CHALLENGES FACED BY MATHEMATICS EDUCATORS AT THE SECONDARY LEVEL: A STUDY WITH SPECIAL REFERENCE TO KAMRUP (METRO) DISTRICT

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Abstract

Mathematics is the foundation of all scientific knowledge and studies. It is often considered to be a critical subject for cognitive development and problem-solving. This study is a humble effort to analyse the challenges faced by Mathematics Educators at the secondary level (NEP-2020 Division -I) with reference to Kamrup (Metro) District. Learning mathematics at this level is often perceived as challenging, leading to a range of performance outcomes. But teaching mathematics is even more challenging to motivate the students to learn mathematics.

Keywords:
Secondary Education, Mathematics Education, Teaching Competencies, Pedagogical Challenges.

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Introduction

When anybody glimpsesat the evolution of science, itbecomes clear that Mathematics is one of the most pure and original form of subjects evolved throughout the history of human civilization. It has been around us since the dawn of time, and probably from the beginning of counting. Mathematics carries its own rich heritage and tradition, and it is present in nearly every aspect of our daily lives.In today's world, no study can be pursuedwithout the application of mathematical principles. In this regard, we can quote the famous quotation of the German Mathematician Carl Friedrich Gauss, who was also called the Prince of Mathematicians. According to him, "Mathematics is the Queen of all Sciences". It serves as the language of Science and

Engineering. Supporting this, McLeod (1989) emphasized that students' beliefs and attitudes toward mathematics play a vital role in shaping mathematics education.

Mathematics is often regarded as the backbone of all branches of science.Beyond its role in scientific concepts, it is essential for analyzing data collected during any research or study. Unlike some subjects, mathematics cannot be studied without pen and paper, and it demands logical thinking and problem-solving skills—abilities that are gradually developed from an early age. However, when students think of mathematics, equations and formulas often come to mind, which can create anxiety or fear. As a result, many students tend to avoid the subject at higher levels of study due to this pre-existing phobia. For these learners, dealing with formulas can be a source of significant discomfort, which in turn affects their understanding of science. Consequently, the number of students pursuing basic science courses with mathematics—particularly at the undergraduate level—has been steadily declining.

Mathematics is an important and core subject in the school curriculum. Studying mathematics at the secondary level is crucial for entering higher education, as it forms the foundation for advanced learning. To build a strong academic path or pursue any career that requires analytical thinking, a solid understanding of mathematics is essential.

According to Pehkonen (2003), students' learning outcomes are strongly linked to their beliefs and attitudes toward mathematics. Lester et al. (1989) further noted that any effective mathematics teacher would recognize that success or failure in problem-solving depends not only on students' mathematical knowledge but also on non-cognitive traits such as self-confidence, motivation, and perseverance. Furinghetti and Pehkonen (2002) observed that teachers often believe they are presenting mathematical content authentically and in a contextually meaningful way during the classroom teaching–learning process. Ma and Xu (2004) also emphasized that a positive attitude toward mathematics helps students develop a stronger foundation for higher studies.

Students' attitudes toward mathematics are influenced by both the teacher and the teaching methods adopted. Learners are more likely to enjoy the subject when it is taught in a supportive, friendly, and pressure-free environment. In the structure of our education system—spanning primary, middle, and secondary or higher levels—a large

number of students tend to opt out of basic science subjects after the secondary stage (NCF, 2005). This trend further underscores the importance of nurturing positive attitudes and strengthening the teaching–learning process in mathematics from the early years.

Apart from students' difficulties, an examination of the challenges faced by secondary-level mathematics educators reveals that they encounter various physical (classroom-based), social, and psychological barriers in their teaching environment.

Pedagogical challenges in mathematics education encompass a wide range of difficulties that teachers encounter while facilitating effective learning. Mathematics educators often struggle with addressing diverse learner abilities, bridging foundational gaps, and fostering conceptual understanding rather than rote memorization. They face the ongoing task of making abstract concepts accessible and relatable, while also encouraging critical thinking and problem-solving skills. These challenges are often intensified by inadequate teaching resources, limited time for syllabus completion, and large class sizes that complicate instructional delivery and individualized attention. Moreover, low motivation and anxiety toward mathematics, combined with insufficient support at home environments further hinder meaningful learning experiences. Collectively, these issues highlight the need for ongoing professional development, well-structured curricular support, and strong collaboration among schools, families, and policymakers. Such collective efforts are essential for strengthening mathematics teaching and promoting deeper, more lasting learning among students.

The study presented in this paper aims to identify the types of challenges faced by mathematics educators, particularly in classroom situations.

