

Causes of Mathematics Phobia among Secondary School Students in Pynursla C&RD Block

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Abstract: Mathematics Phobia continues to be the most common obstacle to students' performance and self-efficacy in academic attainment, particularly at secondary level. This research investigates the causes of Mathematics Phobia among Secondary School Students in the Pynursla C&RD Block, with a variety of factors influencing these causes to range from cognitive abilities, social influence, self-concept, teacher support, learning style, textbook dependence, and student experience. Results indicate that the over-dependence on teacher-centred approach—typified by memorization, narrow strategies to problem-solving, and rigid textbook focus—is the overriding factor in the formation of negative mathematics attitudes. Students are also revealed to be incapable of applying mathematical principles to practical situations, a factor further compounded by inadequate basic knowledge and lack of facilities for application-based learning. With teaching material access and motivational schemes, these are in most instances incapable of countering procedural pedagogy dominance. The result is that students record low motivational scores, reduced critical thinking, and heightened anxiety. The research discovers the imperatives of education reform of conceptual understanding, contextualization, and inquiry-based learning. The interventions suggested include extensive teacher professional development and adoption of student-centred, participatory curricula. Implications from the research, although emerging from a particular regional context, find application to countering Mathematics Phobia and improving education performance in similar contexts.

Key Words: Mathematics Phobia, Secondary School Students, Social influence, Self-Concept, Teacher, Teaching Pedagogies, Textbook and syllabus.

1. INTRODUCTION:

Mathematics is widely considered to be a core subject that develops critical thinking, analytical thinking, and systematic problem-solving abilities needed for the explanation of complicated phenomena in science, technology, engineering, economics, and everyday life (Beswick, 2023; OECD, 2025). A strong grasp of mathematics not only accelerates cognitive development but also facilitates active citizenship and career preparedness in an information era (OECD, 2024). Although it is a core subject, mathematics often causes negative emotional reactions from secondary school students, in the form of Mathematics Phobia, that erodes short-term engagement and long-term success (Carey et al., 2023; Foong et al., 2023). This is a widespread trend in India: nearly 82% of Grades VII-X students experience serious anxiety while learning mathematics (Cuemath, 2021). Anxiety increases as students progress through secondary level, especially with the conventional rote-based learning, high-stakes testing, and poor academic support (Shabab, 2023). The performance metrics also show this trend in states like Meghalaya, where the National Achievement Survey (2017) found that the scores of students in mathematics are significantly lower than the national average, with a high rate of students not achieving grade-level expectations (NCERT, 2017).

Therefore, the present study has focused on the Pynursla C&RD Block to uncover the multi-dimensional reasons of Mathematics Phobia among Secondary School Students in this area. Through the different factors, the study will enlighten teachers, policymakers, and community members regarding how to develop positive, interactive mathematics learning environments. Ultimately, it will transform students' fear into confidence and stress the intrinsic value of mathematics.

2. LITERATURE REVIEW:

Mathematics phobia was described as persistent fear that interferes with involvement in quantitative activities, which is brought about by interrelated cognitive, affective, social, and instructional factors (Finell et al., 2022). The review was analyzed on the following themes.

Cognitive aspect:

Fear exhausts mental resources required for multi-step calculation, resulting in slower reaction times and higher rates of error (Ashcraft & Kirk, 2001; Passolunghi et al., 2016). Such lowered performance acts to reinforce fear by entering into a cycle of self-perpetuation. Also, difficulty in retention of formulae, poor conceptual understanding (Swanson & Beebe-Frankenberger, 2004; Geary, 2011) and lack of engagement in creative activities (Mann, 2006; Leikin, 2009) are another critical factor which hinder the effectiveness of Learning Mathematics.

