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Exploring Students' Self-Efficacy and Anxiety Towards Mathematics Problem Solving During Open and Distance Learning (ODL)

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ABSTRACT

Although mathematics is seen as a crucial precursor to success in modern society, many students still struggle with real mathematical fear. They feel anxious when they engage in solving mathematical problems, especially in the last two years when the learning environment has changed due to the epidemic. One of the affective factors that can influence mathematical anxiety is the beliefs of students about their own ability to resolve issues called self-efficacy. The aim of this research is to explore student self-efficacy and anxiety in solving math problems among high school students during open and distance learning (ODL). The research used a quantitative analytical approach. A survey of 138 students was carried out on forms 1 and 4 at one of the secondary schools in Kota Bharu, Kelantan. The survey follows Diana May's Mathematical Questionnaire on Self-Effectiveness and Anxiety (MSEAQ). The data were analyzed in SPSS using descriptive statistics, an independent sample t-test, and a simple linear regression. The results showed that descriptive statistics had a lower level of self-efficacy and a higher level of mathematical anxiety among Form 1 and Form 4 students. An independent sample t-test revealed no significant difference between lower and upper secondary school students in self-efficacy and anxiety towards mathematics problem solving which means that lower and upper secondary school students can have the same level of mathematics self-efficacy and anxiety. Simple linear regression shows a moderately significant negative linear relationship between mathematics self-efficacy and anxiety. This paper presents an overview of students' self-efficacy and anxiety toward math subjects during secondary school.

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1 Introduction

Mathematics is one of the most challenging subjects and requires creative thinking in solving problems. In several parts of real life, it plays a significant role. An individual uses mathematics in

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daily life for many purposes, such as telling time, counting, paying on, measuring something, or solving problems through algebraic operations. The study innovatively demonstrates the need to differentiate between traits and tendencies to the actual emotional experience and the regulation of emotions used in mathematical anxiety [1]. Math education, therefore, serves the needs of nearly all careers [2]. However, the sudden change from face-to-face to online learning platforms makes everything more difficult for students. Shifting to open and distance learning (ODL) platforms requires the students to have access to a device and a good internet connection whereas the students that have no access to these things could interfere with their mathematics self-efficacy and anxiety. This was exacerbated by the spread of the coronavirus in March 2020, leading to disruptions to learning systems. The change in the learning process during open and distance learning (ODL) makes the teachers and students need to adapt themselves to the online learning environment which can increase their anxiety. In this context, students' self-efficacy is particularly important, especially when students do not have the opportunity to interact with other students and as a result, they become socially isolated.

Other than that, the students must learn a few parts of the syllabus on their own during open and distance learning (ODL). Thus, the ability of students to study and learn subject material in open and distance learning (ODL) creates difficulties for online learners, which may trigger the existence of mathematics anxiety in students. Low self-efficacy and high level of anxiety in mathematics problem-solving in secondary school often reduce students' desire for learning and can ultimately lead to reduced attitude and performance in mathematics. Therefore, understanding students' mathematics self-efficacy and anxiety in online learning are needed to improve online education, which may be a key component of academic success in distance education. Understanding mathematics self-efficacy and anxiety about mathematics problem solving can also help teachers improve or diversify their mathematics online teaching strategies that can reduce student anxiety and increase student self-efficacy

However, there is not much previous research that talks about the self-efficacy or anxiety of the students during open and distance learning in the context of the COVID-19 pandemic. Most of the previous research has been conducted in the context of face-to-face learning, where students can immediately seek learning interventions from teachers or peers when confronted with math anxiety. Students' levels of self-efficacy and anxiety about mathematics problem solving during open and distance learning (ODL) have not been investigated. Therefore, the aim of this study was to investigate whether secondary school students have a high level of mathematics anxiety or a high level of self-efficacy during open and distance learning (ODL). The researcher also found out whether there are any differences between lower and upper secondary school students in self-efficacy and anxiety levels. Likewise, the relationship between mathematics self-efficacy and anxiety. This research is important because self-efficacy and anxiety are two factors that influence the success of students' learning process, especially when the learning mode changes from classroom to online.

2 Literature Review

In this section, the researcher tried to explain the theories that can support the research study. There is one theory and one model that has been elaborated by the researcher which was Bandura's Social Cognitive Theory and The Debilitating Anxiety Model. Both theory and model are chosen by the researcher to explain the phenomena, draw connections and make predictions for the research study. Bandura's Social Cognitive Theory focuses more on mathematics self-efficacy while The Debilitating Anxiety model explains mathematics anxiety.

2.1 Bandura's Social Cognitive Theory

The social cognitive theory began in the 1960s as Albert Bandura's theory of social learning. It developed into Social Cognitive Theory in 1986 and argues that learning occurs with a dynamic and reciprocal interaction of the person, environment, and behavior within the social context. According to social cognitive theory by Bandura [3], Self-efficacy is context-specific and needs to be measured accurately. For example, students may feel confident that they can solve linear equation systems correctly but lack belief in their ability to prove a geometric theorem. Throughout this scenario, asking students to score their interest in mathematics could usually lead to inaccurate reactions. Bandura also indicated that self-efficacy should be measured near the time the activity takes place. Such proximity helps students to evaluate their abilities more reliably than they would

otherwise. Bearing these self-efficacy estimation parameters in mind, it is important to understand how researchers in mathematics typically quantify self-efficacy.

