Mathematics Anxiety and its Relationship with Mathematics Achievement among Secondary School Students

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Abstract: Mathematics attainment has taken on a global focus for the furtherance of economic advancement, thus, magnetising for the appraisal of mathematical edification among school students. However, evidence suggests that mathematics anxiety is a salient contributing factor that obstructs success in mathematics. Drawing upon the evidence, this investigation explores the relationship between mathematics anxiety, performance and strategies that students perceived that could attenuate mathematics anxiety. Data from this study was collected using the mixed method approach of a survey and interview from forty-two Form One students with different levels of academic achievements from one school in Alor Setar, Kedah, Malaysia. All participants demonstrated a moderate level of mathematics anxiety. However, students from the low performance level displayed an inverse and strong relationship between mathematics anxiety and mathematics performance. This indicates that mathematics performance declines with augmented mathematics anxiety. The linear regression revealed that all the three factors of emotion, assessment, and environment are not statistically significant predictors of mathematics achievement. Regardless, emotion has been discerned as a significant predictor of mathematics anxiety for a high performance group of students. The interview revealed that students perceive games, cooperative groups, teaching aids, demonstration, rewards, and teachers with positive classroom attitude have contributed to overcoming mathematics anxiety. Results from this study suggest a strong relationship between anxiety and mathematics performance among low performing students which further indicated the importance for mathematics teachers to vary their teaching and learning activities in assisting students to cope with mathematics anxiety.

Keywords: Mathematics anxiety, Mathematics performance, Learning activities

1. Introduction

Mathematics is a branch of knowledge that allows people to get the notion of patterns, establish the relationship between variables and predict certain phenomena or circumstances with reasoning (Killpatrick, Swafford, & Findell, 2001). For instance, studies in exponential growth with analytical reasoning could help identify the rapidity in the spread of diseases, while probability and statistics help in making suppositions of events which include estimating the number of fatality when natural disasters strike at a certain area. Even though mathematical truth is impermanent, infinite yet synergistic, mathematics acumen is relevant and indispensable in making sense of circumstances and social situations. Any incapacity of understanding basic mathematics knowledge could lead to difficulties when applying and maximising mathematical application in even basic daily context.

Children and adults alike can experience mathematics anxiety, strain, consternation, or discomposure. Consequently, students' difficulty in grasping mathematics knowledge for an extended period of time could lead to anxiety which may further cause the development of dyscalculia. Mathematics anxiety is a situation that happens to anyone when performing mathematics or when they are situated in a mathematical context (Poppy & Edy, 2017). Not all students can achieve good mathematics performance and those who exhibit outward negative feelings towards mathematics encounters would usually demonstrate low mathematics achievements. Regardless of the emphasis being put on its importance in various contexts, mathematics has generally been regarded as a difficult subject.

Mathematics performance has been a prevalent influence on students' academic achievement worldwide and is an unceasing discursive concern globally. Malaysia made its first leap into the Program for International Student Assessment (PISA) in 2009. The country scored 440 in the PISA 2018 report (Malaysia-OECD, 2019) which is woefully below the average global score of 489 as stated by the Organization for Economic Cooperation and Development (OECD). For this reason, the researchers are of the opinion that it is important to gauge students' anxiety level and its relationship to mathematics achievement.

Researchers have performed a multitude of studies in investigating the relationship between mathematics anxiety and performance. The outcome has revealed that the influences by contemporary education reform and trends have impacted both learners' and teachers' attitudes and beliefs. Much debate has occurred these past years with regard to the school curriculum including on the mathematics content with the most recent being highlighted in mainstream mass media and social media platforms by stakeholders especially teachers as the frontliners and concerned parents. Criticisms and grievances have been put up for public debate on the state of the current Mathematics syllabus that has negatively affected the teachers' and students' attitudes and beliefs on their mathematical thinking, knowledge, and ability. This indicates the need to conduct the present study in determining the relationship between mathematics anxiety and achievement among Malaysian secondary school students.