Learner's mathematics self-concept:

Those who think of themselves as "math people" have significantly less anxiety, and negative judgments about the self-enhance it (Kasbi, 2020). Complementary evidence on self-efficacy is that belief in being capable of solving specific problems predicts persistence and success; low self-efficacy accounts for up to half of the variance in anxiety scores (Pajares & Miller, 1994; Meißner et al., 2016). Incremental success experiences and positive feedback therefore immunize against phobia (Skaalvik et al., 2015; Rozgonjuk et al., 2020).

Social influences:

Observational-learning theory argues that students emulate peers' attitudes; disapproving peer comments or public errors can increase anxiety, and supportive peer norms decrease anxiety (Eccles & Wigfield, 2002; Whyte & Anthony, 2012; Garba et al., 2021). Gender stereotypes like the idea that boys are naturally more proficient in math disproportionately influence girls' confidence (Boyung & Hardy, 1994). Parental influence is identical: high-anxiety parents pass it on in homework interactions, and positive parental attitudes are responsible for quantifiable decreases in children's anxiety (Gunderson et al., 2012; Vukovic et al., 2013; Maloney et al., 2015; Choi & Han, 2020).

Teacher:

Teachers themselves under stress regarding mathematics resort to traditional, drill-based instruction and eschew exploratory discussion, unconsciously raising student anxiety (Ramirez et al., 2018; Gresham, 2018). Bookish way of teaching and rote memory learning (Skemp, 1976; Hiebert & Grouws, 2007) weaken the confidence of student in Learning Mathematics. Also, it was found that teacher who build warm relationships and prioritize conceptual understanding reduce anxiety and build self-efficacy (Zhang et al., 2024; Palmwood, 2024).

Pedagogy, Textbooks and syllabus:

Timed testing, single-answer testing, and formulaic drill create a performance-over-mastery culture associated with increased anxiety (Seiter, 2017). Constructivist or inquiry-based methods, peer tutoring, and problem-based learning reliably bring about reductions in anxiety and increases in achievement (Morgan, 2003; Furner, 2024). Overly strict rules and poorly structured exercises make anxious students feel lost and more likely to avoid Learning Mathematics (Quintana, 2023). High-stakes testing within such curricula further heightens fear, particularly among slower learner (Zhang et al., 2019).

3. OBJECTIVES:

To find out the causes of Mathematics Phobias among the Secondary School students in Pynursla C&RD Block.

4. METHODOLOGY:

Research Method:

In this present study the descriptive research method was employed.

Population:

The study population comprised all Class X students enrolled in secondary schools within the Pynursla C&RD Block, totaling 556 students (Pynursla C&RD Block, 2024).

Sampling Technique:

Stratified simple random sampling technique was used in selection of the sample. The sample was stratified on the basis of sex and school management.

Sample of the Study:

The sample of the study comprised of 170 Class X students from the Secondary School in Pynursla C&RD Block. Table 1 shows the sample to be used for the present study.

Table 1: Showing the sample of the study

Types of management	Male students	Female Students	Total
Government aided	35	40	75
Private aided	20	25	45
Private	25	25	50
Total	80	90	170

Tools:

A self-constructed questionnaire was utilized to identify the causes of Mathematics Phobia among Secondary School Students in the Pynursla C&RD Block. The questionnaire comprised six dimensions: cognitive ability, self-concept and social influence, teacher, teaching pedagogies, and textbooks.

Table 2: Distribution of items under the dimension of the Questionnaire

Sl. No.	Dimension	Items	Total
1	Cognitive ability	4,5,7,8,10	5
2	Self-concept	12,13,14,16	4
3	Social influence	1,2,3,6,9,11,15,17	8
4	Teacher	18,19,21,22,23,24,36,37	8
5	Teaching Pedagogies	20,25,26,27,28	5
6	Textbooks	29,30,31,32,33,34,35	7
Total			37

5. Data analysis:

The data collected from the students were analyse as given below:

Table 3: Frequency and Percentage distribution of items in the Questionnaire N= 170