Bandura claimed that four sources can shape self-efficacy. The most powerful sources are the product of the past success of a person, called mastery experience. Outcomes that are considered to effectively improve self-efficacy. The second sources are focused on watching someone performing a task, also known as vicarious experience. While weaker than mastery experience in that self-efficacy, individuals are more prone to the experience when there is a little prior personal experience. The third source is social persuasion, which includes the verbal evaluation of others. Finally, self-efficacy can be impacted by emotional states such as anxiety or stress. If individuals experience negative thoughts about their abilities, those affective reactions can diminish their self-efficacy.

2.2 The Debilitating Anxiety Model

The Debilitating Anxiety Model suggests that the correlation between anxiety in mathematics and performance in mathematics is motivated by the debilitating effects of anxiety on learning and remembering skills. The Debilitating Anxiety Model is supported by several alternative research through childhood, adolescence, and adulthood, indicating that a higher degree of mathematics anxiety will affect output at the pre-processing, processing, and retrieval stages of mathematics knowledge. Hembree's [4] meta-analysis included evidence indicating that students with a higher level of mathematics anxiety may avoid a situation related to mathematics, leading to the possibility that mathematics anxiety is likely to affect performance by reducing learning opportunities.

2.3 Conceptual Framework

Exploring the relationship between mathematics self-efficacy and mathematics anxiety requires an analysis of how such constructions influence student motivation based on student beliefs. Figure 1 shows a conceptual framework that underscored the significance of individual values on a variety of issues and how they interact to contribute to motivation.

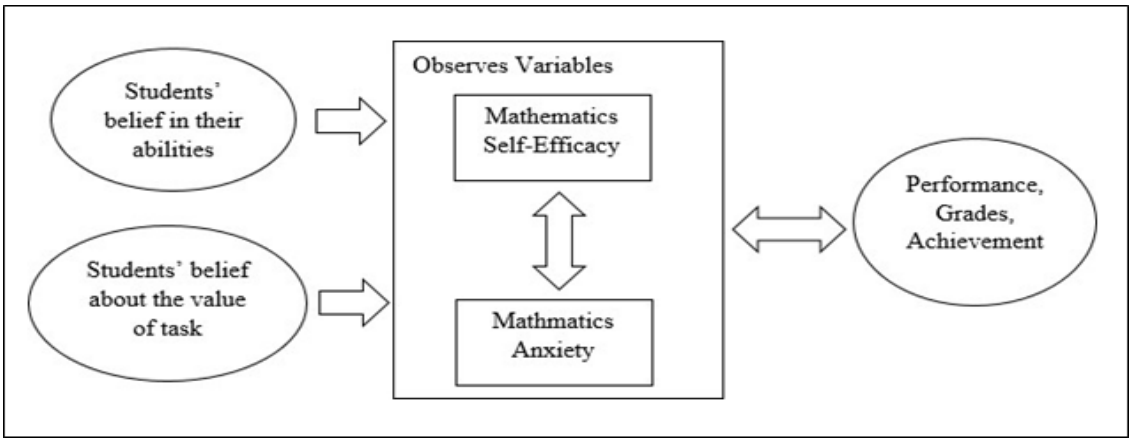

Figure 1. Conceptual framework

This framework takes the students' assumptions about their skills and expectations about the importance of the tasks into consideration. It is important to understand both components to apply this framework to self-efficacy in mathematics and anxiety in mathematics.

3. Research Method

3.1 Research Design

The research study has been conducted at one of the public secondary schools in Kota Bharu, Kelantan. The latest population of the students at the school is 103 students from form 1 and 123 students from form 4. In that school, there are eight classes in form 4 and 8 classes in form 1 with four different class streams which are Science, Technology, Economics, and Art. For all the population, the researcher used stratified random sampling in selecting 138 students from all streams as a sample, which consisted of 68 students from form 1 and 70 students from form 4. The use of

this sampling will ensure that all certain characters are represented in the sample in the same proportion as they occur in the population.

The selection of different class streams to participate in a research study is because the researcher wants to test their self-efficacy and anxiety in mathematics for different intellectual capabilities because the school has graded students into different streams according to their study capabilities. Science and technology are considered highly achievable, while Economics and Art are considered low achievable. Thus, there is no biased selection by doing this kind of sampling since each student tends to be chosen as the participant. The survey was conducted through the distribution of the goggle forms to the student.

3.2 Reliability Test

A total of 30 students from form 1 and form 4 were chosen at random to participate in the data collection for a pilot study. The analysis in Table 1 shows that the reliability coefficients of Cronbach' alpha for the two sections ranged from 0.895 for the students' level of mathematics anxiety section, which was considered to have good reliability, and 0.909 for the student's level of mathematics self-efficacy section which shows excellent reliability.

Table 1. Cronbach' alpha for the pilot study

Sections	**Items**	**Coefficients Cronbach's alpha**
Students' level of mathematics self-efficacy	11	0.909
Students' level of mathematics anxiety	15	0.895
Total (n=30)	26	0.784

The total coefficients of Cronbach's Alpha for both sections were 0.784, indicating an acceptable reliability level which more than 0.7 or higher. Hence, the items in the questionnaires were valid and reliable to be used in the research.