This study attempts to fulfil the following research questions:

1. What is the level of mathematics anxiety among secondary school students?
2. What is the relationship between mathematics anxiety and mathematics achievement among secondary school students?
3. What are the factors that contribute to mathematics achievement among secondary school students?
4. What are the strategies to overcome mathematics anxiety among secondary school students?

2. Literature Review

Mathematics anxiety is a distressing feeling that could affect people of all ages. It has been revealed that low mathematics achievement is most susceptible to mathematics anxiety (OECD, 2015). The general conundrums in students' mathematics learning are found to be linked to their limited conceptual understanding and inadequate mathematical skills. These consequently raised serious concerns among various stakeholders including those in the academic institutions, the policy makers, students and parents. Henceforth, various quarters are calling for the review of the present Malaysian school curriculum in efforts to reduce and ease students' apprehension or detestation towards mathematics. The attention given eventually encouraged various investigations on the relationship between mathematics anxiety with achievements (Olanrewaju & Suleiman, 2019; Zhang et al., 2019) in rigorous endeavours towards improved and admirable mathematics performance.

The PISA scores are not used to determine school admittance or achievement thus, it would not directly impose worries but the scores could be the motivating factor in performance and accelerate mathematics learning. The PISA scores set the benchmark in learning that could augment self-assurance in students' mathematics abilities. The progressive assessment through PISA survey focuses on students' abilities to demonstrate their mathematics knowledge and skills in real-life context rather than testing them on contextualised school curriculum. This goes on to show the shift in curricular objectives that should be inclined towards how students can apply and utilise what they learnt at school instead of just identifying and using formulas or doing calculations.

Mathematics performance influences students' decision in their future pursuit as it is believed that those who hold negative views and feelings would be more inclined in evading math-related activities. Therefore, students who are highly driven or exhibit low degree of mathematics anxiety have greater probability for better achievement compared to those with higher level of anxiety. Interestingly, it was identified that students' motivation could be used to predict PISA performance (Kriegbaum et al., 2015) and that motivation with self-efficacy would encourage learning. Consequently, students' anxiety levels are influenced by their driving factor. It is crucial to control and minimise students' anxiety levels to keep their motivation at the driving end of teaching and learning engagement (Armando, 2019; Tran & Nguyen, 2021) especially after the Covid-19 pandemic.

Uncontrolled level of mathematics anxiety may have a negative effect on an individual and failure to properly address the matter could cause students to have low interests towards venturing into the field of mathematics at a higher level. It is worth mentioning that a significant number of male and female students are found to have moderate mathematics anxiety levels in Malaysian private universities (Wern at. al., 2015). Interestingly, another study indicated similar findings on Malaysian secondary school students but the finding resulted in low mathematics achievement (Marzita & Siti, 2016). Additionally, it was also identified that secondary school students in the Malaysian science stream classrooms experienced low to medium anxiety level with a significant number of participants have moderate anxiety level and a fragment of the participants still experience high level mathematics anxiety (Rahmah, 2013)

The association between mathematics anxiety and mathematics success among secondary school students is also investigated in this study. Mathematics anxiety appears to be a significant factor in determining academic performance, mathematics learning, and accomplishment (Gerardo et. al., 2016). Accordingly, prior research has recognized that low academic accomplishment is invariably connected to high mathematics anxiety (Effandi et. al., 2012). Subsequent research further enhanced this finding when mathematics anxiety was discovered to have an adverse connection with mathematics

performance (Vakili & Pourrazavy, 2017). Consequently, students with higher mathematics anxiety would have difficulty to give their focus when they are overwhelmed with trepidations and uneasy feelings about mathematics.

