



Unlocking The Mathematical World: Teachers' Insights On Secondary And Higher Secondary Math Education

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Abstract: This research article explores the perceptions of Mathematics teachers regarding the challenges and strategies involved in teaching secondary and higher secondary school students. Mathematics, often perceived as a complex and abstract subject, poses unique pedagogical challenges. This study aims to shed light on the experiences, attitudes, and strategies of teachers who navigate the intricacies of teaching mathematics to students at this crucial stage of their education.

Keywords: Mathematics, Perception of teacher, Current Syllabus..

1. INTRODUCTION

Mathematics education forms the foundation for a range of disciplines, while also cultivating critical thinking skills, logical reasoning abilities and problem-solving capabilities among Students. However, the current state of mathematics education at the secondary level often falls short of providing students with a deep understanding of mathematical concepts. Its significance extends beyond the confines of classroom walls, shaping the analytical thinking and problem-solving skills essential for students' academic and professional journeys. As students traverse the secondary and higher secondary stages of their education, the teaching of mathematics becomes a critical juncture, demanding a nuanced understanding of pedagogical challenges and effective instructional strategies.

1.1 RESEARCH FOCUS AND METHODOLOGY

A diverse group of Mathematics educators spanning various age groups, marital statuses, and teaching experiences participated in this research. The sample includes teachers handling different classes in secondary and higher secondary education.

A structured questionnaire was designed to capture insights of teacher's perception about students' attitude towards Mathematics teachers' motivations, teaching practices, and their experiences during the pandemic. The survey covered a range of topics, including demographic time allocation, strategies for student success, and views on the current syllabus.

The analysis was conducted using the data collected through two distinct methods: google form and manual transcription of questionnaire. The data was then analyzed using MS-EXCEL. The survey comprised of structured questionnaire with 15 questions designed for both secondary and higher secondary Math teachers. The survey successfully gathered a total of 66 responses from secondary and higher secondary Math teachers.

2. OBJECTIVE OF THE STUDY

The study aims to achieve the following

- To investigate teachers' perceptions and attitudes regarding the teaching of mathematics to students during this pivotal stage of their education, as well as to assess students' engagement with mathematics.
- To ascertain the opinions of teachers regarding the current syllabus

2.1 DEMOGRAPHIC REPRESENTATION

Particulars		Frequency	percentage
Age	25- 30	4	6.06
	31 - 35 years	6	9.09
	36 – 40	9	13.6
	41 -50	20	30.3
	51 – 60	23	34.8
Marital Status	Married	61	92.4
	Unmarried	5	7.57
Experience in teaching	0-3 years	7	10.6
	3-6 years	9	13.6
	6-10 years	14	21.2
	10- 15 years	13	19.6
	More than 15 years	23	34.8
Location of School	North	38	57.6
	South	28	42.4
	East	0	0
	West	0	0
School	Govt	20	30.3
	Govt – Aided	21	31.8
	Private	25	37.8
Class Handling	9 th Standard	25	37.8
	10 th Standard	19	28.8
	11 th Standard	11	16.6
	12 th Standard	11	16.6

Table 2.1 Demographic Representation

The following table shows the demographics of the respondents. Refer table 2.1.

FINDINGS

- Respondents were primarily within the age group of 40 – 60 years.
- A diverse mix of married and unmarried teachers participated.
- Teachers had varying experiences, ranging from 3-6 years of experience to professionals with over 15 years.
- The majority had chosen Mathematics due to their interest in the subject, inspired by influential math teachers, or influenced by parents or peers.
- Teachers were spread across government, government-aided, and private schools.
- Geographic distribution included North and South regions of Chennai

TEACHING PRACTICES AND TIME ALLOCATION

S.N o	TIME SPENT BY TEACHERS	WM S
1	planning lessons by yourself	1.62
2	preparing or grading for student tests or exams	1.82
3	meeting with students outside of classroom time	1.64
4	meeting with parents	1.56
5	professional reading and development activity	1.65
6	keeping students' records up to date	1.82
7	administrative tasks including staff meetings	1.67

Table 3.1 Time spent by teachers

Effective teaching requires a delicate balance of time allocation. The research investigates how teachers spend their time planning lessons, grading assessments, administrative task, meeting with parents and engaging in professional development. This sheds light on the challenges and priorities teachers face in fostering a conducive learning environment. Refer table 3.1

