadlines. The findings also reveal that the students are ready at a moderate level in terms of learning preference (mean=3.29), self-study habits (mean=3.12), and technology skills (mean=3.24). Thus, students are said to be not fully ready in the online learning in Mathematics especially in being comfortable communicating through online platforms. They cannot also say whether they could dedicate a specific time of day or night to work on their math studies.

In addition, the students are moderately capable in terms of using web browsers and navigating the Internet. Finally, students are found to have a low level of readiness in online learning in Mathematics in terms of hardware/software requirement (mean=2.35) which means that not all of the students have the equipment requirement and others, i.e. computer, internet connectivity, etc., to facilitate online learning in Mathematics. This is worrying because online classes can be possible by having first the materials and equipment requirements.

Similar to the findings of the current study, it was found that computing wireless devices have become ubiquitous on today's school campuses making computers and the internet essential educational tools. However, they also found that students are not fully ready to implement this technology due to the issues of the infrastructure support and the compatibility in converting courses materials to the mobile devices [16]. With the abovementioned findings, it is necessary to consider areas which need attention to be included in planning for the next school years. Identifying where and when students have difficulties, pinpointing their deficits or recommending the more appropriate modality could help students achieve a positive course outcome [14].

Table 1: Level of online learning readiness in Mathematics of the junior high school students

Factors	Mean	Interpretation
Expectations	3.72	High
Self-direction	3.53	High
Learning preference	3.29	Moderate
Self-study habits	3.12	Moderate
Technology skills	3.24	Moderate
Hardware/software requirement	2.35	Low
Overall Mean	3.21	Moderate

3.2. Mathematics Anxiety on the Use of Technology in Mathematics Learning

Mathematics anxiety as an uncomfortable feeling that arises when facing mathematics problems. It is linked to fears and worries in dealing with specific situations related to mathematics. It occurs since such an anxiety leads to the complexity in learning and applying the concept of mathematics [2]. As shown in Table 2, with an overall mean of 2.89, the junior high school students are found to have a moderate level of mathematics anxiety on the use of technology. Though all of the factors of anxiety on the use of technology in mathematics learning are experienced at a moderate level, cognitive was found to have the highest mean of 2.96. This indicates that the students believe that it is difficult for them to concentrate on using technology in mathematics learning and that they find it hard when the teacher gives a task that requires technology.

It is expected that the use of technology in learning provides positive contribution for students. In fact, it was suggested that the integration of math software facilitates students to understand a concept. Nevertheless, the use of technology inadequately diminished students' mathematics anxiety since they are more worried about not understanding the concept of mathematics, instead of applying such technology. On the contrary, Irfan (2015) reported students who are common with gadgets as a learning medium still have high anxiety in learning mathematics. Thus, it can be concluded that even students use technology in learning mathematics, they still experience mathematics anxiety [17].

Moreover, the students were found to have a moderate level of affective anxiety (mean=2.90). It was reported that students with mathematics anxiety have a propensity to claim that mathematics is a difficult course, dislike mathematics, refuse to do their tasks, even skip the class. It certainly can affect their success in math exams [18]. The results also reveal that the students have a moderate level of anxiety on the use of technology in mathematics learning in terms of physiological aspect (mean=2.82). Here, anxiety refers to the curiosity of how the technology-based mathematics learning system, the lack of self-confidence to complete the task, the fear in presenting the paper directly using the software, and the fear of forgetting the procedure in implementing the software [2].

Table 2: Level of mathematics anxiety on the use of technology in mathematics learning of the junior high school students

Factors	Mean	Interpretation
Cognitive	2.96	Moderate
Affective	2.90	Moderate
Physiological	2.81	Moderate
Overall Mean	2.89	Moderate

3.3. Relationship between the Online Learning Readiness and Mathematics Anxiety on the Use of Technology in Mathematics Learning

The factors affecting structure and interaction include gender, learning style, strategy and approaches, technology use skill and readiness including learning through technology, etc. and that readiness stands out among these [19]. Students who use online learning will inevitably suffer a sense of isolation. So, it continues to be an area of growing concern among academic providers. Consequently, parallel to the attention to online learning, there is a concern of social interaction anxiety [20].

Presented in Table 3 is the relationship between the students’ online learning readiness and mathematics anxiety on the use of technology in mathematics learning. Overall, there is no significant relationship between the two variables ($r=.029$, $p=.813$). That is, the students’ capability to adapt to a new learning environment, using new technologies, and be involved in self-directed learning do not significantly affect their level of anxiety due to the interaction using a computer or any technology source during their mathematics learning activities.

On the other hand, the results reveal that the level students’ online learning readiness in terms of expectations is significantly correlated to their level of anxiety on the use of technology in terms of cognitive ($r=.363$, $p=.002$). This implies that their beliefs that learning mathematics is their responsibility and that they cannot complete an online course in mathematics without the appropriate technology has something to do with their anxiety in especially when given a task that requires technology.