3.3 Research Questions

The research questions of this research are:

1. What is students' level of self-efficacy towards mathematics problem-solving?
2. What is students' level of anxiety towards mathematics problem-solving?
3. What is the difference between lower and upper secondary school students in self-efficacy and anxiety level towards mathematics problem-solving?
4. How is the relationship between mathematics self-efficacy and mathematics anxiety related to each other?

3.4 Descriptive Statistic

To determine the students' level of self-efficacy and anxiety toward mathematics problem solving, the researcher analyzes the data by using descriptive statistics. The descriptive statistic has been used to calculate the frequencies, percentage, mean, and standard deviation of the data. Each item in the questionnaires has been grouped according to its category, which is mathematics self-efficacy and anxiety. The variable that had a higher mean percentage of agreement indicated it had a higher level than the other variable. For example, if mathematics self-efficacy had a high mean percentage of agreement than mathematics anxiety, it means that the students had a high level of self-efficacy than mathematics anxiety and vice versa

3.5 Independent Sample T-Test

An independent sample t-test was used to investigate the difference between lower and upper secondary school students' self-efficacy and anxiety levels toward mathematics problem-solving. This data analysis method was used because it is commonly used in determining if there exists a difference in means between two independent groups or related groups which for this study were upper and lower secondary school students. A result is called statistically significant if the p-

value in levene's test for equality of variances was lower than 0.05. The smaller the p-value, the greater the likelihood that the findings are valid.

3.6 Simple Linear Regression

To test the relationship between mathematics self-efficacy and anxiety, a simple linear regression has been used. Simple linear regression is a regression model that gives a straight-line relationship between two variables. The relationship between these two variables is expressed in a straight line as below:

$$y = ax + b \tag{1}$$

where:
y=represents the dependent variable
x= represents the independent variable

In this case, the researcher assumes mathematics self-efficacy as a dependent variable while mathematics anxiety is the independent variable. If the Sig. value (p-value) was lower than 0.05, the variables show a statistically significant relationship with the other variable, and R square indicates a percentage of the variance in the dependent variables which can be predicted from the independent variables.

4. Results and Discussion

4.1 Demographic Details

First and foremost, all the items used for the research were adapted from Diana (2009)'s previous research [5]. The questionnaire was called the Mathematics Self-Efficacy and Anxiety Questionnaires (MSEAQ). Then, the frequency distribution analysis was established on the demographic variable using SPSS to identify the respondents' demographic composition. Section A in the questionnaire had 5 demographic questions to identify; class, do the respondents like mathematics subjects, their level of confidence and anxiety to answer questions related to mathematics problem solving, and their grade in the most recent mathematics exam. The frequency distribution results for each question asked in the demographic section are as shown in each of the following Table 2.

Table 2. The Class of the Respondents

	Frequency	**Percentages**
Form 1	68	49.3%
Form 4	70	50.7%
Total	138	100%

Table 2 shows a class of the respondents. It indicated that there were 138 respondents in total from form 1 and form 4 students in that school. Out of 138 respondents, 68 were form 1 student (49.3%), and the remaining 70 respondents were form 4 students (50.7%). Other than that, there are also questions about respondents' grades on the most recent mathematics exam. Table 3 list the frequency results on the most recent mathematics exam.

Table 3. Most recent mathematics exam

Grade	Frequency	Percentage
A+	6	4.3%
A	18	13.0%
A-	13	9.4%
B+	10	7.2%
B	16	11.6%
C+	10	7.2%
C	15	10.9%
D	19	13.8%
E	20	14.5%
F	11	8.0%
Total	138	100%

The result in Table 3 showed that 20 respondents (14.5%) got a grade of E in their most recent mathematics exam, followed by a grade of D with 19 respondents (13.8%). The respondents who got grade A were 18 respondents (13%), and 16 respondents (11.6%) got grade B in their latest mathematics exam. Besides, 15 respondents (10.9%) got a grade of C, 13 respondents (9.4%) got a grade of A- and 11 respondents (8%) got a grade of F in their most recent mathematics exam. Grade B+ and C+ had the same number of respondents, which is 10 respondents (7.2%), while grade A+ had the lowest respondents with 6 respondents (4.3%). The following Table 4 presents the results of students' preference on mathematic subjects.

Table 4. Students' preference on mathematic subjects

Preference	Frequency	Percentage
Not interested at all	13	9.4%
Slightly interested	33	23.9%
Somewhat interested	39	28.3%
Quite interested	26	18.8%
Extremely interested	27	19.6%
Total	138	100%

Besides, the third item asked in section A is whether the respondents like mathematics subjects. Table 4.3 shows that most of the respondents chose somewhat interested in the mathematics subject which was 39 respondents (28.3%), followed by slightly interested in the mathematics subject showed 33 respondents (23.9%). In comparison, 27 respondents (19.6%) chose to be extremely interested in mathematics subjects. The respondents who decided to be quite interested in mathematics subject differed only one respondent from extremely interested with 26

respondents (18.8%) and not interested at all in mathematics subject had the lowest respondents which was 13 respondents (9.4%). Table 5 presents the results of students' confidence on mathematic questions.

