Article

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Identifying the Causes of Learning Difficulties in Mathematics among Primary School Students

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Abstract

A variety of factors are associated with the learning difficulty in mathematics in the context of Pakistani schools. This study explored the different causes of learning difficulties in mathematics faced by primary school students in Karachi, Pakistan. Using a quantitative research design, the data was gathered from the parents and teachers of primary-going students in Karachi. The data was gathered using an adapted questionnaire having demographic and construct sections. The constructs were adopted by reviewing the literature. The findings of the study reveal a significant effect of Mathematics Efficacy, Grade Anxiety, Future Factors and Confidence level of students on their mathematic performance in classrooms. The study recommends that teachers serving to teach mathematics to primary school students consider the explored factors while preparing the lesson plans. This study contributes into the existing literature in terms of the impotence of increasing teachers' awareness regarding the preparation of lesson plans having the source of fun and enjoyment in the classroom, as enjoyable mathematics learning increases the motivation of students to keep their future enjoyment in the mathematics tasks.

Keywords: learning difficulties, learning disorders, learning mathematics, primary school students

Introduction

All students in schools are not equal in all aspects. Many students may struggle with some skills or topics from time to time. Some students may face Learning Disorders, the term, also known as Learning Difficulties, used for students having difficulties in one or more learning areas. Snowling et al. (2021) identified three classifications of Learning Difficulties among students including arithmetic, reading and writing. Students facing all or either learning difficulty may meet the academic underachievement. According to Maki and Adams (2020) learning disability is an umbrella term used for a variety of learning problems faced by students. Nevertheless, the term does not necessarily refer to the problem of a student with their motivation or intelligence. Similarly, a student with learning difficulty does not mean to be incompetent or slow learner. Most of the students with learning difficulties are as smart as other students are. Maki and Adams (2020) point out that the brains of students with learning difficulties are wired differently which effects on the fact ow they receive and process specific information.

Problem Statement

Salihu et al. (2018) examined the mathematics skills of students and found the reading skills, at the initial levels of students, as one of the most powerful determinants for the mathematics performance at their later stages. According to Ali (2011) the prior knowledge of students is the most significant cause that strengthens the learning difficulty among the secondary schools' students in Pakistan. Mahjabeen et al. (2021) found a variety of factors that are associated with the learning difficulty in mathematics in the context of Pakistani schools. Among those factors include the insufficient pedagogical expertise of the appointed teachers, lack of teachers' professional involvement, strict educational style, use of inappropriate teaching methods, non-relevant and inadequate assessment of mathematics teaching. The purpose of this study is to explore the significant causes of learning difficulties in mathematics among Primary School Students (PSS) in Karachi, Pakistan.

Objectives of the Study

1. To test the effect of Mathematics Efficacy on performance of PSS in Mathematics
2. To test the effect of Grade Anxiety on performance of PSS in Mathematics

3. To test the effect of Future Factor on performance of PSS in Mathematics
4. To test the effect of In-Class Assignments on performance of PSS in Mathematics
5. To test the effect of Confidence level of students on performance of PSS in Mathematics
6. To confirm if the demographic aspects of students have an impact on performance of PSS in Mathematics

Research Question

Based on the objectives of the study, the following research question was developed:

1. What are the significant causes of learning difficulties in mathematics among the PSS in Karachi?

Literature Review

Mathematics Efficacy and Mathematics Performance

Efficacy in mathematics is defined as the perception or belief of a student with respect to their abilities in mathematics (Nurhikmah et al., 2021). The efficacy in mathematics is also described as the confidence level of students in terms of completing a variety of tasks associated with the mathematics ranging from concepts understanding to solving problems. According to Rozgonjuk et al. (2020) efficacy is connected with the motivation level of student. In line with such assumption, the study's findings conducted by Öztürk et al. (2020) reveals that students having higher efficacy are more inclined to be motivated to engage in the learning process as compared to their peers. A large number of research studies (Arens et al., 2022; Perera & John, 2020) confirmed the four sources of self-efficacy including physiological states, social persuasion, vicarious experiences, and mastery experiences as described by Bandura et al. (2001). Özcan and Kültür (2021) conducting a study to design a scale exploring the mathematics self-efficacy and its sources, found the Perceived Mastery Experience (PME) as one of the powerful sources for the self-efficacy of students in mathematics. The investigators further explained that students with the feeling of mastered skills experience an increased efficacy belief.