It is also crucial for the researchers to further investigate the contributing factors of mathematics anxiety among secondary school students because there is only a handful of research that delve into this area. It has been identified that emotions is the primary contributing factor to the occurrence of mathematics anxiety which is followed by the environment and assessment (Sharifah et. al., 2013). Therefore, it is valuable to investigate whether those who are able to self-regulate their emotions would be better in overcoming their mathematics anxiety.

Another essential aspect of this study is identifying the strategies that can be exploited to overcome mathematics anxiety. Teachers' practices in the teaching process become determinants in encouraging mathematics students to learn and perform (Saka, 2021). It is necessary for teachers to employ various teaching strategies to help students with high mathematics anxiety (Faustin, 2018). Essentially, in efforts to improve students' self-efficacy, teachers are also encouraged to hold classes in a mathematics lab towards encouraging students to make their own discoveries while increasing their understanding on specific topics (Baig, 2015). Teachers could also include simulation in their classroom including giving students with real-life situations for students to apply their mathematics knowledge (Ishaq et. al., 2019). Using games could also make mathematics learning and the environment more interesting and improve anxiety.

It has also been established that students would find that learning is more memorable and appealing when teachers use teaching tools in the classroom and students are found to be less likely to forget the content learnt (Ashatri et. al., 2019). The use of teaching aids makes allowance for students to watch teachers demonstrate certain mathematics concepts and applications. Importantly, through varied teaching strategies, teachers could also encourage students to make predictions and pose questions with varying difficulty levels to reflect the problems being discussed during the demonstration (National Research Council, 1997).

Students' attitude needs to be addressed when applying varied teaching strategies in overcoming mathematics anxiety. Other teaching alternatives include introducing the rewards system to reduce mathematics anxiety among students which could pave for the development of motivation and interest in mathematics (Renard, 2017). Alternatively, teachers could also include classroom humour to reduce anxiety among students (Renee, 2017). Hence teachers could also improve teaching techniques and quality when varied methods and strategies are employed in the classroom to reduce mathematics anxiety and improve motivation.

2. Methodology

This study focuses on identifying mathematics anxiety and its relationship with mathematics performance among secondary school students. Both quantitative and qualitative approaches are employed to collect the data for analysis.

Research Design

A questionnaire was developed and distributed to collect the necessary quantitative data and the interview was used to obtain the qualitative data. The application of these two methods is to gather adequate data that could answer each research question while providing sufficient understanding of the research intent.

Target Population

A secondary school in Alor Setar, Kedah, Malaysia was selected for its close proximity with the researchers' location. A total of 288 students participated in the research as permitted by the authorities that also suit the objectives of the study.

Sample and Sampling Procedure

There are three categories of classes within the eight classes for Form One. The classes are categorised into higher achievement students, medium achievement students and lower achievement students. Due to the permitted for the research, only three classes were randomly chosen using cluster sampling for the three categories in this study. The three classes selected are categorised into high performing students, moderate performing students, and low performing students. A total of forty-two students took part in the study while nine students participated in the interview.

Instrumentation

A questionnaire and interview protocol were prepared to achieve answers for the research questions and achieve the objectives in investigating mathematics anxiety among Form One students at the selected school.

Quantitative Instrument

The questionnaire consists of two parts. The first part is to test students' anxiety which was adopted from Meece Mathematics Anxiety Questionnaire (May, 2009). There are 29 items for this part with response options for all scales given on a five-point scale from "1=Never", "2=Rarely", "3=Sometimes", "4=Often" and "5=Always". The value 0.96 Cronbach's alpha indicated that the questionnaires were highly reliable.

The second part of the instrument was employed to obtain data on factors contributing to mathematics anxiety among secondary school students. The items were adopted from Math Anxiety among students at higher education levels by Sharifah et al. (2013). There are three main factors identified as factors which include emotion, assessment, and environment. The three factors, emotions, assessment, and environment, have Cronbach's Alpha values of 0.873, 0.895 and 0.868, respectively.