Table 5. Students' confidence on mathematic questions

Confidence	**Frequency**	**Percentage**
Not confident at all	17	12.3%
Slightly confident	51	37.0%
Somewhat confident	45	32.6%
Quite confident	19	13.8%
Extremely confident	6	4.3%
Total	138	100%

The results in 5 indicated that almost half of the respondents showed slight confidence to answer questions related to mathematics problem solving with 51 respondents (37%). The second-highest number of respondents was 45 respondents (32.6%) who chose somewhat confident to answer questions related to mathematics problem solving and 19 respondents (13.8%) who decided quite confident for this third question in section A. Of the respondent who chose not to be confident at all to answer a question related to mathematics problem solving 17 respondents (12.3%), while only 6 respondents (4.3%) chose extremely confident to answer questions related to mathematical problem-solving. Furthermore, the last question of the survey is to get the level of anxiety among the students and the results are listed in Table 6.

Table 6. Anxiety to answer questions related to mathematical problem-solving

Anxiety	**Frequency**	**Percentage**
Not worried at all	3	2.2%
Slightly worried	45	32.6%
Somewhat worried	36	26.1%
Quite worried	33	23.9%
Extremely worried	21	15.2%
Total	138	100%

The results in Table 6 showed that most of the respondents chose to be slightly worried in answering questions related to mathematics problem solving, which was 45 respondents (32.6%). The respondents who chose somewhat worried were 36 respondents (26.1%), while 33 respondents (23.9%) chose quite worried to answer a question related to mathematics problem-solving. Lastly, 21 respondents (15.2%) felt extremely worried about answering questions related to mathematics problem solving, and the other 3 respondents (2.2%) were not worried at all.

4.2. The students' level of self-efficacy towards mathematics problem solving

The respondents' level of self-efficacy was measured using a Mathematics Self-Efficacy and Anxiety Questionnaires (MSEQ) which had 11 self-opinion items on the mathematics self-efficacy. Respondents were asked to rate themselves on their mathematics self-efficacy. Each of these 11 items, as indicated in Table 7, shows the mathematics self-efficacy results, which was measured using the five-point Likert scale where 1 = Never, 2 = Seldom, 3 = Sometimes, 4 = Often, and 5 = Usually.

Table 7. Students' Level of Self-Efficacy (N=138)

Items	Level of Agreement					Mean	SD
	Never	Seldom	Sometimes	Often	Usually		
I feel confident enough to ask questions about problem-solving in my mathematics class.	14 (10.1)	47 (34.1)	56 (40.6)	7 (5.1)	14 (10.1)	2.71	1.067
I believe I can do well on a mathematics exam.	8 (5.8)	35 (25.4)	53 (38.4)	32 (23.2)	10 (7.2)	3.01	1.007
I believe I can complete all the assignments about problem-solving in a mathematics subject.	9 (6.5)	30 (21.7)	64 (46.4)	21 (15.2)	14 (10.1)	3.01	1.022
I believe I am the kind of person who is good at mathematics problem-solving.	40 (29.0)	35 (25.4)	49 (35.5)	7 (5.1)	7 (5.1)	2.32	1.101
I believe I will be able to use mathematics problem-solving in my future career when needed	10 (7.2)	34 (24.6)	44 (31.9)	40 (29.0)	10 (7.2)	3.04	1.059
I believe I can understand the content of a mathematics subject.	4 (2.9)	31 (22.5)	62 (44.9)	22 (15.9)	19 (13.8)	3.15	1.017
I believe I can get an "A" when I am in a mathematics subject.	19 (13.8)	36 (26.1)	44 (31.9)	26 (18.8)	13 (9.4)	2.84	1.1667
I believe I can learn well in a mathematics subject.	8 (5.8)	20 (14.5)	45 (32.6)	45 (32.6)	20 (14.5)	3.36	1.079
I feel confident when taking a mathematics exam.	23 (16.7)	45 (32.6)	42 (30.4)	21 (15.2)	7 (5.1)	2.59	1.092
I believe I can think like a mathematician.	42 (30.4)	42 (30.4)	37 (26.8)	9 (6.5)	8 (5.8)	2.27	1.137
I feel confident when using mathematics outside of school.	28 (20.3)	30 (21.7)	50 (36.2)	21 (15.2)	9 (6.5)	2.66	1.156
Mean Percentage of Agreement						25.15 %	
Construct Mean						2.81	

SD: Standard Deviation

Table 7 shows the result of descriptive analysis, namely frequencies, percentages, means, and standard deviation (SD) of all the 11 items on the students' level of self-efficacy toward mathematics problem-solving. Based on the findings, the item "I believe I can learn well in mathematics subject" was scored with the highest mean (Mean 3.36, SD = 1.079) followed by the lowest mean on the item "I believe I can think like a Mathematician" (Mean 2.27, SD = 1.137). In addition, the overall mean for mathematics self-efficacy was 2.81. This analysis shows that the respondents have a lower level of self-efficacy as compared to mathematics anxiety where the overall mean for mathematics anxiety was 3.20

This is understandable, given how tough it is to study mathematics in this circumstance. This is presumably because the students and teachers must continue to learn in a new environment to prevent the spread of Covid-19. Learning mathematics in an online medium would be challenging as the students could not get a clear picture of what has been taught by their teachers. This can be supported by [6], where the researchers described that other subjects require a presentation, discussion, and elaboration as their teaching method where all of that can be done online while this is not the case for mathematics subjects where, other than discussion, the teachers need to communicate with the students by writing words and symbolic language on a whiteboard, especially during 21st-century learning which problem-solving question become more dominant. So, this is not an easy task in distance learning. Hence, this case can be one of the reasons why the students have a lower level of self-efficacy during open and distance learning (ODL).