Efficacy is intended for setting and should be estimated suitably. For instance, students could feel sure that they can accurately settle frameworks of direct conditions yet need trust in their capacities to demonstrate mathematical assumptions (Ningsih & Hayati, 2020). In such circumstance, requesting that the students rate their trust in science largely could bring about deceiving reactions. Bandura likewise recommended that self-Efficacy ought to be estimated near the time that the undertaking would occur. This vicinity assists students with making more precise decisions about their capacities than in any case. With these rules for estimating self-viability as a main priority, it is essential to comprehend how scientists normally measure math self-viability. Estimating arithmetic self-viability (Ningsih & Hayati, 2020). A significant number of the underlying exploration concentrates on directed on undergrads' math self-viability tried to investigate what students' science self-viability meant for their school major and profession decisions (Thurm & Barzel, 2020). A student's self-efficacy assumes a significant part in achieving the school majors. For instance, students with more significant levels of Math Self-Efficacy (MSE) were altogether bound to pick science-based school majors as compared to the students with the lower levels of MSE. Furthermore, MSE has likewise been demonstrated to be an indicator for students' profession decisions, with more elevated levels of math efficacy being connected with more science-based vocations (Thurm & Barzel, 2020). Math efficacy has additionally been related with students' math accomplishment.

H_1: Mathematics Efficacy has a significant impact on the performance of PSS in Mathematics

Grade Anxiety and Mathematics Performance

Jolejole-Caube et al. (2019) found that mathematics anxiety significantly affects the motivation level of students to learn in the classes of mathematics. The mathematics-anxiety of students is associated with their tense feeling while working on mathematics tasks. Similarly, the grade anxiety of students is associated with their tense feeling regarding their performance connected with the mathematics tasks. The study's findings conducted by Jolejole-Caube et al. (2019) to explore the anxiety among the students of grade seven and their math performance, reveal that the anxiety of students towards the mathematics learning has a negative impact on their mathematics performance. Therefore, students displayed high anxiety towards the mathematics learning tended to achieve low performance in mathematics.

However, students who experience anxiety do not be guaranteed to encounter it in the other subjects of study. There are numerous negative results of mathematic anxiety. Students, for instance, who experience more anxiety commonly foster pessimistic perspectives and feelings toward arithmetic. When students arrive at school science courses, their perspectives toward math are generally steady, and students with math nervousness are more averse to take arithmetic classes or seek after vocations requiring math.

Richardson and Suinn developed a scale in 1972 "Mathematics Anxiety Rating Scale" perceived to be the most cited scale, is used to measure the mathematics anxiety. The scale was developed with the aim to assist the researchers to explore mathematics anxiety as well as to evaluate mathematics-anxiety relief techniques. A large number of research studies used the MARS to explore the negative impact of mathematics anxiety in order to determine the mathematic achievement of students. The findings of the study conducted by Samante and Alave (2021) suggest the same as the students' anxiety level negatively affects the students' performance in mathematics. According to Samante and Alave (2021) mathematics anxiety is basically developed due to the anxiety of students for their grades, the overall performance. In line with this, students with high levels of mathematics anxiety feel less excited, less confident and low motivated towards learning mathematics as compared to the students having low anxiety levels.

H_2: Grade Anxiety has a significant impact on the performance of PSS in Mathematics

Future Factor and Mathematics Performance

Among most of the future factors, one is the motivation that increases the mathematics performance of students in terms of their future engagement in the mathematics tasks. According to Ali and Hassan (2019) increasing the motivation of students in class is a significant problem for teachers, particularly when it comes to students' achievement in mathematics. The study suggests the mathematics teachers are to utilize a variety of teaching methods in mathematic classes to make sure the math learning is a fun and enjoyable for students, as enjoyable mathematics learning increases the motivation of students to keep their future enjoyment in the mathematics tasks. Furthermore, since the enjoyable mathematics learning increases the motivation of students, it is the great defence against the negative impact of mathematics anxiety. According to Ali and Hassan (2019) when students

perceive the mathematics a source of fun in classrooms, they enjoy learning it and this enjoy remains present in the rest of their lives.