Sl. No.	Questions	Responses			
1	Do you believe that Mathematical ability is an inborn?	Yes		No	
		67%		33%	
		(114)		(56)	
2	Do you feel that male students can perform better in	Strongly disagree	Disagree	Agree	Strongly agree
		16%	28%	27%	29%
		(27)	(48)	(46)	(49)

Sl. No.	Questions	Responses					
	Mathematics than female students?						
3	Do you prepare mathematics test with enthusiasm?	Always	Sometimes		Rarely		Never
		22%	68%		7%		3%
		(37)	(116)		(12)		(5)
4	Do you find difficulties in understanding mathematical Concepts (eg.Sum of angles in a triangle is 1800)?	Yes			No		
		85% (144)			15% (26)		
5	Do you find difficulties in understanding mathematical ideas (eg.Sum of any two sides in a triangle is always greater than the third side)?	Yes			No		
		68% (116)			32% (54)		
6	Do you practice the sums which are done in school at home?	Yes	No				
			I don't understand the concept clearly.	The steps are too lengthy	The steps are too complicated	Too many assignment	Others
		20% (34)	43% (73)	13% (22)	5% (9)	12% (20)	7% (12)
7	Are you finding difficulties in remembering the mathematical formulae?	Yes			No		
		64% (109)			36% (107)		
8	Do you find difficulties in tackling mathematical problems?	No	Yes				
		9% (15)	91% (155)				
9	Mathematics is a burden and stressful Subject.	Strongly disagree	Disagree		Agree		Strongly agree
		19%	39%		28%		14%

Sl. No.	Questions	Responses				
		(32)	(66)	(48)	(24)	
10	I like to come up with new ways to solve math problems.	This is true to me		This is a little bit true to me	This is not at all true to me	
		18%		57%	25%	
		(31)		(97)	(42)	
11	Do you believe that ability to excel in mathematics can be achieve through hard work and consistence practices?	Strongly disagree	Disagree	Agree	Strongly agree	
		1%	7%	25%	67%	
		(2)	(12)	(43)	(113)	
12	One is good in Mathematics because he/she belongs to certain Race?	Strongly disagree	Disagree	Agree	Strongly agree	
		43%	22%	15%	20%	
		(73)	(37)	(26)	(34)	
13	Did anyone tell you that Mathematics is a difficult subject?	No	Yes			
			Parents	Sibling	Peers	Community members
		5%	15%	27%	39%	14%
		(8)	(26)	(46)	(66)	(24)
14	Do you feel that mathematics is an important tool that we are using in our day-to-day life?	Strongly disagree	Disagree	Agree	Strongly agree	
		10%	12%	27%	51%	
		(17)	(20)	(46)	(87)	
15	Do you agree that Mathematics is a Subject which can be treated as an Optional Subject?	Strongly disagree	Disagree	Agree	Strongly agree	
		21%	13%	39%	27%	
		(36)	(22)	(66)	(46)	
16	Do your parent encourage you to do well in Mathematics?	Always	Most of the time	Once in a while	Never	
		60%	28%	7%	5%	
		(102)	(47)	(12)	(9)	
17	I feel confident when using mathematics outside the school.	Strongly disagree	Disagree	Agree	Strongly agree	
		8%	15%	42%	35%	
		(14)	(26)	(71)	(59)	