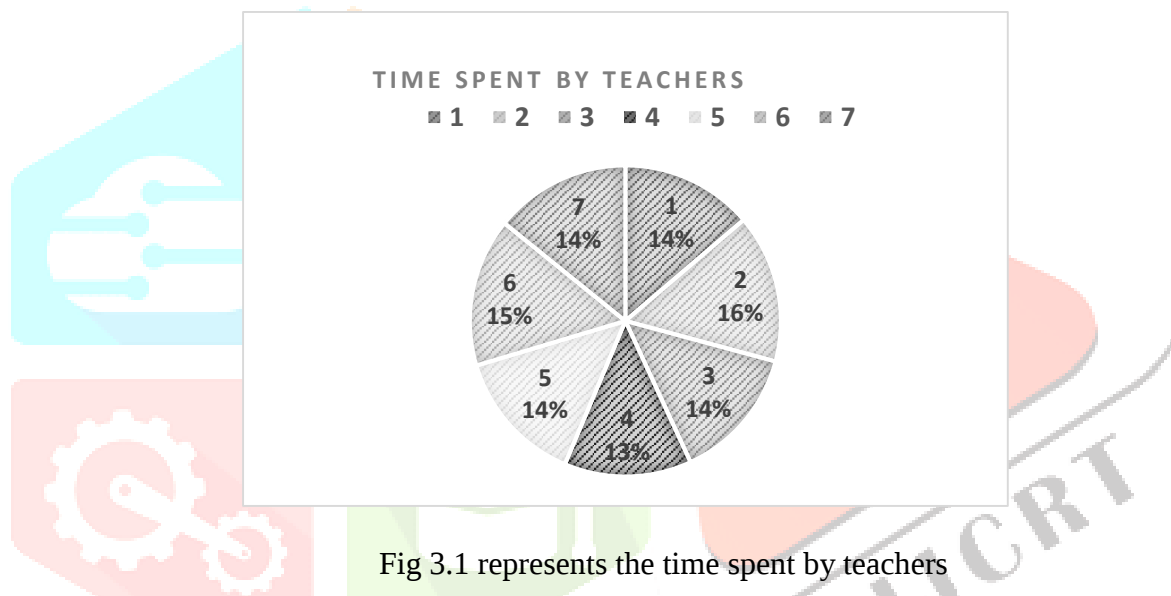


Fig 3.1 represents the time spent by teachers

From the table 3.1 it is clear that 14% of hour per week is spend on planning lessons,16% on preparing or grading for student tests or exams ,14%on meeting with students outside of classroom time ,13% on meeting with parents ,14% on professional reading and development activity ,15%on keeping students records up to date and 14% on administrative tasks. On an average it shows that teachers spent 8 hours per week for all preparation, grading for student test etc.

1. STRATEGIES FOR STUDENT TO BE GOOD AT MATH

Teachers employ various strategies to unlock the potential of each student. The research delves into teachers' beliefs about strategies for student success, providing insights into the varied approaches used in classrooms. Mathematics is a subject that often poses challenges for students, but with the right strategies, anyone can become proficient. Our focus will be on four crucial aspects: remembering formulas and procedures, thinking sequentially and procedurally, understanding mathematical concepts, and appreciating how mathematics is applied in the real world.

The strategies which can be adopted by students to be good in math	Total Responses	Strongly Agree	Agree	Neutral
remember formulas and procedures	66	66.70%	31.80%	1.50%
think in a sequential and procedural manner.	66	42.40%	54.50%	3.03%
understand Mathematical concepts, principles and strategies.	66	72.70%	21.20%	6.06%
understand how Mathematics is used in the real world.	66	60.60%	39.40%	0%

Table 4.1 Strategies adopted by students to be good in math

4.1 REMEMBERING FORMULAS AND PROCEDURES:

One fundamental aspect of success in mathematics is the ability to recall and apply formulas and procedures.

4.2 THINKING IN A SEQUENTIAL AND PROCEDURAL MANNER:

Mathematics often requires a step-by-step approach, and students benefit greatly from thinking sequentially and procedurally. Agreeing with the importance of this strategy involves recognizing that breaking down complex problems into manageable steps is a key to success. This approach not only enhances problem-solving skills but also fosters a deeper understanding of mathematical processes. Embracing sequential and procedural thinking is like constructing a logical roadmap for navigating through mathematical landscapes.

4.3 UNDERSTANDING MATHEMATICAL CONCEPTS:

Beyond memorization, true mastery of math comes from understanding underlying concepts, principles, and strategies. Seeking clarification from teachers, engaging in group discussions, can gain a profound understanding of the subject matter. This strategy fosters critical thinking and analytical skills, essential for tackling complex mathematical problems.