According to the findings of the study conducted by El-Adl and Alkharusi (2020) the achievement of students in mathematics is affected by their motivation with a correlation format i.e. with the increase in one factor there is a significant increase in the other factor and vice versa. The mathematic performance of highly motivated students was found better than that of the lowly motivated students. The study suggests the mathematics teachers should use a variety of teaching methods in the mathematic classes to make sure the math learning is a fun and enjoyable for students, as enjoyable mathematics learning increases the motivation of students to keep their future enjoyment in the mathematics tasks. Furthermore, since the enjoyable mathematics learning increases the motivation of students, it is the great defence against the negative influence of math anxiety.

H_3: Future Factor has a significant impact on performance of PSS in Mathematics

In-Class Assignments and Confidence Level

Trained teachers are usually able to assess the mathematics efficacy, motivation, and anxiety of students through the in-class assignments (Chen et al., 2020). According to the study's findings conducted by Malanchini et al. (2020) in-class assignments and tasks are the significant determinants for mathematics teachers to build the mathematics efficacy, motivation, and anxiety. According to Malanchini et al. (2020) anxiety in mathematics learning is strongly connected with the lower motivation and engagement of students in mathematics and thus results in their poor performance in mathematics. The mathematics anxiety of students is associated with their tense feeling while working on mathematics tasks. Similarly, the grade anxiety of students is associated with their tense feeling regarding their performance connected with the mathematics tasks. According to Çiftçi and Yildiz (2019) self-confidence is used majorly for the individual's belief in himself or herself. While self-confidence is believed to be a personality trait, it can be understood to a specific situation. In the context of self-efficacy, the concept of self-confidence is perceived as a significant determinant to portray the feelings, thoughts, behaviours and motivation of a student towards a specific task and its performance. The findings of the study conducted by Çiftçi and Yildiz (2019) reveal that self-confidence has a significant effect on the mathematics achievement of students.

H_4: In-Class Assignments has a significant impact on performance of PSS in Mathematics

H_5: Confidence level has a significant impact on performance of PSS in Mathematics

Conceptual Framework

Various factors found while reviewing literature that contributed to the mathematics performance of students. The factors included mathematics efficacy, future anxiety, grade anxiety, in-class tasks, and confidence level of students. The extracted factors from the literature are thus used to develop the conceptual framework for the present study. Furthermore, some of the hypotheses are made up of the demographics of the participants to gather further insights from the gathered data. For instance:

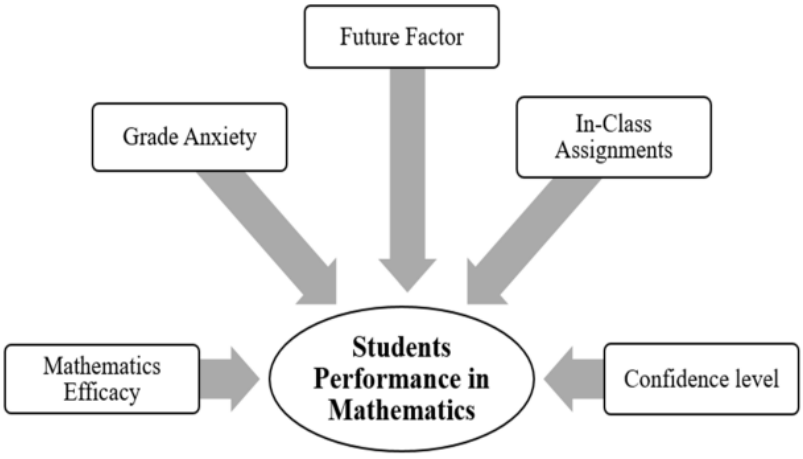
H_6: Performance of PSS in Mathematics is different based on their different gender

H_7: Performance of PSS in Mathematics is different based on their different age groups

H_8: Performance of PSS in Mathematics is different based on their different school sectors

Figure 1

Factors Affecting Students Performance in Mathematics



Methodology

Research Design

This study is correlational research in design and quantitative in nature. According to Prematunga's (2012) correlational analysis is used for the direction and magnitude of linear relationships between the variables of the study to be estimated via statistical significance. This study identified the variables having connection with the learning difficulties in mathematics while reviewing literature and explored the relationship among them. The quantitative research design was used in this study because it was intended to estimate the correlation between the variables associated with the learning difficulties in mathematics and the students' performance in mathematics. In order to achieve the objectives this study, a survey method was used to collect data about the performance of students in mathematics.