Qualitative instrument

The respondents are required to complete the questionnaire while only nine students were involved in the interview. A semi-structured interview protocol was prepared with five questions regarding strategies to overcome mathematics anxiety among students. The reason for choosing this method is to get more wide-ranging responses that could help address the research question since interviewing is a normal mode of communication (Gubrium, et. al., 2012) which can also build a deeper connection between respondents and the researcher. Additionally, the interviewer can add prompt questions to obtain more in-depth responses. The interview protocol has been validated by three senior lecturers from a selected public university.

3. Data Analysis

The first research question was analysed using descriptive analysis to determine the level of mathematics anxiety among respondents. Then, the Pearson Correlation was gauged to identify the relationship between mathematics anxiety and mathematics performance among the students. Next, the multiple and linear regression were measured to find the factors contributing to secondary school students' mathematics achievement. Finally, the researchers used thematic analysis to identify the strategies the students preferred to overcome mathematics anxiety.

5. Findings and Discussion

The first research question was to seek the level of mathematics anxiety among secondary school students. The result showed that most of the participating secondary school students have a moderate level of mathematics anxiety It was significantly observable that 83.3% of the participants have a moderate level of mathematics anxiety. It was also discernible that 9.5% students have low anxiety, and concern should also be given to the 7.1% students with have high level of anxiety. Similar observation was also made by Effandi et al. (2012), who identified that a significant number of secondary school students had a moderate level of mathematics anxiety. Hence, the constant comparable results support the notion that mathematics anxiety among students is a universal concern (Foley et al., 2017). Table 1 summarizes the findings on the level of mathematics anxiety among secondary school students in the present study.

Table 1. Level of mathematics anxiety among secondary school students

	Frequency	Percentage
High	3	7.1
Low	4	9.5
Moderate	35	83.3
Total	42	100.0

The second research question attempts to identify the correlation between mathematics anxiety and mathematics achievement among secondary school students. This study found that r = -.138 and the p-value is larger than .05 suggesting that there was no significant relationship between the two variables. The result of this finding is summarised in Table 2.

Table 2. Correlation between mathematics anxiety and mathematics achievement

		Test mark	Anxiety
Test mark	Pearson Correlation	1	-.138
	Sig. (2 tailed)		.384
	N	42	42
Anxiety	Pearson Correlation	-.138	
	Sig. (2 tailed)	.384	
	N	42	42

However, the results were different when correlation analysis was conducted separately between classes, as seen in subsequent tables. For high performing students (Table 3), the Pearson correlation test showed that r = -.212 and the p value was larger than .05 suggesting that there was no significant relationship between the two variables as illustrated in Table 3.

Table 3. Correlation between mathematics anxiety and mathematics achievement For high performing students

		Anxiety	Test
Anxiety	Pearson Correlation	1	-.212
	Sig. (2 tailed)		.371
	N	20	20
Test	Pearson Correlation	-.212	1
	Sig. (2 tailed)	.371	
	N	20	20

Meanwhile, for the medium performing students, Table 4 exhibits the Pearson Correlation test result with r = -.229 and the p value was larger than .05 demonstrating that there was no significant relationship between the two variables.

Table 4. Correlation between mathematics anxiety and mathematics achievement for medium performing students

		Anxiety	Test
Anxiety	Pearson Correlation	1	-.229
	Sig. (2 tailed)		.451
	N	13	13
Test	Pearson Correlation	-.229	1
	Sig. (2 tailed)	.451	
	N	13	13

Consequently, for low performing students, the Pearson Correlation test showed that r = -.773 and alpha = .015 were smaller than .05 as tabulated in Table 5. This proposed significant negative strong relationship between mathematics anxiety and mathematics achievement. Marzita and Siti (2016) revealed in their study that the relationship between mathematics anxiety and mathematics achievement was significant with negative correlation. In other words, as mathematics anxiety increases, mathematics performance decreases. Accordingly, Kalsia (2017) also investigated the relationship between mathematics anxiety and mathematics achievement with the results demonstrating that both variables have an inverse relationship.

