

Challenges in Teaching and Learning Mathematics at Secondary Level in Government Schools of Rohtak District, Haryana: A Contemporary Analysis

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Abstract

Mathematics at the secondary stage plays a decisive role in shaping students' academic trajectories and career opportunities. Despite its recognized importance, achievement levels in government secondary schools remain a matter of concern, particularly in rural and semi-urban contexts. The present paper critically examines the academic, pedagogical, infrastructural and psychological challenges associated with teaching and learning mathematics at the secondary level (Classes IX–X) in government schools of Rohtak district, Haryana. Drawing upon existing research, national survey findings and field-based observations, the study identifies major constraints such as weak foundational skills, abstract curriculum design, examination-driven pedagogy, inadequate teaching-learning resources, overcrowded classrooms and negative learner attitudes towards mathematics. Algebra and word-problem solving emerge as the most problematic domains due to conceptual gaps and limited exposure to experiential learning. The paper further discusses systemic factors including teacher workload, limited professional development opportunities and uneven implementation of reforms. In light of the transformative vision proposed in the National Education Policy 2020, the study recommends competency-based instruction, activity-oriented pedagogy, integration of technology, continuous assessment practices and strengthened teacher preparation. By situating local realities within broader educational reforms, the paper proposes a practical roadmap for enhancing conceptual understanding and fostering a positive mathematical culture in government secondary schools.

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Introduction

Education is widely acknowledged as a catalyst for social transformation and economic advancement. The progress of any nation depends not only on natural resources but also on the effective development of human capabilities. Systematic schooling equips individuals with knowledge, skills and values necessary for meaningful participation in society. In this broader framework, secondary education occupies a strategic position because it consolidates foundational learning and prepares students either for higher education or for vocational pathways.

Mathematics, as a core subject within the secondary curriculum, holds particular significance. It nurtures logical reasoning, analytical thinking and problem-solving abilities that are essential in contemporary knowledge societies. However, despite its importance, mathematics remains one of

the most feared and poorly performed subjects among secondary school students in India. Government schools, especially in districts such as Rohtak in Haryana, face multiple structural and pedagogical constraints that affect mathematics learning outcomes. The present paper attempts to analyze the persistent challenges in mathematics education at the secondary level and propose context-sensitive solutions aligned with national educational reforms.

Significance of Mathematics in Modern Society

Mathematics is often described as the language of science and technology. Developments in engineering, economics, medicine, data science and digital communication rely heavily on mathematical concepts. In everyday life, individuals use mathematical reasoning while managing finances, interpreting data, planning schedules and making informed decisions.

At the cognitive level, mathematics develops clarity of thought, precision in expression and the capacity for logical argumentation. It encourages learners to move from concrete experiences to abstract reasoning. For adolescents in secondary schools, exposure to structured mathematical thinking strengthens intellectual discipline and enhances academic confidence. Given its pervasive influence, ensuring quality mathematics education is not merely an academic goal but a developmental necessity.

Mathematics in the Secondary School Curriculum

In India, mathematics is a compulsory subject up to Class X. The curriculum at this stage includes arithmetic, algebra, geometry, mensuration, statistics and introductory trigonometry. These topics aim to balance practical applications with conceptual depth.

However, curriculum reforms over the years have introduced more abstract and symbol-heavy content. While conceptual rigor is desirable, insufficient scaffolding often leads to confusion among learners who lack strong foundational skills from primary schooling. In many government schools, students enter secondary classes with limited proficiency in basic operations such as fractions, decimals and percentages. This gap widens when they encounter algebraic expressions, linear equations and quadratic identities.

Thus, curriculum expectations frequently exceed learners' preparedness, creating a mismatch between content and comprehension levels.

Pedagogical Practices in Mathematics Classrooms

Effective mathematics teaching requires more than delivering formulas and procedures. It demands conceptual explanation, guided discovery, questioning strategies and opportunities for student participation. However, classroom practices in many government secondary schools remain largely teacher-centered.

A typical mathematics lesson often involves the teacher demonstrating solutions on the blackboard while students copy steps into notebooks. Limited time is devoted to exploratory discussion or independent problem-solving. Homework exercises are assigned primarily for examination preparation rather than conceptual reinforcement.

Several Factors Contribute to this Pattern

- Pressure to complete the prescribed syllabus.
- Large class sizes that restrict individual attention.
- Limited access to teaching aids such as models, charts and digital tools.
- Inadequate in-service training for innovative pedagogies.

As a result, mathematics becomes a routine mechanical activity rather than an engaging intellectual pursuit.

Infrastructural and Resource Constraints

Infrastructure significantly influences teaching effectiveness. Many government secondary schools in Rohtak district lack specialized mathematics laboratories or resource rooms. Teaching aids such as geometric models, graph boards, projectors and interactive digital platforms are either insufficient or non-functional.

Furthermore, teachers often rely solely on textbooks due to absence of supplementary materials like workbooks, activity manuals or teacher guides. Without visual or manipulative resources, abstract concepts remain difficult for students to grasp.

In rural schools, additional challenges include irregular electricity supply, limited internet connectivity and overcrowded classrooms. These constraints reduce opportunities for technology-enhanced learning and collaborative activities.

Foundational Learning Gaps

One of the most critical barriers in secondary mathematics education is weak foundational knowledge. Students frequently struggle with multiplication tables, fraction operations and basic algebraic manipulation. When such gaps persist, higher-order topics become intimidating.