Targeted Population & Sampling

The targeted population of this study consisted the primary schools in Karachi either public or private sector. Using convenient sampling, 50 schools were approached to take their consent for their participation. However, various schools, significantly public schools, declined to participate due to their overloaded schedule. Since the primary students were too young to respond to the predesigned survey, their parents and/or teachers were requested to participate on their behalf. Initially, the entire population was divided into two major strata including public and private sector primary schools and then parents and teachers were selected randomly. Either parents or teachers of the students were supposed to participate against each student. A total of 350 participants (150 from public sector schools and 200 from private sectors schools) were recruited for this study.

Data Collection Tool

An adopted questionnaire was used to collect primary data from the selected participants. The constructs and items for the questionnaire were adopted from the studies conducted by Fogarty et al. (2001) and May (2009). The predesigned questionnaire, consisted consent, demographic and constructs & items (Appendix A), was distributed to the selected participants. Each item under the constructs contained a 5-points Likert scale having 1 as a least level of agreement and 5 as a highest level of agreement. Along with the constructs (variables associated with the learning mathematics), the questionnaire also contained the question about the

achieved score in mathematics in the previous grade of students to confirm their performance.

A pilot study was conducted to measure the reliability of the Data Collection Tool. While conducting the pilot study, 25 responses were scrutinized for the measurement of the internal consistency between the items used under the selected constructs. Furthermore, reverse coded items were applied to discard the invalid response received. A sign of ® was used to identify the reverse coded items at the time of data analysis.

Data Analysis

The gathered data was compiled and organized on Microsoft Excel sheet and entered in the Statistical Package for Social Sciences (SPSS) for analysis. The gathered data was analysed in two directions including descriptive statistics and inferential analysis. The descriptive statistics was used to describe the characteristics of the students while the inferential analysis was used to test the hypothesized statements.

Results

The gathered data from teachers and parents of the students from the selected schools was analysed using the statistical techniques such as inferential analysis and descriptive statistics. The descriptive statistics, from this perspective, was used to describe the characteristics of the students and the responses of the parents and teachers against the data-gathering tool. On the other hand, the inferential analysis was used to confirm the hypothesized statements included in the present study subsequent to the reviewed literature. The internal consistency, prior to the inferential analysis, was measured to confirm if the items used under each construct are reliable for further statistical procedure.

Descriptive Statistics

Table 1

Descriptive Statistics of Students

Gender	Frequency	Percent
Female	191	69.0
Male	86	31.0
Age Group		
5 - 6 Years	17	6.1
7 - 8 Years	44	15.9
9 -10 Years	61	22.0
11-12 Years	77	27.8
13+ Years	78	28.2
Grade (Standard)		
1st Standard	24	8.7
2nd Standard	15	5.4
3rd Standard	41	14.8
4th Standard	41	14.8
5th Standard	156	56.3
School Sector		
Private	240	86.6
Public	37	13.4
Total	277	100.0

Table 1 demonstrates that the number of male students currently studying in primary schools in Karachi was (n=86) and the number of female students was (n=191). The age group of the students between 11 and 12 and 13+ were the highest ones (27.8% and 28.2%). Most of the students were currently studying in the 5th grade and private schools. The total number of students was n=277.

Table 2

Performance of Students in Mathematics

Achieved Scores in Mathematics	
Mean	72.68
Std. Error of Mean	1.345
Median	78.00
Mode	70
Std. Deviation	22.391
Minimum	1

Maximum	100

Table 2 describes the average performance of students achieved in mathematics in their previous grades and/or exam. The performance was measured in terms of achieved scores. From this perspective, the average (mean) scored achieved by the students was 72.68 /100, having Standard Deviation as 22.391.