4.4 UNDERSTANDING HOW MATHEMATICS IS USED IN THE REAL WORLD:

By understanding the real-world applications of mathematical concepts, students gain motivation and a broader perspective. Teachers can facilitate this understanding by incorporating practical examples and case studies into their lessons. Refer table 4.1.

FINDINGS

- A significant percentage of students (66.7%) strongly agree that remembering formulas and procedures is an effective strategy, while 31.8% agree to some extent.
- Students are somewhat divided on the importance of thinking in a sequential and procedural manner, with 42.4% strongly agreeing, 54.5% agreeing, and a small percentage (3.03%) expressing a neutral stance.
- The majority of students (72.7%) strongly agree that understanding mathematical concepts, principles, and strategies is essential, while 21.2% agree to some extent.

PERCEPTIVES ON THE NATURE OF MATHEMATICS

SN O		STATEMENT	WM S
1	Q1	If students are having difficulty, an effective approach is to give them more practice.	4.35
2	Q5	A liking for and understanding of students are essential for teaching Mathematics.	4.27
3	Q2	Some students have a natural talent for Mathematics and others do not.	4.15
4	Q3	More than one representation (picture, concrete material, symbol set, etc.) should be used in teaching a Mathematics topic.	4.12
5	Q4	Mathematics should be learned as sets of algorithms or rules that cover all possibilities.	3.94

Table 4.2 Perceptive on the nature of Mathematics

Correlation between statements

	Q1	Q2	Q3	Q4	Q5
Q1	1				
Q2	0.2	1			
Q3	0.05	0.35	1		
Q4	0.29	1	0.6	1	
Q5	0.31	5	9	5	1

Table 4.3 Correlation for perceptive on the nature of Mathematics

There is a positive correlation between statement Q5 and Q3 stating that liking and understanding of students are essential for Teaching Mathematics and more than one more than one representation (picture, concrete material, symbol set, etc.)should be used in teaching a Mathematics topic.

5. STUDENT COLLABORATIVE LEARNING IN MATHEMATICS

In the realm of mathematics education, understanding how students engage with the subject is crucial for effective teaching strategies. Refer table 5.1.

FINDINGS

- Students generally seem to have a tendency to work individually rather than collaboratively.
- When collaborative work occurs, it is more likely to happen with teacher assistance.
- Collaborative activities involving student interaction are reported less frequently compared to individual work or teacher-assisted activities.

5.1 VIEWS ON THE CURRENT SYLLABUS AND CURRICULUM ADAPTABILITY

Current Syllabus		WM
Q1	Do the student feel syllabus is heavy	3.66
	students are not able to practice	7
	because of more problems in	3.84
Q2	Mathematics.	8
	students find it difficult adapting to the	3.62
Q3	new curriculum.	1
	As a part of creativity and innovation,	2.86
	it is difficult for me to adapt to the new	
Q4	curriculum.	4

Table 5.1 current Syllabus

As education evolves, teachers must navigate through changing curricula. The research explores teachers' thoughts on the current syllabus, its perceived weight, and their adaptability to new educational standards, offering a snapshot of challenges and opportunities. Refer table 5.1.