Table 5. Correlation between mathematics anxiety and mathematics achievement For low performing students

		Anxiety	Test
Anxiety	Pearson Correlation	1	-.773*
	Sig. (2 tailed)		.015
	N	9	9
Test	Pearson Correlation	-.773*	1
	Sig. (2 tailed)	.015	
	N	9	9

*. Correlation is significant at the 0.05 level (2-tailed)

From the Pearson Correlation performed on all respondents and separately among classes, significant correlation was only observable when Pearson Correlation analysis was conducted between mathematics performance and mathematics anxiety for low performing students.

Subsequently, the third research question seeks to identify the factors contributing to secondary school students' mathematics achievement. The data were analysed using multiple and linear regression according to the participants' classes. The findings showed the result for multiple regression first, followed by the linear regression for every class.

Table 6 exhibits the model summary. The value for R was .517, which indicated moderate correlation between the variables among high performing students. However, this value only suggests the strength of the relationship of the three factors and does not necessarily predict the participants' mathematics performance. The value R^2=.267 indicated that 26.7% of the total variation in test marks could be explained by the independent variables, emotion, assessment, and environment. Nevertheless, the ANOVA (Table 7) reported that the regression model could not predict mathematics test marks since p > .05.

Table 6. Multiple regression output for high performing students

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.517[a]	.267	.130	13.247

a. Predictors: Constant, environment, emotion, and assessment

Table 7. Anova[a] for multiple regression analysis in table 6

	Sum of Squares	df	Mean Square	F	Sig.
Regression	1024.152	3	341.384	1.945	.163[b]
Residual	2807.598	16	175.475		
total	3831.750	19			

a. Dependents Variable: Test (achievement)

b. Predictors: (Constant), environment, emotion, and assessment

Further analysis was conducted by entering the emotion factor into the model as tabulated in Table 8. The result in Table 10 disclosed that the regression model was significant with F=6.303, p <0.05. Additionally, Table 9 exhibits that 25.9% of the variation in the achievement (test score) was explained by the factor of emotion.

The result diverged when linear regression was conducted on the factors that contribute to mathematics anxiety. The result was tabulated in Table 10. It was established that emotion was statistically a significant predictor for mathematics anxiety with p = .022, while assessment and environment were not statistically significant predictors for mathematics achievement, p = .090 and p = .382, respectively. In their study on mathematics anxiety, Sharifah et al. (2013) found that emotional factor was the principal factor that causes mathematics anxiety among students. This finding matched with results established in a study by Adina and Colomeischi (2015), in which students who carried negative emotions during mathematics class were inclined to have high level of anxiety, leading to bad performance in mathematics.

Table 8. Linear regression output for high performing students

Model	Variables Entered	Variables Removed	Method
1	Emotion	.	Enter

a. Dependent Variable: Test (achievement)
b. All requested variables entered

Table 9. Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.509[a]	.259	.218	12.557

a. Predictors: (Constant), emotion

Table 10. Anova[a]

	Sum of Squares	df	Mean Square	F	Sig.
Regression	993.766	1	993.766	6.303	.022[b]
Residual	2837.984	18	157.666		
total	3831.750	19			

a. Dependents Varibale: Test (achievement)
b. Predictors: (Constant), emotion

Table 11 demonstrates the predicted model of mathematics achievement indicated that the contributing factor of emotion significantly predicted mathematics achievement among high performing students. The model is presented as below:

Mathematics achievement = 76.911 + (-9.960) emotion

Table 11. Coefficients[a]

	Unstandardized B	Coefficients Std. Error	Standardized Coefficients Beta	T	Sig.
(Constant)	76.911	9.263		8.303	.000
emotion	-9.960	3.967	-.509	-2.511	.022

a. Dependent Variable: Test (achievement)

Table 12 illustrates the model summary. R was .590, which indicated a moderate correlation between the variables among moderate performing students. R^2=.348 indicated that 34.8% of the total

variation in test marks can be explained by the independent variables, emotion, assessment, and environment. However, the ANOVA result as shown in Table 13 reported that the regression model could not predict mathematics test marks since $p > .05$.