Table 3

Description of Responses

Constructs	Mean	Std. Deviation	Variance	Skewness	Kurtosis
GME	3.74	0.95	0.91	-0.66	-0.44
GA	2.96	0.72	0.52	-0.11	-0.75
FF	2.88	0.80	0.63	0.04	-0.86
INA	3.11	0.78	0.61	-0.03	-0.29
CON	2.97	0.76	0.58	-0.09	-0.94

GME = General Mathematics-Efficacy
GA = Grade Anxiety
FF = Future Factor
INA = In-Class Assignments
CON = Confidence

Table 3 describes the mean scores, along with Standard Deviation (SD), Variance (Var), Skewness & Kurtosis, of the responses from the participating teachers and parents of the students against each variable. From this perspective, the response of teachers and parents against General Mathematics Efficacy was mean = 3.74, SD = 0.95, and Var = 0.91. The response of teachers and parents against Grade Anxiety was mean = 2.96, SD = 0.72, and Var = 0.52. The response of teachers and parents against Future Factor was mean = 2.88, SD = 0.80, and Var = 0.63. The response of teachers and parents against In-Class Assignments was mean = 3.11, SD = 0.78, and Var = 0.61. The response of teachers and parents against Confidence was mean = 2.97, SD = 0.76, and Var = 0.58. The minimum and maximum values for the responses was between 1 and 5. The values of Skewness and Kurtosis show the data as normal, as per the explanation of Murtagh and Heck (2012).

Internal Consistency

Table 4

Internal Consistency (Items' Reliability)

Constructs	CA*	No. of Items	ID**
GME	.942	7	None
GA	.821	8	None
FF	.737	5	None
INA	.704	5	None
CON	.811	10	None

The acceptable Cronbach's Alpha values (<.5), as displayed in Table 4, was used to consider the internal consistency between the items used under each construct (Tavakol & Dennick, 2011). No item was under either construct was found with lower value to remove from the scale.

Inferential Analysis

Table 5

Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
.481a	0.231	0.217	19.815

Predictors: (Constant), CON, GME, FF, INA, GA

Table 5 displays the "Multiple Correlation Coefficient" (R) values (.481), indicating an appropriate prediction level, and R Square (0.231). The value of R Square explains the proportion of variation (23.1%) in the dependent variable 'Achieved Scores in Mathematics' (ACM) explained by the Independent Variables (IVs) such as General Mathematics Efficacy (GME), Grade Anxiety (GA), Future Factor (FF), In-Class Assignments (INA), and Confidence (CON).

Table 6

ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	31964.231	5	6392.846	16.281	.000b
Residual	106407.813	271	392.649		
Total	138372.043	276			

a. Dependent Variable: Score

b. Predictors: (Constant), CON, GME, FF, INA, GA

In the Table 6, the F-ratio tests is an overall a good fit for the data. It displays that IVs statistically significantly prophesy the dependent variable, $F(5, 271) = 16.281$, $p < .0005$ (See Table 6).

Table 7

Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	98.105	6.546		14.987	.000
GME	8.692	1.666	.369	5.217	.000
GA	-13.861	3.316	-.448	-4.180	.000
FF	4.669	2.592	.166	1.801	.073
INA	-1.581	2.338	-.055	-.676	.500
CON	8.564	1.656	-.292	-5.172	.000
a. Dependent Variable: Score					

Table 7 presents the equation to predict ACM from GME, GA, FF, and CON. The equation is as followed:

Predicted ACM = 98.105 + (8.692 x GME) – (13.861 x GA) + (4.669 x FF) + (8.564 x CON)

It is noteworthy to understand that with the increase in Grade Anxiety the scores of students get decrease significantly. On the other hand, with the increase in General Mathematics Efficacy, Future Factor, and Confidence the scores of students get increase significantly.

Table 8

Group Statistics

ASM		N	Mean	Std. Deviation	Std. Error Mean	Sig. (2-tailed)
Gender	Female	191	60.63	32.126	3.464	0.000
	Male	86	78.11	13.083	0.947	
School Sector	Private	240	72.73	22.332	1.442	0.925
	Public	37	72.35	23.079	3.794	

Table 8 concludes that there is no statistically significant difference for the performance of PSS in Mathematics based on their different school sectors. However, the performance of PSS in Mathematics based on their different gender contains the statistically significant difference. The performance of male students is higher (78.11%) than that of the female students (60.63%).

Table 9

AVOVA

Age Groups	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	32283.279	4	8070.820	20.693	.490
Within Groups	106088.765	272	390.032		
Total	138372.043	276			

While comparing the difference between the age groups and grades of students, no statistically significant difference was found in terms of the performance of PSS in Mathematics (See Table 9).