Besides, [1] states that self-efficacy is a person's belief in producing positive outcomes and mastering the situation. The students with the confidence would believe that they can control the outcome of the effort that has been made to understand the learning materials in every situation they face so that the level of self-efficacy would be increased. This can be supported by the acquisition of the highest mean (Mean 3.36, SD = 1.079) on the item "I believe I can learn well in mathematics' subject". For this item, it shows that 47.1% or as many as 65 students choose often and usually for that item. It means that a lot of students are still passionate about learning mathematics and believe in themselves that they can succeed in mathematics.

4.3 The students' level of anxiety towards mathematics problem solving

To examine the students' anxiety levels, the researcher also measured using a Mathematics Self-Efficacy and Anxiety Questionnaires (MSEQ), which had 15 self-opinion items on math anxiety. Respondents were asked to rate themselves on their mathematics anxiety, and each of these 15 items as shown in Table 8 on mathematics anxiety was measured using the five-point Likert scale where 1 = Never, 2 = Seldom, 3 = Sometimes, 4 = Often, and 5 = Usually.

Table 8. Students' Level of Anxiety (N=138)

Items	Level of Agreement					Mean	SD
	Never	Seldom	Sometimes	Often	Usually		
I get tense when I prepare for a mathematics exam	6 (4.3)	18 (13.0)	52 (37.7)	51 (37.0)	11 (8.0)	3.31	.950
I get nervous when I have to use mathematics outside of school.	20 (14.5)	43 (31.2)	34 (24.6)	28 (20.3)	13 (9.4)	2.79	1.199
I worry that I will not be able to use mathematics problem solving in my future career when needed	13 (9.4)	34 (24.6)	29 (21.0)	52 (37.7)	10 (7.2)	3.09	1.137
I worry that I will not be able to get a good grade in my mathematics subject.	3 (2.2)	13 (9.4)	23 (16.7)	77 (55.8)	22 (15.9)	3.74	.915

I worry that I will not be able to do well on the mathematics exam.	2 (1.4)	14 (10.1)	25 (18.1)	77 (55.8)	20 (14.5)	3.72	.888
I feel stressed when listening to mathematics teachers in class.	57 (41.3)	39 (28.3)	25 (18.1)	14 (10.1)	3 (2.2)	2.04	1.097
I get nervous when asking questions about mathematics problem solving in class.	21 (15.2)	27 (19.6)	42 (30.4)	35 (25.4)	13 (9.4)	2.94	1.201
Working on mathematics problem solving homework is stressful for me.	29 (21.0)	45 (32.6)	43 (31.2)	12 (8.7)	9 (6.5)	2.47	1.115
I worry that I do not know enough mathematics problem solving to do well in future mathematics subjects.	4 (2.9)	31 (22.5)	36 (26.1)	52 (37.7)	15 (10.9)	3.31	1.031
I worry that I will not be able to complete every assignment about problem solving in a mathematics subject.	9 (6.5)	21 (15.2)	38 (27.5)	56 (40.6)	14 (10.1)	3.33	1.061
I worry I will not be able to understand the mathematics problem solving.	5 (3.6)	21 (15.2)	37 (26.8)	52 (37.7)	23 (16.7)	3.49	1.055
I worry that I will not be able to get an "A" in my mathematics subject.	5 (3.6)	16 (11.6)	26 (18.8)	69 (50.0)	22 (15.9)	3.63	1.004
I worry that I will not be able to learn well in my mathematics subject.	7 (5.1)	19 (13.8)	40 (29.0)	59 (42.8)	13 (9.4)	3.38	1.005
I get nervous when taking a mathematics exam.	7 (5.1)	20 (14.5)	29 (21.0)	63 (45.7)	19 (13.8)	3.49	1.062
I am afraid to give an answer when my teacher asks during the class.	11 (8.0)	28 (20.3)	41 (29.7)	39 (28.3)	19 (13.8)	3.20	1.152
Mean Percentage of Agreement						46.49 %	
Construct Mean						3.20	

SD: Standard Deviation

Table 8 gives the descriptive analysis, namely frequencies, percentages, means, standard deviation (SD) of each of the 15 items on students' level of anxiety towards mathematics problem-solving. From all 15 items asked in the questionnaire, the item “I worry that I will not be able to get a good grade in my mathematics subject” had the highest mean (Mean = 3.74, SD = 0.915). The lowest mean was on the item “I feel stressed when listening to mathematics teachers in class” (Mean = 2.04, SD = 1.097) and 3.20 was the overall mean for mathematics anxiety. As mentioned in 4.2.1, the respondents had a high level of mathematics anxiety as compared to mathematics self-efficacy