Sl. No.	Questions	Responses			
18	Teachers motivates the class before starting a new topic.	Always	Most of the time	Once in a while	Never
		42%	22%	21%	15%
		(71)	(37)	(36)	(26)
19	Teachers teaches according to what it is written on the textbook.	Always	Most of the time	Once in a while	Never
		62%	26%	9%	3%
		(106)	(44)	(15)	(5)
20	Teachers elaborate abstract concepts by using examples.	Always	Most of the time	Once in a while	Never
		45%	38%	12%	5%
		(77)	(65)	(20)	(8)
21	Teachers linked the content taught with day-to-day life.	Always	Most of the time	Once in a while	Never
		28%	43%	18%	11%
		(48)	(73)	(31)	(18)
22	Teachers simplify the difficult topic into simple form by using?	3D-Model	Pictorial Chart	Video Demonstration	None of the above
		32%	38%	18%	12%
		(54)	(65)	(31)	(20)
23	Teachers encourages to learn Formulae by heart.	Always	Most of the time	Once in a while	Never
		69%	17%	9%	5%
		(117)	(29)	(15)	(9)
24	Teachers encourages to memorize Theorems by heart.	Always	Most of the time	Once in a while	Never
		44%	23%	21%	12%
		(75)	(39)	(36)	(20)
25	Teachers explains formulae by using	Derivation	Explanation	Demonstration	Teaching aids
		61%	30%	5%	4%
		(104)	(50)	(9)	(7)
26	Teachers explains Theorems by using	Derivation	Explanation	Demonstration	Teaching aids
		55%	29%	5%	11%
		(94)	(49)	(9)	(18)
27	Teachers restrict to only one Method for solving a Problem.	Always	Most of the time	Once in a while	Never
		72%	21%	4%	3%
		(122)	(36)	(7)	(5)

Sl. No.	Questions	Responses			
		Always	Most of the time	Once in a while	Never
28	Teachers explain the practical applicability of the mathematical Content learned with real life problems.	24%	25%	37%	14%
		(40)	(43)	(63)	(24)
29	Did the textbook provides an alternatives Method for solving a Problem?	Yes		No	
		83%		17%	
		(141)		(29)	
30	Are you able to link the mathematical content that you have learned in the classroom with the real-life situation?	Yes		No	
		48%		52%	
		(81)		(89)	
31	What are the reasons that makes you unable to link the mathematical content that you have learned in the classroom with real life problems?	Not clear with the concept		Problems solve in the classroom are not application-based problems.	No project work and activities
		62%		18%	13%
		(105)		(31)	(22)
					(12)
32	There are learning gap between the present mathematical course that you are learning with the previous grade.	Yes		No	
		41%		59%	
		(70)		(100)	
33	You are finding difficulties to tackle with the	Yes		No	
		55%		45%	

Sl. No.	Questions	Responses			
	present mathematical course because you are not clear with the mathematical concept that you have learned in your previous class.	(94)		(76)	
34	Solves examples provided in the textbook helps you for better understanding and referencing to solve the other mathematical problems.	Strongly disagree	Disagree	Agree	Strongly agree
		6% (10)	11% (19)	32% (54)	51% (87)
35	Words and statements used in your prescribed textbook is easy for you to understand and follow.	Strongly disagree	Disagree	Agree	Strongly agree
		9% (15)	14% (24)	35% (60)	42% (71)
36	Do teachers provide Solutions to every home assignment that are given to you?	Always	Most of the time	Once in a while	Never
		55% (94)	34% (57)	5% (9)	6% (10)
37	Do Teachers conduct test after completion of every unit.	Always	Most of the time	Once in a while	Never
		80% (136)	13% (22)	6% (10)	1% (2)

6. FINDINGS AND DISCUSSIONS:

The findings and discussions have been interpreted and discussed in accordance with the respective dimensions outlined below.

Cognitive ability:

The findings indicate that a considerable percentage of students have problems regarding conceptualization as well as memory in the subject of Mathematics. Specifically, 85% of the Secondary School Students indicate that they experience problems in grasping basic mathematical concepts, while 68% have problems with various mathematical concepts. Additionally, 64% experience problems in remembering formulae. Still, only 9% indicate having a problem in solving mathematical problems, which may suggest a smaller subset with improved problem-solving abilities. Furthermore,

creative engagement is quite low as only 18% indicate that they enjoy coming up with new approaches to problems, while 82% do not relate to this statement at all.