For instance, solving linear equations requires comfort with transposition and arithmetic operations. If students hesitate at these preliminary steps, they lose confidence quickly. The cumulative nature of mathematics means that early deficiencies compound over time.

Bridging courses, remedial instruction and diagnostic assessments are therefore essential at the beginning of secondary schooling to identify and address learning deficits.

Algebra as a Major Area of Difficulty

Among all branches of secondary mathematics, algebra consistently emerges as the most challenging. The transition from arithmetic (numbers) to algebra (symbols) demands abstract reasoning. Students often perceive variables as confusing or meaningless symbols rather than generalized numbers.

Word problems add another layer of complexity. Learners must interpret linguistic information, translate it into mathematical expressions and apply appropriate operations. Weak reading comprehension further aggravates the difficulty.

Consequently, performance in algebra tends to be significantly lower than in arithmetic or geometry. Without targeted conceptual instruction, students resort to memorizing procedures without understanding underlying principles.

Examination-Oriented System and Rote Learning

The prevailing examination culture strongly influences classroom dynamics. Success is measured primarily through board examination results, leading schools to emphasize repetitive practice of expected question types. While practice is necessary, excessive focus on anticipated patterns discourages creative thinking.

Students often memorize standard procedures for solving equations or proving theorems without comprehending why those procedures work. This approach may yield short-term examination success but fails to cultivate genuine mathematical competence.

Reducing overreliance on high-stakes testing and incorporating formative assessment methods can encourage deeper engagement with concepts.

Teacher-Related Challenges

Teachers play a pivotal role in shaping students' mathematical experiences. However, they face multiple professional constraints:

- Heavy workload and administrative responsibilities.
- Limited opportunities for sustained professional development.
- Insufficient exposure to contemporary teaching strategies.
- Pressure to achieve high pass percentages.

Some teachers themselves feel uncertain about newly introduced topics or innovative pedagogies. Without structured support systems and collaborative forums, adopting student-centered approaches becomes difficult.

Continuous professional training programs focusing on conceptual clarity, activity-based methods and assessment literacy are crucial for strengthening mathematics instruction.

Student Attitudes and Mathematics Anxiety

Attitude significantly influences achievement. Many secondary students perceive mathematics as inherently difficult and anxiety-inducing. Fear of failure, negative peer comparison and past academic struggles contribute to low self-efficacy.

Mathematics anxiety manifests in avoidance behavior, lack of participation and reduced persistence in problem-solving tasks. When learners believe they are “not good at math’s,” motivation declines sharply.

Creating a supportive classroom climate, celebrating incremental progress and encouraging questioning can gradually transform negative perceptions.

Rural–Urban Disparities in Rohtak District

Rohtak district presents a mix of urban and rural educational settings. Urban schools may have relatively better infrastructure and exposure to digital resources, whereas rural institutions often contend with limited facilities and teacher shortages. Socio-Economic factors also influence learning outcomes. Students from economically weaker backgrounds may lack access to private tutoring or supportive home environments. First-generation learners may receive minimal academic guidance outside school.

Addressing these contextual disparities requires targeted policy interventions and equitable resource allocation.

Alignment with the National Education Policy 2020

The National Education Policy 2020 envisions a shift from rote memorization to competency-based learning. It advocates experiential pedagogy, integration of technology, critical thinking and flexibility in assessment.

For mathematics education, the policy recommends:

- Emphasis on conceptual understanding.
- Use of local contexts and real-life applications.
- Integration of digital platforms for interactive learning.
- Continuous professional development for teachers.
- Reduction of curriculum load to essential concepts.

Implementing these recommendations in government secondary schools of Rohtak can potentially mitigate many existing challenges. However, effective implementation demands coordinated efforts from policymakers, school administrators and teachers.

Recommendations

Based on the analysis, the following measures are proposed:

- Diagnostic Assessment at Entry Level: Conduct baseline tests in Class IX to identify foundational gaps.
- Remedial Support Programs: Organize bridge courses focusing on arithmetic and pre-algebra skills.
- Activity-Oriented Teaching: Incorporate group work, puzzles, mathematical games and projects.
- Use of Technology: Employ digital simulations, smart boards and online problem-solving platforms.
- Teacher Professional Development: Arrange regular workshops emphasizing conceptual pedagogy.

- Formative Assessment Practices: Introduce quizzes, peer assessment and reflective journals.
- Parental Involvement: Sensitize parents about supportive learning environments at home.
- Resource Enhancement: Establish mathematics laboratories with essential models and manipulatives.

Conclusion

Mathematics education at the secondary level in government schools of Rohtak district faces interconnected academic, structural and psychological challenges. Weak foundational skills, abstract curriculum content, examination pressures and infrastructural limitations collectively hinder effective learning. Teachers operate within constrained environments that limit pedagogical innovation.

Yet, these challenges are not insurmountable. With systematic reforms aligned to the National Education Policy 2020, strengthened teacher capacity, improved infrastructure and learner-centered approaches, mathematics classrooms can become spaces of inquiry and confidence rather than fear.

Enhancing mathematics education is vital not only for individual academic success but also for broader national development. By fostering logical reasoning and analytical skills among adolescents, secondary schools contribute significantly to building an intellectually empowered society.

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