Table 10

Summary of Hypotheses

No.	Hypotheses	Sig Value	Status
1	Mathematics Efficacy has a significant impact on the performance of PSS in Mathematics	.000	Supported
2	Grade Anxiety has a significant impact on performance of PSS in Mathematics	.000	Supported
3	Future Factor has a significant impact on performance of PSS in Mathematics	.073	Supported
4	In-Class Assignments has a significant impact on performance of PSS in Mathematics	.500	Not Supported
5	Confidence level has a significant impact on performance of PSS Mathematics	.000	Supported
6	Performance of PSS in Mathematics is different based on their different gender	.000	Supported
7	Performance of PSS in Mathematics is different based on their different age groups	.490	Not Supported
8	Performance of PSS in Mathematics is different based on their different school sectors	.925	Not Supported

Discussion

The findings of the present study, in compassion of the reviewed literature, are consistently aligned with the findings of the other studies conducted on the students' performance in Mathematics. From this perspective, this study found a significant impact of Mathematics Efficacy on the students' performance in Mathematics (H1). The finding is consistently aligned with the studies conducted by Bandura et al. (2001); Nurhikmah et al. (2021); Öztürk et al. (2020); Özcan and Kültür (2021); Perera & John (2020); Rozgonjuk et al. (2020). The findings of the present study also supported the Grade Anxiety as a significant factor influencing the mathematics performance of the students (H2). The finding is aligned with the reviewed literature. For instance, Jolejole-Caube et al. (2019) found that mathematics anxiety significantly affects the motivation level of students to learn in mathematics classes. The findings of the study conducted by Samante and Alave (2021) suggest the same as the students' anxiety level negatively affects the students' performance in mathematics. According to Samante and Alave (2021), mathematics anxiety is basically developed due to the anxiety of students for their grades, the overall performance. In line with this, students with high levels of mathematics anxiety feel less excited, less confident and low motivated towards learning mathematics as compared to the students having low anxiety levels.

The present study found the future factor as a significant factor affecting the performance of PSS in Mathematics (H3). This finding is also in line with the reviewed literature. For example, the study conducted by Ali and Hassan (2019), suggests the mathematics teachers should utilize a variety of teaching methods in mathematic classes to make sure the math learning is a fun and enjoyable for students, as enjoyable mathematics learning increases the motivation of students to keep their future enjoyment in the mathematics tasks. However, the finding of the present study for the variable In-Class Assignments is not supported by the reviewed literature (H4). According to the findings of the study conducted by Malanchini et al. (2020) in-class assignments and tasks are the significant determinants for mathematics teachers to build mathematics efficacy, motivation, and anxiety. Furthermore, the finding of the study against the other variables including Confidence level is also aligned with the reviewed literature (H5). Self-confidence is used majorly for the individual's belief in himself or herself. While self-confidence is believed to be a personality trait, it can be understood to a specific situation. In the context of self-efficacy, the concept of self-confidence is perceived as a significant determinant

to portray the feelings, thoughts, behaviours and motivation of a student towards a specific task and its performance. The findings of the study reveal that self-confidence has a significant effect on the mathematics achievement of students (Çiftçi and Yildiz, 2019).

Conclusion & Recommendations

The study concludes with the support of the explored factors to be considered as significant factors for the increase in the performance of students in mathematics. The explored factors including Mathematics Efficacy, Grade Anxiety, Future Factor, In-Class Assignments, and Confidence Level of students are also supported by the reviewed literature. The efficacy in mathematics is also described as the confidence level of students in terms of completing a variety of tasks associated with the mathematics ranging from concepts understanding to solving problems. Students' self-efficacy assumes a significant part in achieving the school majors. For instance, students with more significant levels of math self-efficacy were altogether bound to pick science-based school majors as compared to the students with lower levels of arithmetic self-efficacy. Furthermore, math self-efficacy has likewise been demonstrated to be an indicator for students' profession decisions, with more elevated levels of math efficacy being connected with more science-based vocations.

Based on the findings of the present study as well as the reviewed literature, the study recommends the teachers serving to teach mathematics to the PSS to consider the explored factors while preparing the lesson plans. Furthermore, they are to make sure if their prepared lesson plans are the source of fun and enjoyment in the classroom, as enjoyable mathematics learning increases the motivation of students to keep their future enjoyment in the mathematics tasks. Furthermore, since the enjoyable mathematics learning increases the motivation of students, it is the great defence against the negative influence of math anxiety.

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