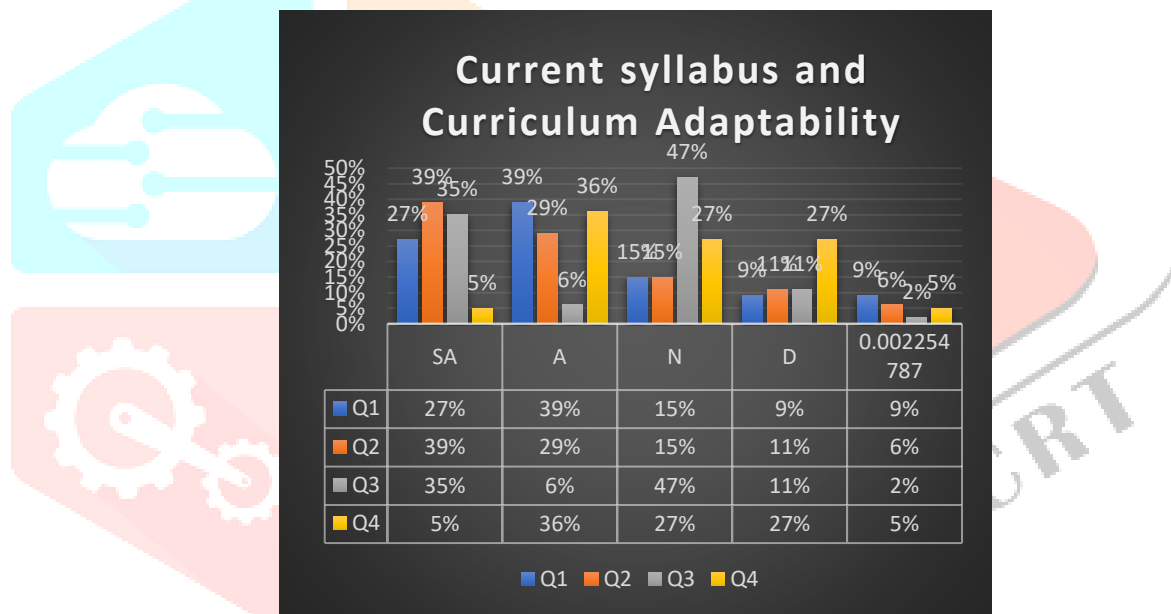


Figure 5.1 Current Syllabus and Curriculum Adaptability

RESULT**HYPOTHESIS**

There is association between teachers who participate more frequently in development programming activities tend to adapt more changes in the curriculum/educational standards.

INTERPRETATION

Chi – Square Test for Independence of Attributes was applied and the result is stated in table

Level of Significance	df	Calculated Value	Critical Value
0.05	4	0.0024	9.488

therefore we accept the hypothesis. ie There is association between teachers who participate more frequently in development programming activities tend to adapt more changes in the curriculum/educational standards.

5.2 PERSPECTIVES ON TEACHER-STUDENT RELATIONSHIPS AND STUDENT DEVELOPMENT

Perspectives on Teacher-Student Relationships and Student Development refers to the viewpoints, beliefs, and attitudes held by educators regarding to share with their students and the importance they attribute to aspects such as positive bonds, student progress, regular positive feedback, and individual attention to students with special needs. This shows how teachers perceive the interaction between themselves and students and the significance they place on fostering a conducive learning environment for the overall development of their students. Refer table 5.2.

In Mathematics chapter, how often do students	No of Responses	Frequency%				
		Never	Rarely	Sometimes	Often	Always
work individually without assistance from the teacher.	66	42%	36%	12%	9%	0%
work individually with assistance from the teacher.	66	33%	29%	29%	4%	5%
work together as a class with the teacher teaching the whole class	66	42%	36%	12%	7%	3%
work together as a class with students responding to one another.	66	30%	27%	26%	11%	4%
work in pairs or small groups without assistance from the teacher.	66	38%	26%	24%	6%	6%
work in pairs or small groups with assistance from the teacher.	66	35%	29%	23%	12%	1%

Table 5.2 Collaborative learning

FINDINGS

- An overwhelming majority of respondents (84.80%) consider the student's progress as always of utmost importance. This suggests a high significance of prioritizing students' academic development and growth.
- A significant majority of respondents (78.80%) believe that teachers and students should always have a positive bond with each other.
- The majority of respondents (69.70%) emphasizes that teachers should always provide individual attention to students with special needs.
- A notable portion of respondents (59.10%) believes that teachers should always provide positive feedback to students regularly.

5.3 IMPACT OF THE PANDEMIC ON MATHEMATICS EDUCATION

The global pandemic has reshaped education, and this research seeks to understand how mathematics educators adapted to these changes. The insights reveal the adaptability of teachers, showcasing their ability to handle challenges and innovate in the teaching field. Refer table 5.3.

How important do you think the following are, in your opinion?	Frequency %			
	Rarely	Sometimes	Often	Always
The student's progress is of utmost importance	0%	3%	12%	84.80%
Teachers and students should have a positive bond with each other	3%	9.10%	9.10%	78.80%
Teachers must provide individual attention to students with special needs	3%	12.10%	15.20%	69.70%
Teachers should give positive feedback to students regularly	6.06%	18.20%	16.70%	59.10%

Table 5.3 attitude of teachers towards students

HYPOTHESIS

There is no significant correlation between the impact of the pandemic on teaching-learning practices in Mathematics and the provision of remedial or supplementary materials to bridge foundational gaps among students.