This indicates that the students were concerned or anxious about studying mathematics whereas the students agreed to have mathematics anxiety during open and distance learning (ODL). Similarly, this result was not surprising for the same reason as given for the students’ lower level of mathematics self-efficacy. In general, it can be concluded that students who had a high level of mathematics anxiety were due to their lower mathematics self-efficacy levels. In addition, high mathematics anxiety could be one of the factors for students to perform badly in their examinations. A result reported by [7] shows that 34.7% or 179 out of 516 respondents were nervous during the test and were concerned that their academic outcomes will impede their future. This result by [15] can support the highest mean (Mean 3.74, SD = 0.915) on the item “I worry that I will not be able to get a good grade in my mathematics subject”. It means that the students believe their anxiety about mathematics problem solving can increase if they get a poor result in their mathematics examination.

On the other hand, students’ fear of mathematics can also be attributed to teachers. According to [8] in their interview session with high school students in Kenya, most students reported that teachers’ actions such as teaching too fast, explaining poorly, or scolding them for doing the questions incorrectly could influence their anxiety level towards mathematics problem-solving. However, the factor of teachers in increasing the students’ level of mathematics anxiety could be considered low in the findings of the study because the item “I feel stressed when listening to mathematics teachers in class” had the lowest mean (Mean = 2.04, SD = 1.097). Hence, given the fact that the students feel less anxious when listening to their teacher, the teacher should play a key role in supporting the students by making them feel comfortable in mathematics class so that it can reduce students’ level of anxiety and enhance back students’ self-efficacy towards mathematics problem-solving.

4.3 The differences between lower and upper secondary school students in self-efficacy and anxiety level toward mathematics problem solving

To see whether lower and upper secondary school students have the same level of mathematics self-efficacy and anxiety or not, the researcher has used an inferential statistic which is an independent sample t-test in SPSS software to analyze and interpret the data. Table 4.8 shows the result of mathematics self-efficacy while Table 9 indicates a difference in mathematics anxiety.

Table 9. Independent Sample T-test result for the level of self-efficacy in lower and upper secondary school students (N=138)

		Levene’s Test for Equality of Variances		**t-test for Equality of Means**						
									95% Confidence Interval of the Difference	
		F	**Sig.**	**t**	**df**	**Sig. (2-tailed)**	**Mean Difference**	**Std. Error Difference**	**Lower**	**Upper**
Level of Self-Efficacy	Equal variances assumed	.350	.555	1.4889	136	.139	.19778	.13291	-.6505	.46062
	Equal variances not assumed			1.487	135.101	.139	.19778	.13301	-.06526	.46083

An independent sample t-test was conducted to measure the difference between lower and upper secondary school students’ self-efficacy levels towards mathematics problem-solving. The result in Table 9 indicated that the p-value in levene’s test for equality of variance was greater than 0.05 (0.555), hence, there is no significant difference between lower and upper secondary school

students in self-efficacy level t(136) = 1.488, p-value = 0.139. However, the mean for the upper secondary school students (M = 2.91, SD = 0.77) is slightly higher than lower secondary school students (M = 2.71), SD = 0.80) as shown in Table 10.

Table 10. Independent Sample T-test results for the level of anxiety in lower and upper secondary school students (N=138)

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Level of Anxiety	Equal variances assumed	.525	.470	-1.319	136	.189	-.15154	.11490	-.37876	.07567
	Equal variances not assumed			-1.321	135.629	.189	-.15154	.11476	-.37849	.07541

On the other hand, an independent t-test was also conducted to measure the level of anxiety towards mathematics problem solving between lower and upper secondary school students. The result in Table 10 also shows that the p-value in levene's test for equality of variance was greater than 0.05 (0.470), hence, there was no significant difference between lower and upper secondary school students in anxiety level t(136) = -1.319, p-value = 0.189. However, the mean and standard deviation for lower secondary school students (M = 3.27, SD = 0.65) is higher than upper secondary school students (M = 3.12, SD = 0.70) as shown in table 4.9. From both tables above, it can be concluded that there is no difference between lower and upper secondary school students in self-efficacy and anxiety levels towards mathematics problem solving where both lower and upper secondary students have almost the same levels of self-efficacy and anxiety in mathematics problem solving during open and distance learning (ODL).

This conclusion was consistent with [9] findings, which revealed that there was no grade difference in the math self-efficacy-anxiety relationship between grades 7 and 9 and the grades 10 and 12 comparison. In addition, regarding the presence of anxiety towards mathematics, students at this level, both lower and upper secondary school students show math anxiety due to the nervousness and discomfort when they face a problem in mathematics. It is understandable because students were exposed to a more difficult mathematics curriculum during higher educational periods especially in 21st-century teaching and learning, while more cognitive engagement was required. Additionally, this stage is critical for students to build social and emotional management abilities as they enter adolescence. These changes will likely have an impact on how students approach mathematics, which in turn may have an impact on their emotional responses to the subject. That is why the students show a high level of anxiety.