Competencies of Mathematics teachers: The competencies of a mathematics teacher include mathematical knowledge, pedagogical expertise, interpersonal skills, and overall professional competencies. According to Pascual (2024)teachers should engage in continuous professional development to maintain high levels of competence and strengthen areas that need improvement. Therefore, it is essential that teachers are provided with adequate opportunities to enhance their professional practice and refine their teaching skills.

Stages of Formal Education-

There are four stages of development of every human being. They are –

1. Infancy (0-5years)

2. Childhood (6-12 years)
3. Adolescence (12/13-18 years)
4. Adulthood (18+)

So, according to these four developmental stages of human beings, education also progresses accordingly. The formal education starts at the age of 6 years, then gradually students develop their knowledge-acquiring abilities year by year.

There are different stages of formal education. They are –

1. Lower Primary
2. Upper Primary
3. Secondary
4. Graduation
5. Post-Graduation.

Need and Importance of the Study:

The study titled *"Challenges Faced by Mathematics Educators at the Secondary Level: A Study with Special Reference to Kamrup (Metro) District"* is essential for enhancing the overall quality of mathematics education. It brings to light the real classroom issues encountered by teachers, including gaps in students' foundational knowledge, limited instructional resources, and time constraints in completing the curriculum. By identifying these challenges, the study offers valuable insights for policymakers, school administrators, and curriculum planners, enabling them to design targeted interventions that more effectively support mathematics educators.

Furthermore, the findings help in strengthening professional development programmes, encourage the adoption of innovative teaching strategies, and promote a positive learning environment for students. The study also contributes to educational research by providing region-specific data that can guide future improvements in mathematics teaching practices. Ultimately, understanding the challenges faced by educators at the grassroots level ensures better learning outcomes for students and helps build a stronger foundation for mathematics education in the Kamrup (Metro) district.

Review of Literature :

Several studies, both national and international, have explored various aspects of mathematics education at the secondary level. The present investigator has reviewed relevant literature on mathematics education across regional, national, and international contexts, as outlined below.

Asagar(2025) examined teachers'perceptionsexploring the challenges faced by mathematics teachers during the transition from primary to upper-primary levels and findings were analysed based on the difficulties faced by mathematics teachers when transitioning from elementary to upper-primary levels.

Hussain (2019) has mentioned in his studies on the attitude of high school students towards science and mathematics in relation to some selected variables and found that that there are significant influences of teacher-student related variables, such as the teaching aids used in science and mathematics classes, which leads to a positive attitude towards mathematics.

Samanta (2019) studied on mathematics education at the primary level in West Bengal primary schoolswith reference to national curriculum framework 2005, focusing on the quality of mathematics education. The findings of the study reveals that the mathematics books at the primary level are designed as application–oriented, student-oriented, as well as attractive to the students. Traditional culture and values are included in the text book andthereby it becomes attractive among the students.

Andrea and et al.(2015) studied on parallel transitions and challenges faced by new mathematics teachers. Their study reveals the challenges faced by K-12 mathematics educators in mentoring and lackof teaching experience.

Lalremmawii (2015) studied onmathematics education in secondary schools in Aizawl city and found that male mathematics teachers occupy a higher percentage than female mathematics teachers in secondary schools andsome mathematics teachers at secondary schools are not qualified to teach the mathematics subject.

Wilburne and Napoli, *(*2008) conducted a study connecting Mathematics and Literature among pre-service elementary school teachers' changing beliefs and knowledge. Their studygenerated positive results and beliefs on connecting literature and mathematics among the pre-service elementary teachers. The use of the novel helped the pre-service teachers realize first-hand extent of mathematical learning that can occur through literatures. They found that literature served as a great motivator to

engage students in mathematics and help inspire a sense of motivation to learn mathematics.

Saha(2007) conducted a study on gender, cognitive style and attitude towards mathematics in achievement of mathematics learning. The study reveals that the three variables- gender, cognitive style and attitude contribute to a statistically significant difference in achievement on mathematics learning.

Significance of the study:

The present study on challenges faced by the mathematics educators of Kamrup Metro District is significant as it places special emphasis on mathematics education at the grassroots level of formal education (i.e., secondary education), focusing on challenges and attitude of mathematics teachers towards mathematics.

It has been observed that though students are gradually developing a positive attitude towards professional education but study onbasic sciences (study in Physics, Chemistry or Mathematics) is drastically decreasing universally, which is becoming a matter of great concern.