	Column 1	Column 2
Column 1	1	-0.1345
Column 2	-0.1345	1

Table 5.4 Correlation

This table suggest that there is significant correlation between the impact of the pandemic on teaching-learning practices in Mathematics and the provision of remedial or supplementary materials to bridge foundational gaps among students.

6. OPEN -ENDED QUESTIONS

6.1 TEACHER SUPPORT AND PROFESSIONAL OPPORTUNITIES

Teachers thrive with support and opportunities for professional growth. The research explores teachers' perspectives on the resources and opportunities needed during curriculum transitions, offering valuable recommendations for educational policymakers.

What resources or professional opportunities do you believe would support teachers during a curriculum transition?

Respondents few suggestions

- I believe most teachers can benefit from utilizing various resources such as library books, digital learning materials (videos, audio, text, websites, animations, images), and social media.
- Utilizing websites and YouTube can be valuable for many teachers.
- Emphasizing simple step-by-step calculations in each problem.
- Teachers should simplify teaching methods based on the curriculum to enhance student understanding and interest.
- Effective tools like PowerPoint presentations and videos can aid in teaching.
- Incorporating practical applications of geometry and graphs in mathematics.
- Advocating for a reduced syllabus to facilitate better understanding.
- Introducing practical exams and providing mathematics lab equipment.
- Encouraging individual expression and fostering collaboration through activities like insecure training and WhatsApp groups for doubt discussions.

What difficulty levels do students associate with topics in the Senior Secondary Mathematics syllabus?

- Students find theoretical problems in trigonometry, analytical geometry, and algebra challenging.
- Specific challenges arise in understanding Cartesian and vector equations in vector algebra.
- Difficulty in recognizing the application of concepts to particular problems after learning.
- Challenges in grouping trigonometry and integration formulae and methods.

- Struggling with basic concepts and application in various situations.
- Overwhelming difficulty due to a high number of exercises under particular chapters.
- Especially challenging are the theoretical portions, with struggles in memorizing numerous formulas.
- Some students feel the difficulty is around 50 percent.
- The heavy syllabus and numerous problems make studying mathematics challenging.

Suggestions for improvement:

- Emphasize effective teaching and learning of mathematics for broader empowerment in science, mathematics, and engineering.
- Acknowledge the importance and interest of mathematics but advocate for a more manageable syllabus in higher secondary (+1, +2).
- Allocate sufficient time before exams for adequate preparation.
- Appreciate the benefits of the new curriculum but suggest reducing the number of exercises and problems.
- Address the issue of continuity from 10th standard to higher secondary.
- Advocate for regular worksheets, basic skill development, and a focus on real problem-solving and reasoning.
- Stress the need for increased concentration and patience in teaching and learning.

7. CONCLUSION

This research sheds light on the dynamic landscape of secondary and higher secondary math education through the lens of dedicated mathematics teachers. The findings reveal a diverse group of educators, spanning age, marital status, and teaching experiences, united by a common goal—nurturing the mathematical minds of students. The study covered valuable insights into teachers' perceptions, attitudes, and strategies, providing a roadmap for addressing the challenges inherent in teaching mathematics.

Teachers, the unsung heroes of education, play a pivotal role in shaping students' understanding and appreciation for mathematics. The research emphasizes the significance of effective teaching practices, time allocation, and the strategies employed by teachers to unlock the potential of each student. Collaborative learning, a key aspect explored in this study, highlights the need for fostering a balance between individual and group work, ensuring a holistic learning experience.

As the education landscape evolves, the research also delves into teachers' perspectives on the current syllabus and its adaptability. The findings suggest varying opinions on the weight of the syllabus and the ease of adapting to new educational standards. However, the study concludes that professional development opportunities play a crucial role in mitigating challenges associated with curriculum transitions.

In the face of the global pandemic, mathematics educators showcased resilience, adapting to new teaching-learning practices. The correlation between the impact of the pandemic and the provision of remedial or supplementary materials underscores the commitment of teachers to bridge foundational gaps among students.

The open-ended questions and teachers' responses provide a wealth of suggestions for supporting teachers during curriculum transitions and improving the senior secondary mathematics syllabus. From embracing digital learning materials to advocating for reduced syllabi and allocating sufficient preparation time, the recommendations offer valuable insights for educational policymakers.

In essence, this research serves as a compass for educators, policymakers, and stakeholders in the field of mathematics education, guiding them toward a more effective and student-centric approach. By unlocking the mathematical world through the lens of teachers' insights, we pave the way for a future where students not only conquer the challenges of mathematics but also develop a lasting love for the subject.

8. REFERENCE

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