The findings are in agreement with other research that indicates memory deficit and poor conceptual understanding adversely affect students' performance in Mathematics (Swanson & Beebe-Frankenberger, 2004; Geary, 2011). The comparably small proportion of students suffering from problem-solving difficulty, however, contradicts findings highlighting the critical role conceptual understanding assumes in effective mathematical reasoning (Rittle-Johnson & Schneider, 2015). Such discrepancy can be an indication of excessive reliance on memorization along with procedural strategies. Furthermore, the lack of engagement in creative activities as reported by the students aligns with the existing literature that avers conventional pedagogical strategies are not conducive to mathematical creativity (Mann, 2006; Leikin, 2009). The trends highlight the critical need for teaching strategies that foster cognitive growth, conceptual understanding, and mathematical creative problem-solving.

Social Influence:

The outcome of the present study reveals that 35% of students believe that Mathematics ability is a race issue, while 65% disagree. Only 5% profess never to have been told that Mathematics are difficult, compared with 15% by parents, 27% by siblings, 39% by friends, and 14% by individuals in their communities. An overwhelming 78% majority admit the applicability of mathematics to daily life. Parental encouragement is high: 60% of students are always encouraged by their parents, 28% most often so, 7% sometimes so, and only 5% never so.

Parallel to these findings, recent studies highlight the strong influence of social factors on students' performance and attitude towards mathematics. Reinforcement of stereotypes—that is, the association of mathematical competence with racial identity—has been found to negatively affect motivation and achievement (Steele & Aronson, 1995). Peer and family stories play a key role in the formation of students' attitudes, as derogatory remarks from intimate social groups can effectively erode confidence (Eccles & Wigfield, 2002). High parental support, as observed in the current study, is in line with earlier work indicating such support improves academic self-concept and persistence in the subject of mathematics (Gunderson et al., 2012). Moreover, the framing of mathematics as relevant to daily life has been found to be a powerful predictor of enduring interest (Harackiewicz et al., 2014).

Self-Concept:

The result showed that 67% of the students are of the opinion that maths ability is innate, while 33% disagree. Gender stereotyping is still prevalent since 56% agree or strongly agree that males are good at maths and 44% disagree. Interest in test preparation is moderate: 22% always, 68% sometimes, 7% rarely, and 3% never. Only 20% always practice at home; 43% state unclear concepts, 13% long steps, and 5% complexity as obstacles. Maths is considered heavy and burden for learning by 42%, while 58% do not agree. Amazingly, 94% of them are of the opinion that excellence is due to hard work and practice. On curriculum, 66% opine that maths can be optional, while 34% disagree. Maths usage confidence outside school is high at 77%.

The findings of the present study are in line with previous research that indicates a belief in innate mathematical ability is a fixed mindset, which can deter students' persistence and decrease their interest in the field (Dweck, 2006; Blackwell et al., 2007). Furthermore, long-established gender-based stereotypes are opposite to empirical research providing little gender difference in mathematical ability (Hyde et al., 2008). Moreover, moderate levels of interest with not enough practice might be reflective of a decrease in motivation due to perceived difficulty (Wigfield & Meece, 1988). However, strong belief in effort value and high confidence levels in real-world importance reflect a high sense of self-efficacy, a strong predictor of long-term involvement and academic achievement (Bandura, 1997).

Teacher:

The finding shows that 42% of the teachers report that they frequently encourage the class before introducing new content, and 22% do so in most cases. Strict adherence to prescribed texts is noted, with 62% of teachers typically teaching from prescribed books. The instructional strategies include the use of frequent examples to illustrate abstract concepts (45% always) and making math real by 28% always, and 43% often. In supporting students to comprehend difficult work, teachers use visual aids (38%) and examples in practice (59%). Facilitating memorization is significantly highlighted, with 69% of the students being encouraged often to memorize formulae and 44% theorems. In addition, 55% are regularly given solutions to their homework, and 80% attest that unit tests are given after each stage of teaching.