In NEP2020, it has also given special importance on STEM learning. In part I, chapter 4of NEP 2020, emphasis has been given on curriculum and pedagogy in schools.As per NEP 2020, learning should be holistic, integrated, enjoyable, and engaging, focusing on curricular integration on essential subjects, skills, and capacities. At section no 4.25 of chapter 4 of NEP 2020,it is recognised that mathematics and mathematical thinking is very important for India's future and India's leadership role in the numerous upcoming fields and professions such as artificial intelligence, machine learning, and data science, etc. In the new education policy, mathematics and computational thinking are given increased importance throughout the school years, starting from the foundational stage, through a variety of innovative methods, including regular use of puzzles and games that make mathematical learning more enjoyable and engaging. It is also proposed to involve activities involving coding to be introduced in the middle stage.

Consequently, fostering a positive disposition toward mathematics presents a significant pedagogical challenge for secondary-level educators, who must simultaneously address the diverse effective needs of students and the broader societal demand for mathematical education.

Given this context, the present study is highly significant as it provides a critical examination of the specific professional challenges encountered by teachers in achieving this complex objective.

Objective of the study:

1. To analyse the challenges faced by the Mathematics Educators while teaching Mathematics at the Secondary Schools of Kamrup Metro District.
2. To evaluate the extent and manner of utilisation of the flipped classroom model by mathematics educators, with a particular focus on the integration of supporting technologies such as smart class resources and general information and communication technology (ICT) tools.

Area of study:

This study is confined to randomly select Government and Provincialized Secondary Schools of KamrupMetro District.

Research design of the study:

Sample of the study:

The participant respondents for the present study comprise twenty four(24) teachers of secondary schools drawn from five (5) secondary schools within the Kamrup Metro District.

Tools used for the study:

Research Instrument and Challenge Categorization:

For this study,data collection was conducted using a self-administered questionnaire, specifically developed to assess teacher’s beliefs, attitudes, and perceived challenges in teaching mathematics at the secondary level.

The questionnaire was structured to categorise the perceived challenges into the following four core domains, utilising them/serving as the primary independent variables for analysis:

- **Low Intrinsic Motivation:** Addressing the student's internal drive, interest, and value placed on learning mathematics.
- **Deficiencies in Foundational Mathematical Knowledge:**About gaps in prerequisite concepts and skills necessary for successful progression in the subject.

- **Insufficient Parental or Familial Assistance:** Exploring the perceived lack of necessary support, supervision, or encouragement from the student's home environment.
- **Constraints on Instructional Time:** Relating to the perceived inadequacy of allocated class time for teaching, practicing, and remediation of complex mathematical topics.

Use of Teaching Methodologies:

To evaluate onthe use of teaching methodologies - whether the teachers use traditional instructional method or use of flipped class room such as -

a. Traditional Instruction (TI).

b. Information and Communication Technologies. (ICT)

Operational Definition:

FC - Flipped Classroom

TI – Traditional Instruction

ICT – Information and Communication Technologies

STEM- Science, Technologies, Mathematics and Engineering

Data analysis:

Statistical Technique used:

Descriptive statistical measures used to analyse the data.

Objective 1: To analyse the challenges faced by the Mathematics Educators while teaching Mathematics at the Secondary Schools of Kamrup Metro District.

For objective number 1, the teachers were given a questionnaire on challenges faced by the educators.

The challenges categorised were mentioned in the table-1as follows:

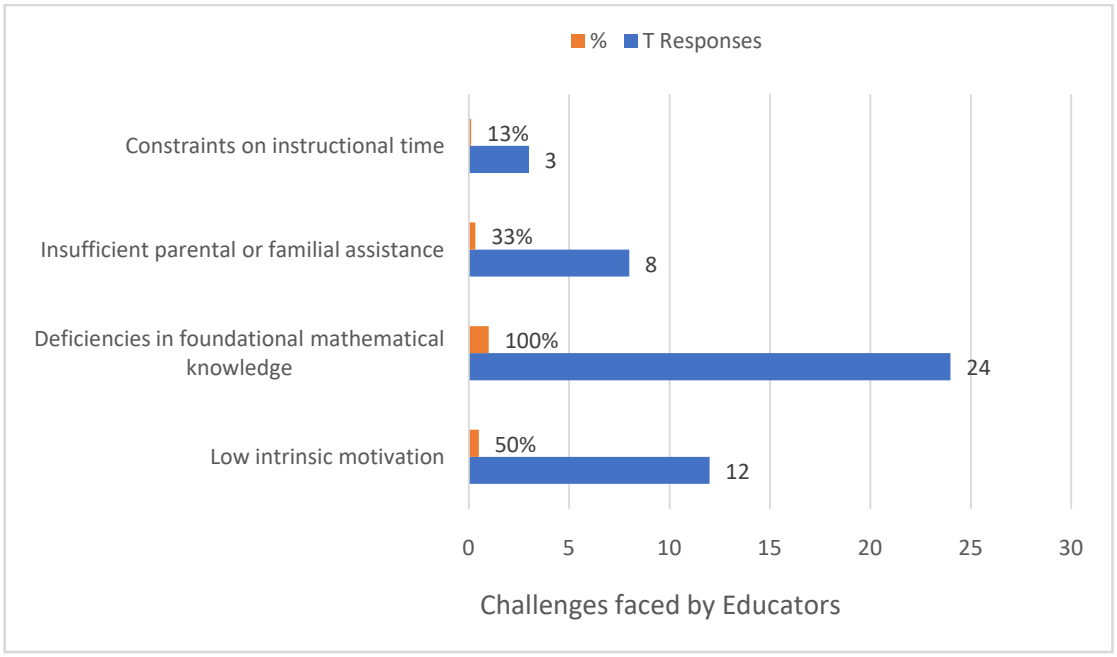
Table-1

Challenges	Number of teacher support	Percentage
Low intrinsic motivation	12	50%
Deficiencies in foundational mathematical knowledge	24	100%
Insufficient parental or familial assistance	8	33%
Constraints on instructional time	3	13%

Findings are represented graphically in Figure-1 and analysed.

Graphical representation of the data collected and mentioned in Table-1 is as follows:

Figure-1



Analysis of objective 1:

Foundational Knowledge Deficiency:

From Table–1, the investigator observed a notable outcome reflecting unanimous agreement among the surveyed educators. All the 24 teachers (100% of the respondents) indicated that deficiencies in foundational mathematical knowledge constitute one of the foremost challenges they encounter during classroom interactions with students. This finding highlights a critical pedagogical impediment, wherein students' lack of prerequisite essential skills substantially hinders the effective teaching–learning processes of current mathematical concepts.

Low Motivation:

In addition to foundational gaps, motivational issues also emerge as a highly significant factor. Among the respondents, 50% of the educators specifically highlighted low student motivation toward learning mathematics as an area requiring special attention. This indicates that half of the teaching cohort perceives students' apathy or lack of engagement as a major barrier, further compounding the challenges already posed by inadequate mathematical backgrounds.

A significant finding highlights the perceived impact of the home environment on students' learning. Specifically, 33% of the mathematics educators reported that parental and home-related factors influence students' performance in mathematics.

The respondent teachers identified the inadequate study environment at students' homes as another major challenge. The absence of a conducive learning environment or sufficient academic support beyond school hours directly contributes to the difficulties teachers encounter in the classroom. This suggests that factors external to the school setting play a substantial role in shaping students' academic outcomes.

The data indicates that the issue of syllabus incompletion due to teacher incompetence is minimal among the surveyed mathematics educators. Only 13% of the teachers reported facing challenges related to their own inability to complete the required syllabus within the allotted time. This suggests that the primary barriers to effective teaching are largely external—such as students' academic background, motivation, and home environment—rather than arising from any lack of professional competence or preparedness on the part of the educators.

Objective 2:To evaluate the extent and manner of utilisation of the flipped classroom model by mathematics educators, with a particular focus on the integration of supporting technologies such as smart class resources and general information and communication technology (ICT) tools.

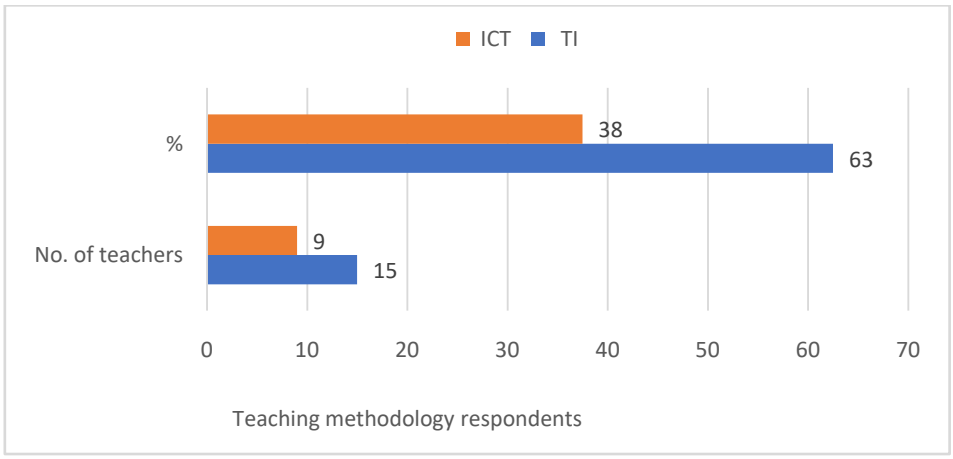
Table - 2

Teaching methodology	No. of teacher	%
TI	12	67
ICT	6	33

Graphical representation of the Table-2

Graphical representation of the data collected and mentioned in Table-2 is as follows:

Figure-2



Analysis of Objective 2:

The effectiveness of the flipped classroom model relies heavily on students' initial learning phase—such as watching lectures or reviewing materials—outside the classroom. However, the results indicate a continued preference for traditional instructional methods among the mathematics educators in the study sample, suggesting limited adoption of flipped classroom practices.Specifically:

- **Traditional Instruction**: A substantial 67% of the educators reported either relying on or preferring traditional instructional methodologies.
- **Flipped Classroom/Technology**: Only 33% of the teachers expressed interest in or adopted the flipped classroom model, which integrates modern tools such as smart boards and various online teaching methods.

This distribution highlights a substantial pedagogical gap, indicating that the majority of educators have yet to transition to or embrace technology-enhanced instructional models such as the flipped classroom, and continue to prefer conventional approaches to teaching.

In addition to the challenges mentioned above, the respondent teachers expressed that effective teaching-learning requires the availability of appropriate teaching aids as well as adequate professional training. They further emphasized the importance of memorizing multiplication tables up to 20 by the students and suggested that each class should be equipped with well-designed, level-appropriate teaching aids to enhance instructional effectiveness.

Results of the study:

From the above data, it is evident that 100% of the surveyed teaching fraternity agree that students exhibit deficiencies in foundational mathematical knowledge. Additionally, 50% of the teachers identified low intrinsic motivation among learners, while 33% reported that an inadequate home learning environment contributes to students' difficulties in mathematics. A comparatively smaller proportion (13%) of teachers indicated challenges related to completing the syllabus on time.

Regarding teaching methodologies, the majority of teachers (67%) reported feeling more comfortable using traditional instructional methods such as chalk, duster, and textbooks. In contrast, 33% of the teachers stated that they employ smart boards or other online instructional tools in classroom situations.

Educational implication:

Mathematics is a vital and influential subject in human society, playing a significant role in every aspect of human civilization.

The findings indicate several significant implications for educational practice and policy. The unanimous agreement among teachers that students possess deficiencies in foundational mathematical knowledge highlights the urgent need for strengthening basic numeracy skills at the primary and upper-primary levels. Targeted interventions, such as remedial teaching, foundation courses, and diagnostic assessments, may be essential to bridge these learning gaps.

On identification of low intrinsic motivation, 50% of the respondents suggest the necessity of adopting motivational and student-centred pedagogical strategies. Incorporating activity-based learning, real-life applications of mathematics and reward-based or interest-driven learning environments may enhance students' engagement and enthusiasm for the subject.

Additionally, 33% of the respondents highlighted that learning difficulties stemming from an inadequate home environment underscore the importance of fostering stronger school–home partnerships. To address this issue, parent orientation programs, community-based awareness campaigns, and the provision of supportive home-learning resources could help create a more conducive environment for mathematics learning outside of school.

On the other hand, a small proportion of the respondents (13%) who face challenges in completing the syllabus on time suggest for better academic planning, continuous monitoring, and possibly the restructuring of curriculum pacing guides to ensure timely coverage without compromising conceptual understanding.

In terms of pedagogy, the majority of the respondents (66%) prefer traditional teaching methods, indicating a reliance on conventional practices, which may limit opportunities for interactive and technology-supported learning. Professional development programmes should therefore focus on enhancing teachers' digital competencies and encouraging the effective integration of smart boards and online tools. The fact that only 33% of the respondents currently use such technologies in their classroom delivery processes.This suggests a pedagogical gap between TI and ICT driven practices,which can be addressed through training, infrastructural support, and continuous mentoring.

Conclusion: Overall, the findings suggests a comprehensive, multi-level approach to improve mathematics education by strengthening foundational skills, fosters motivation, enhancing support to home-environment, and promoting modernised teaching methodologies. Teachers are the torchbearers of the society. They accomplish their duties at their best to cater all the needs of students. It is now the shared responsibility of both society and the government to support the teachers in overcoming these challenges in order to shape a well-informed and progressive society.

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