The linear regression produced contrasting results on the factors that contributed to mathematics anxiety among high performing students as illustrated in Table 13. The results showed that all the factors; emotion, assessment, and environment were not statistically significant predictors of mathematics achievement, with $p = .119$, $p = .359$ and $p = 0.86$ respectively.

Table 12. Multiple regression output for medium achieving students

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.590[a]	.348	.130	12.701

a. Predictors: Constant, environment, emotion, & assessment

Table 13. Anova[a]

	Sum of Squares	df	Mean Square	F	Sig.
Regression	773.326	3	257.775	1.598	.257[b]
Residual	1451.751	9	161.306		
total	2225.077	12			

a. Dependents Varibale: Test (achievement)

b. Predictors: (Constant), environment, emotion, & assessment

Table 14 shows the model summary. R was .663, which indicated a moderate correlation between the variables among low performing students. R^2=.439 indicated that 43.9% of the total variation in test marks could be explained by the independent variables, emotion, assessment, and environment. Nevertheless, the ANOVA table reported that the regression model could not predict mathematics test marks since $p > .05$.

The linear regression results in Table 15 illustrates that all factors studied in this research were not statistically significant predictors of mathematics achievement for low performing students. Emotion, assessment, and environment with significant values of $p = .366$, $p = .150$ and $p = .092$ respectively. The three factors on the emergence of mathematics anxiety do not contribute to students' mathematics achievement. R values were .343, .522 and .594, respectively, showing that they have low and moderate correlations between the variables.

Table 14. Multiple regression output for low performing students

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.663[a]	.439	.103	10.547

a. Predictors: Constant, environment, emotion, & assessment

Table 15. Anova[a]

	Sum of Squares	df	Mean Square	F	Sig.
Regression	435.767	3	145.256	1.306	.370[b]
Residual	556.233	5	111.247		
total	992.000	8			

a. Dependents Varibale: Test (achievement)

b. Predictors: (Constant), environment, emotion, & assessment

The thematic analysis as displayed in Table 16 indicates that games, rewards, cooperative groups, demonstration, teaching aids, and going to the lab were the preferred teaching strategies to reduce mathematics anxiety and make the students less anxious in class. Each one of these teaching techniques has its advantages for the students. A study by Rabiee and Afzouni (2018) recognized that students who were taught through the cooperative learning method had improved their academic performance. The researchers further added that cooperative learning also could enhance students' creative thinking skill, encourage cooperation, and boost personal development. Accordingly, Fabian (2018) has identified that using different mathematics games like tic-tac-toe, mathematics cards, and dots and boxes in mathematics lessons help students to understand challenging topics in mathematics, which indirectly improved assessment at schools and reduces mathematics anxiety.

Table 16. Respondents' answers on methods to reduce mathematics anxiety

Respondents	Methods to reduce mathematics anxiety	Group
1	Game, teaching aids	L
2	Game, teacher's personality, ask questions	L
3	Mathematics lab	L
4	Ask questions	M
5	Demonstration	M
6	Games, mathematics lab	M
7	Cooperative grouping, teaching aids, games, teacher's personality	H
8	Mathematics lab, games	H
9	Games, demonstration, cooperative grouping, teacher's personality	H

Indicator: L-low performing; M- medium performing; H-High performing

Meanwhile, a study by Alshatri et al. (2019) found that students prefer their teachers to use teaching aids which are stimulating and it can help the students understand the subject better. Students also reported that they prefer the teachers to use audio-visuals during lessons. Interestingly, bringing students to the lab is much preferred by students and effective in reducing mathematics anxiety among students. It was also made known by Jain (2017) that bringing students to the lab encourages students to explore mathematics knowledge through practical activities and learning by doing.