In contrast, this result was somewhat different from the findings in the [10] study, which indicated that there were statistically significant grade level differences. Based on their study, grade 11 students had the highest mean score for anxiety. They concluded that the students' levels of anxiety will increase as the students go through the grade levels. It could also be linked to the mathematics curriculum's complexity, with more difficult topics being introduced at a higher level. This result could also be due to how mathematics is taught in the lower grade levels. The finding by [11] supported by Gunderson *et al* (2018) reported that as the difficulty of mathematics learning increases with age, mathematics anxiety might also increase. However, the result in the study showed a difference from these two previous studies where most of the students in both lower and upper secondary school students believe that they had a lower level of confidence and a higher level of worry when they are facing mathematics problems solving. It means that the students have the same level of mathematics self-efficacy and anxiety, but it depends on their own way of difficulty.

4.4 The relationship between mathematics self-efficacy and mathematics anxiety related to each other

A scatterplot and a simple linear regression were performed in SPSS software to determine the relationship between these two variables (Refer to Figure 2).

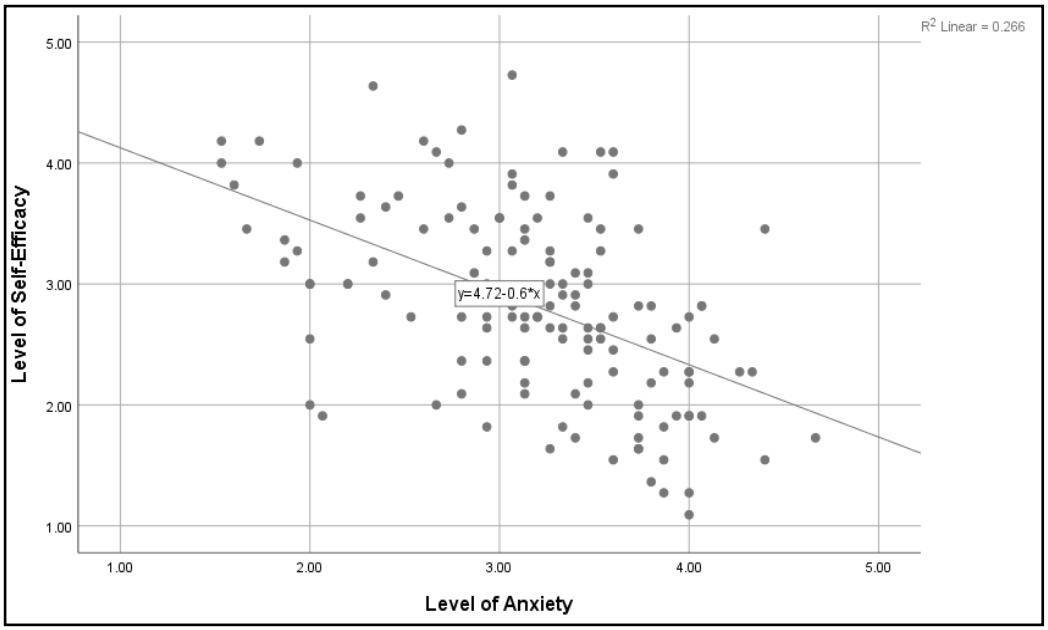

Figure 2. Simple Scatter of the level of self-efficacy by level of anxiety.

A scatterplot of the level of mathematics self-efficacy against the level of mathematics anxiety was plotted. Based on Figure 2, the value of coefficient correlation was -0.516 which is in the range of -0.3 to -0.7. Hence, it indicated a moderate negative linear relationship between the two variables and that higher levels of mathematics self-efficacy denote lower levels of mathematics anxiety and vice versa. It can be explained that visual inspection of this scatterplot was going downhill, but the points are somewhat scattered in a wider band. It means that there is some relationship between self-efficacy and anxiety towards mathematics problem solving, but there were also a lot of randomnesses affecting one or both variables, and perhaps other variables affect the two variables in questions, so the direct relationship was not strong, but it was certainly noticeable. A simple linear regression model was conducted to determine whether the level of mathematics self-efficacy among students can be significantly predicted by their level of mathematics anxiety and the result can be viewed in Table 11.

Table 11. Simple linear regression results for the relationship between mathematics self-efficacy and mathematics anxiety. (N=138)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	-0.516[a]	0.266	0.261	0.67401

a. Predictors: (Constant), Level of Anxiety

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	22.429	1	22.429	49.372	.000[b]
	Residual	61.784	136	.454		
	Total	84.213	137			

a. Dependent Variable: Level of Self-Efficacy

b. Predictors: (Constant), Level of Anxiety

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	4.724	.278		17.005	.000
	Level of Anxiety	-.598	.085	-.516	-7.027	.000

a. Dependent Variable: Level of Self-Efficacy

The result in Table 11 revealed that the level of mathematics anxiety has a statistically significant relationship with the level of mathematics self-efficacy, $F(1, 136) = 49.372$, $p = 0.000$. R^2 value indicates that 26.6% of the variance is the level of mathematics self-efficacy that can be predicted from the level of mathematics anxiety. The coefficient for the level of mathematics anxiety is -.598. Hence, for every unit decrease in the level of mathematics anxiety, we expect a 0.598 unit increase in the level of mathematics self-efficacy. This is statistically significant $t = -7.027$, $p < 0.05$. Lastly, the predicted regression equation is the level of mathematics self-efficacy predicted = 4.724 – 0.598 (level of mathematics anxiety).