These results are supported by previous research attesting that motivational approaches and practical applications maximize student engagement and facilitate conceptual understanding (Boaler, 1998; van de Walle et al., 2013). Heavy dependence on textbooks and memorization, on the other hand, is a transmission pedagogy that can inhibit the mastery of critical thinking (Skemp, 1976; Hiebert & Grouws, 2007). Though procedures such as frequent testing and offering solution sets can optimize understanding and promote responsibility (Black & Wiliam, 1998), excessive dependence on procedural fluency can stifle conceptual acquisition. Moreover, though the utilization of visual aids and contextual instruction is reflective of constructivist methods (Bruner, 1966), the over-emphasis on memorization suggests an immediate call for pedagogical change towards more inquiry-based and student-centered methods.

Teaching Pedagogies:

The study in this present research discovered that most teachers use the derivation approach to explain theorems (55%) and formulae (61%). Furthermore, explanation and demonstration were also the common strategies used in mathematics teaching in the class. The research also discovered that 72% of teachers always restrict learners to a single approach to problem-solving. Attempts in using mathematical content for real-life applications are extremely limited since only 24% always and 25% frequently use mathematics in resolving everyday problems. Moreover, instructional materials, such as visual models and interactive materials, are also utilized in an effort to support conceptualization.

Previous research confirms the viewpoint that excessive reliance on derivation and demonstration is characteristic of teacher-centered pedagogical models, which, though facilitating procedural knowledge, could be at the expense of student autonomy and critical thinking (Hiebert & Grouws, 2007). Restraint to a single method of problem-solving has been shown to hinder the establishment of adaptive and flexible cognitive abilities (Schoenfeld, 1985). Moreover, the lack of real-world contexts is against constructivist pedagogies, which emphasize much contextually driven learning in fostering relevance and retention (Boaler, 1998).

Textbooks:

The survey shows that 83% of students say their textbooks contain alternative problem-solving strategies, while 77% say the language in these materials is clear and understandable. However, only 48% are able to apply the mathematics content learned in class to practical situations, while 62% say unclear concepts uncovered during lectures are the reason. While 59% do not feel the learning gap between their previous and current study levels, 55% say they are having trouble with their current studies because they do not understand basic concepts learned in previous courses. Also, 83% agree that examples in textbooks aid understanding; however, major issues include, for example, the irrelevance of the syllabus (34%) and the lack of application problems and activities (18%), which prevent effective embedding of mathematical learning into practical situations.

Results from the current study support earlier studies that textbooks with straightforward solution approaches and easy language promote students' understanding and motivation (Boaler, 1998; van de Walle et al., 2013). Yet, lack of conceptual simplicity and applicability in teaching activities undermines successful knowledge transfer (Hiebert & Grouws, 2007). Poor foundational knowledge forms the root of most students' issues, even when learning gaps remain undetected (Black & Wiliam, 1998). Additionally, the lack of application-oriented activities and the feeling of irrelevance in syllabus materials decrease students' capacity to connect mathematics to real-life situations, and hence the need for more contextualized, inquiry-based teaching (Boaler, 1998).

7. Conclusion:

This present study illuminates the complex reasons behind Mathematics Phobia among Secondary School Students in Pynursla C&RD Block. Findings show a reliance on teacher-centred approach, such as rigid stickiness to textbooks and memorization, that transfer procedural knowledge but leave students with little room for autonomy and conceptual understanding. The majority of students are not able to connect Mathematics to real-life situations, being compelled to deal with ineffective learning and absence of application-based learning—issues earlier identified to be the perpetrators of Mathematics Phobia. Despite the use of motivational strategies and instructional materials, the classroom setting remains focused on the transmission of knowledge, creating the illusion that Mathematics is abstract and irrelevant in real life. This issue is augmented by weak foundation knowledge and poor problem-solving strategies, furthering feelings of incompetence and Mathematics Phobia. Additionally, poor application-based exercises deprive students of knowledge about the applicability of Mathematics beyond classroom doors

To eradicate Mathematics Phobia at Pynursla C&RD Block, we must move away from conventional teaching to participative, relevant practices that reassure students and bring Mathematics into everyday life.

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