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EXPLORING THE CHALLENGES FACED BY MATHEMATICS TEACHERS DURING THE TRANSITION FROM PRIMARY TO UPPER-PRIMARY LEVELS: A STUDY OF TEACHERS' PERCEPTION.

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Abstract

This study investigated the challenges faced by mathematics teachers in India during the transition from primary to upper-primary levels, focusing on three key dimensions: students' previous knowledge, teaching strategies, and learning preferences. A descriptive survey design was employed, and a questionnaire was administered to 120 in-service TGT mathematics teachers from Delhi/NCR. The findings suggest that teachers encounter moderate to high levels of difficulty in various aspects of mathematics instruction, including assessing prior knowledge, applying teaching strategies, and accommodating learning preferences. The study highlights the need for professional development opportunities to enhance teachers' skills in assessment and instruction, innovative teaching methods, and differentiation strategies to make mathematics engaging and accessible to all students. The findings have implications for mathematics education policy and practice, emphasising the importance of supporting teachers in addressing the challenges they face during this critical transition phase.

Keywords: *Mathematics Education, Teacher Challenges, Primary-Upper Primary Transition, Student Prior Knowledge, Teaching Strategies, Learning Preferences*

Introduction

The quality of life individuals experience as adults has a lot to do with the school education they receive. High quality education is necessary for the nation. Primary, middle & secondary/higher levels are the flow chart of our education system. In the school years, children encounter history and economics, physics or geography not only in books but also directly. More students opt out from science and mathematics choices as they move ahead, especially in higher or senior

ISSN: 0030-5324
UGC CARE Group 1

secondary (9th - 10th grade). This problem is specifically discussed in the National Curriculum Framework (2005) which points to common problem areas in mathematics education such as fear of failure, lacklustre classrooms and a meaningless curriculum, poor assessment procedures used for quality control or teacher preparation.

Several researchers have studied the difficulties faced while learning and teaching of mathematics, across various educational levels but very few are available which focuses on primary to middle school transition. This stage is important as it marks the beginning of a high leap towards abstract thinking. Mudaly and Sukhdeo (2015) stress that a strong foundation in mathematics is essential since the more advanced concepts become progressively harder to understand as students move through calculus, linear algebra, real analysis/statistics. Development of mathematics education changes a great deal from lower to higher levels primary, middle-level, secondary level and at the tertiary level. In middle school, students approach abstract mathematical ideas as they will be introduced to more complex topics that expand outside the realm of simple algebra. This transition, especially the algebra part of it can be very scary for some. This is because as the National Curriculum Framework (NCF), 2005 points out, "poor teacher preparation thwarts effective articulation of theory with action" in mathematics at this stage.

Transition is the process of moving from one state or condition to another and it often involves psychological, social and educational adjustments (Jindal-Snape & Foggie, 2006). The transition from primary to secondary school is especially important as it may significantly impact the educational degree of general scholars and emotional wellness. Of this move, Jha & Kelleher (2006) and Powell et al. (2006) remark that problems of underachievement and disaffection in secondary school begin at a base during these periods. Kaur et al. (2022) which also shines a light on the issue of maths anxiety, which is rife amongst specific student populations and can be made worse by this transition. Mathematics, due to it abstract nature is seen as a difficult subject. The curriculum is built upon a foundation of mathematics that some students cannot meet the demands in their study, as evidenced by high dropout rates (Rampal & Subramanian, 2012). The teaching and learning of mathematics cannot be complete without relating abstract concepts to everyday experiences (Brosvic & Epstein, 2007). Discontinuities in the curriculum can hinder students'

ISSN: 0030-5324
UGC CARE Group 1

ability to grasp new concepts, emphasizing the need for well-organized content and appropriate teaching methodologies.

Transition in mathematics not only because of change in content but also involve multiple elements, such as changes in teaching methods, social interaction, and modifications in evaluation strategies. According to Catherine Attard's research in 2010, these factors are essential address to enhance the teaching learning of mathematical and previous knowledge has a major impact on the learning of new concepts (Schneider et al., 2009). According to Attard (2012), challenging transitions might result in disengagement and unfavourable attitudes towards mathematics. According to Paul (2014), there are various hurdles that can affect students' learning experiences and future involvement with mathematics throughout transitions. These problems include changes in teaching styles, subject matter, and social dynamics.
The content of mathematics education encompasses foundational principles that are important to understanding the more advancing topics. According to Chinofunga et al. (2022), a well-organized curriculum, provided in a clear and logical manner in textbooks, can improve students' understanding and proficiency in mathematics. Ensuring that the appropriate concepts are taught at the appropriate time is essential for achieving effective learning, as stressed by Piaget's notion of readiness. Tilleczek (2008) highlights that when information becomes more complex and new teaching methods are introduced, it might create difficulties that may result in a decrease in academic performance.