It was reviewed by Nurin and Edy (2017) that secondary school students managed to improve their academic performance when the teachers used classroom demonstration during lessons. Introducing classroom reward is also effective in inspiring students to focus and show positive attitudes in mathematics learning (Dawe, 2018)

Regardless, students also mentioned that teachers' personality also affects their mathematics anxiety. Teachers need to be conscious of how they bring themselves in the classroom and in facilitating

learning. Students develop more relaxed composure and thoughts when the teacher includes humour during lessons and injecting some fun in learning creates a classroom environment that is more enjoyable. Importantly, teachers' attitude and behaviour can reduce mathematics anxiety among students while creating a classroom that is not threatening or stressful (Ramirez et. al., 2018). This is also in correspondence with John and Dio (2019) who recognized the factors causing mathematics anxiety of senior high school students in calculus. They concluded that teachers' teaching style, teachers' characters in class, and skills related to mathematics subjects are the three dominant factors that contribute to mathematics anxiety among students.

6. Implications

This study has addressed four research questions which were laid out at the beginning of the writing. Outcomes of this study have added insights regarding students' mathematics anxiety and the contributing factors. Also, more rigour in studying mathematics anxiety among Malaysian secondary school students has yet to be emphasised among the stakeholders. Importantly, findings from this study would shed some light on the importance of reducing mathematics anxiety among students in Malaysia. Consequently, more teaching and learning strategies could further be identified and developed to be used in the Malaysian setting.

The results have also suggested that there is a significant need in exploiting teaching techniques that are engaging, fun, and challenging for the students. The teachers must adapt to the evolving contemporary trends in teaching and learning especially with incorporating various teaching strategies while integrating digital technologies in the classroom.

Although teachers are the frontliners in identifying students' mathematics anxiety, parents are also among the responsible stakeholders who could assist in identifying apprehension among students. Parental involvement in students learning is of utmost importance in reducing learning anxiety while also helping the teachers and institutions in providing safe and unthreatening emotional support and learning environment. Hence, this study is seen to be of benefit to all stakeholders including students, parents, and teachers, while providing a platform for future research. For this, further studies that look into more detailed factors on the themes that cause and contribute to incremental mathematics anxiety should be performed. Consequently, provision should be given in the application to reduce mathematics anxiety in the classroom and beyond the classroom setting.

7. Suggestions

Future research could consider looking into a deeper aspect of the present study including identifying gender differences with mathematics anxiety while expanding the context to a larger group of students. More affecting factors that trigger mathematics anxiety could also be investigated aside from the three factors mentioned in this research. However, thoughtful considerations should be put with regard to the application of methods that could reduce mathematics anxiety within and beyond the classroom setting.

8. Conclusion

This study has fulfilled four research questions regarding mathematics anxiety and its relationship with mathematics achievement among secondary school students. Mathematics anxiety should be given due attention as the current education curriculum in Malaysia is considered to be in a state of debacle especially mathematics with criticisms that it has been receiving by various quarters

including parents and teachers. It is hoped that findings from this study could further be extended for future and more in-depth studies so that it would get the expected veracious response from policy makers including the Ministry of Education, dedicated in-service and pre-service teachers, and parents alike. It needs to be emphasised that mathematics anxiety is existent among students in Malaysian schools and it has taken the toll on not only students but also teachers who have to acknowledge the situation especially in the classroom. Hence, further studies and impactful actions must be appropriately considered to improve mathematics learning in Malaysia.

9. Co-Author Contribution

For this article, the authors are responsible for carrying out the study, collecting data from respondents, analysing the data, and writing the whole article. Concurrently, the three authors have worked cooperatively to fulfil the research questions stated in this research. Therefore, it is crucial to interpret the data correctly and in detail to produce the desired answers to the research questions. After writing the whole article, the co-authors reviewed and read this article several times to prevent any misinterpretation or errors.

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