This research agreed with [12], who found that self-efficacy affects anxiety by influencing a person's sense of self-confidence. Additionally, the same results were found by [13], who discovered that mathematics self-efficacy had a detrimental effect on math anxiety. Similarly, [14] observed a significant effect of mathematics self-efficacy on mathematics anxiety among junior high school students, and their findings supported the second hypothesis of this study. On the other hand, [15] found that mathematics self-efficacy and anxiety are separate categories that are empirically distinct from each other. This contrast seems to suggest that mathematics self-efficacy and anxiety vary by context and situation.

Meanwhile, the R^2 coefficient of this study was 26.6%, which means that the level of mathematics anxiety can influence the level of mathematics self-efficacy by 26.6% while the remaining 73.4% was impacted by the other factors. This result was consistent with the findings of [12], who discovered that 46.3 % of self-efficacy reduced mathematical anxiety in their study. Mathematics self-efficacy was found to be a good predictor of mathematics anxiety in both studies. According to [13], parental style is one of the other factors that could explain 40% of mathematics anxiety. However, these were outside the scope of the study. This year, because of changes connected to COVID-19 in how children learn in socially distant or remote settings, or because of gaps in mathematical knowledge they may have experienced, students may feel more worried about mathematics. As a result, parties involved in education, whether directly or indirectly, should take early steps to address these concerns so that secondary school students' mathematical anxiety can be managed.

5. Conclusion

In conclusion, it was clear that secondary school students have a low level of mathematics self-efficacy and a high level of mathematics anxiety. The result explains that mathematics self-efficacy among students stems from their self-belief that they can do well in mathematics, while mathematics anxiety occurs among school students due to nervousness and discomfort if they are not able to get a good grade in their mathematics exam. In distinguishing the level of mathematics self-efficacy and anxiety among lower and upper secondary school students, an independent sample t-test revealed that there is no significant difference in students' level of self-efficacy and anxiety between these two constructs. Meanwhile, simple linear regression analysis indicated a moderate negative linear relationship between mathematics self-efficacy and anxiety. It means that self-efficacy and anxiety are related to each other. Reducing one variable would increase another variable.

As mentioned in the result, listening to the mathematics teachers in class was the least chosen answer by the students which increased their level of anxiety. Hence, this result should be beneficial to the teachers as they are the closest person that can help the students in reducing their mathematics anxiety and improving their mathematics self-efficacy. The first thing teachers can do is motivate the students to build self-confidence and think creatively about any problems they encounter in their problem-solving. Self-efficacy is known can predict mathematics anxiety, so motivating students may build students' confidence in mathematics. Likewise, the teachers can facilitate the students' performance-related self-esteem by making them interpret challenges not as a threat to their self-esteem, but as an opportunity to increase their abilities. This alternative should be emphasized to ensure it will not become a hindering factor for students to learn mathematics.

Apart from that, the covid-19 pandemic may have made learning mathematics on an online platform more difficult. Therefore, this research may help teachers identify which teaching techniques and learning outcome assessments should be adjusted in online learning to reduce students' anxiety levels and improve self-efficacy levels during the covid-19 epidemic. In addition, teachers can develop positive learning habits, such as promoting student cooperation and responsive learning, being tolerant enough to students with problems with internet speeds, giving transparent grades, and providing students with interesting learning so that the students would not feel bored in mathematics classes in which this can improve their self-efficacy in mathematics and reduce their mathematics anxiety at the same time.

Furthermore, this research could impact educational change in schools by bringing them together toward the common goal of improving students' mathematics self-efficacy and reducing mathematics anxiety. As for school administration, it is necessary to review the curriculum, especially those related to online learning with the covid-19 pandemic. There is a difference in the handling of the teaching process between classes during the pandemic and those taught in person. This will aid all teaching efforts so that students do not experience mathematics anxiety in their mathematics learning. In this context, [16] says that schools and teachers need to identify which syllabus in curriculum content requires special attention to enable the effective learning process during these peak situations. If before this, the teachers did not know the students' level of mathematics anxiety. However, the result of this study showed a high level of mathematics anxiety among students. Hence, the teachers can no longer take this issue lightly as it can harm the students emotionally.

In addition, schools can develop action plans to help students reduce the burdens and problems they experience. Subsequently, provide students with engaging and relevant course content that connects students to learning opportunities. However, keep in mind that middle and high school students had similar levels of math self-efficacy and anxiety about mathematics problem-solving. Therefore, schools can use this result to not differentiate between any interventions aimed at improving students' mathematics self-efficacy and reducing students' mathematics anxiety. Lastly, going back to the main results of the study, the study showed lower levels of mathematics self-efficacy and higher levels of mathematics anxiety. So, if the results of this research are to be realized, students may experience a beneficial effect, which is that they will benefit from being more confident and less anxious about mathematics, both in and out of the classroom.

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Conflict of Interest
The authors declare no conflict of interest in the subject matter or materials discussed in this manuscript.

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