Similarly, it was found that learners’ readiness is expected to increase by preparing them on both technical and psychological levels and by giving them a sense of relevance with regard to the value of virtual learning [21]. Consequently, they added, it is helpful to anticipate any decreases in the confidence levels and increases in anxiety of both learners and instructors.

Table 3: Relationship between the online learning readiness and mathematics anxiety on the use of technology in mathematics learning of the junior high school students

Online Learning Readiness	Mathematics Anxiety on the Use of Technology	Correlation Coefficient	p-value	Interpretation
Expectations	Cognitive	.363*	.002	Significant
	Affective	.048	.694	Not significant
	Physiological	.278*	.020	Not significant
Self-direction	Cognitive	-.041	.736	Not significant
	Affective	-.234	.051	Not significant
	Physiological	-.083	.494	Not significant
Learning preference	Cognitive	.089	.465	Not significant
	Affective	-.122	.313	Not significant
	Physiological	.034	.780	Not significant
Self-study habits	Cognitive	.005	.969	Not significant
	Affective	-.158	.192	Not significant
	Physiological	-.044	.720	Not significant
Technology skills	Cognitive	.103	.396	Not significant
	Affective	.148	.220	Not significant
	Physiological	.000	1.000	Not significant
Hardware/software requirement	Cognitive	.078	.521	Not significant
	Affective	.040	.745	Not significant
	Physiological	-.094	.441	Not significant
Overall		.029	.813	Not significant

3.4. Factors of Online Learning Readiness That Significantly Predict Mathematics Anxiety on the Use of Technology in Mathematics Learning

To determine which among the factors of online learning readiness significantly influence the students’ level of mathematics anxiety on the use of technology, regression analysis is shown in Table 4. As the data disclose, only one of the factors of online learning readiness predicts the level of mathematics anxiety of the students ($\beta=.376$, $p=.006$). Hence, the more they expect that online class in mathematics is not easier requiring them technology support, the more they feel anxious on the use of technology in mathematics learning.

This is important to note that it appears important to measure the different types of expectations to determine their level of contribution to the development and/or maintenance, and to the outcome of anxiety disorders [22]. Anxiety in distance learners stems mainly from their life experiences, and expectations/assumptions they make as a result. The distance learners tend to fear failure, yet conversely can have high, even unrealistic expectations of themselves. They may have had negative experiences of educations in the past, and assume that distance

learning education may provide the same disempowering learning environment as that experiences by many schools [23]. In addition, perfectionism and achievement motivation affect gifted students. Perfectionist students may undergo from academic anxiety because of unrealistic expectations set by themselves or others [24].

Further, readiness can be measured in terms of having a proper e-learning infrastructure in place and being trained to use learning management systems [25]. Learning readiness is considered as a supporting factor in academic resilience [26]. Since the situation of school closure and learning from home due to the COVID-19 pandemics, there have been changes in learning methods that require students to readily use online learning. Unfortunately, students' readiness in online learning has not been widely discussed in terms of its effect on the student's academic anxiety.

Table 4: Factors of online learning readiness significantly predict the mathematics anxiety on the use of technology in mathematics learning of the junior high school students

Independent Variable (Online Learning Readiness)	Dependent Variable	Beta Coefficient	t	p-value	Interpretation
Expectations		.376	4.065	.006	Significant
Self-direction		-.215	2.818	.170	Not Significant
Learning preference	Mathematics	-.030	-1.387	.857	Not Significant
Self-study habits	Anxiety on the Use of	-.167	-.181	.315	Not Significant
Technology skills	Technology	.151	-1.014	.316	Not Significant
Hardware/ software requirement		.072	1.011	.638	Not Significant

4. Conclusion

With the findings of the current study, the researcher has come with the following conclusions. The level of online learning readiness in Mathematics of the junior high school students is high in terms of expectations and self-direction, moderate in terms of learning preferences, self-study habits, technology skills, and low in hardware/software requirements. This means that students use mobile technologies extensively, and have experience using social media but are unfamiliar with other collaborative e-learning tools. The junior high school students have a moderate level of mathematics anxiety on the use of technology in mathematics learning of in terms of cognitive, affective, and physiological. Thus, the mathematics educators may consider learning about and understanding the mathematics anxiety. It could be that improving students' mathematics self-efficacy, as well as facilitating learning with the appropriate math technologies could help as a remedy against mathematics anxiety. Generally, the online learning readiness of the students has no effect on their mathematics anxiety on the use of technology; however, their expectations influence their anxiety in the cognitive aspect and

among the factors of online learning readiness, expectations significantly predicts the mathematics anxiety on the use of technology in mathematics learning of the junior high school students. With this, it is of utmost importance for the government, specifically the Department of Education, to identify which policies can maximize the effectiveness of online learning, policies which examine the role of students' attitudes towards learning in maximizing the potential of online schooling when regular face-to-face instruction cannot take place.

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