To achieved the teaching-learning goals, there is importance to use of the appropriate teaching methods. While experiential learning activities are commonly employed in elementary education, more advanced methods are required in upper-primary school to effectively address the growing complexity of mathematical topics. Teachers play a crucial role in influencing the educational experiences of their students, so they need to adapt their methods in order to maintain their students' attention and comprehension (Attard, 2009; Boaler, 1997). In order to achieve success, relying just on conventional approaches may prove insufficient. Instead, it is imperative to employ innovative tactics that establish a connection between novel knowledge and past encounters (Stoll et al., 2012). Planning and identifying relationships between different levels of mathematical content can help bridge gaps in understanding and ensure a smoother transition for students.

ISSN: 0030-5324
UGC CARE Group 1

There are few studies specifically examining the transition from elementary to upper-primary education in the field of mathematics education in India, despite the abundance of studies on the transition from primary to secondary education. The purpose of this study is to fill this gap by looking at the teaching-learning strategies and mathematical content from the perception of teachers. The results will make it easier to identify the areas that need work and suggest changes to raise the standard of mathematics instruction, ensuring that students get a strong basis and continue to be interested in the subject throughout time.

Research objectives

1. To examine the challenges faced by teachers in mathematics regarding students' transition from primary to upper primary in terms of students' previous knowledge.
2. To examine the effectiveness of current teaching strategies employed by teachers during the student transition phase from primary to upper-primary mathematics education.
3. To explore the challenges faced by teachers in mathematics related to the learning preferences of students during the transition from primary to upper-primary.

Research Methodology

The study used a descriptive survey design. A total number of 20 In-service TGT Mathematics teachers taken from the ten schools of Delhi/NCR. A questionnaire was developed based on the objective of study. Each dimension comprised multiple items designed to study specific aspects of that respective dimension. Likert scale type items were used to study participants' perception in three dimensions such as Previous Knowledge of Students', learning preferences of students.

Data was gathered using a structured questionnaire distributed to participants via printed forms facilitated by In-service TGT Mathematics teachers. Subsequently, the collected data underwent analysis aligned with the study objectives. Mean and Standard Deviation were employed to analyse each variable dimension. The range of five-point Likert scale was calculated as the difference between the highest and lowest values divided by the highest value.

ISSN: 0030-5324
UGC CARE Group 1

Analysis and Interpretation

The findings have been reported as per the objectives of the study.

1. **To examine the challenges faced by teachers in mathematics regarding students' transition from primary to upper-primary in terms of students' previous knowledge.**

This objective of the study is to explore the challenges encountered by teachers regarding students' prior knowledge during the transition from primary to middle school, particularly in the context of mathematics.

Table 1

Responses of Teachers Regarding Students' Previous Knowledge

Items	**Mean**	**SD**
Facilitating students' ability to apply previously learned mathematical formulas to novel concepts poses a significant challenge	3.35	0.99
Developing students' understanding of the connections between prior mathematical concepts is a difficult task	2.90	1.07
Assessing individual students' prior knowledge and understanding in mathematics is a challenging endeavour	3.55	1.43
Helping students comprehend the cohesive and interconnected nature of mathematical concepts is a difficult challenge	3.10	1.21
Enabling students to effectively utilize concrete examples to visualize and understand abstract mathematical concepts is a challenging task	2.95	0.94
Overall	**3.17**	**1.15**

Table 1 shows the several challenges teachers face regarding students' previous knowledge in mathematics. The highest mean scores (3.55) suggests that a significant challenge to assess each student's prior knowledge likely due to the diverse backgrounds and learning paces of students (Pashler et al., 2008). The second highest mean score of 3.35 suggest the teacher face neutral challenges regarding helping students to understand previously learned formulas apply to new concepts underlines the complexity of mathematical abstraction and application (Sfard, 1991). The mean score of 3.10, with a standard deviation of 1.21, indicates that teachers face some

ISSN: 0030-5324
UGC CARE Group 1

difficulties in helping pupils understand and value the links between different mathematical concepts. Furthermore, the mean score of 2.95 suggests that teachers are facing natural barrier in helping pupils effectively use concrete examples to understand abstract mathematical concepts. This is a notable concern in the field of mathematics education, as highlighted by Bruner (1966). Furthermore, although the mean score of 2.90 indicates neutral difficulty in developing the understanding to link previous concepts during mathematics class. The Overall mean score of 3.17 suggests that teachers find it neutral challenging to incorporate existing knowledge into new mathematics learning. This is consistent with the results of earlier research, such as the studies conducted by Hiebert and Grouws (2007), which highlighted the significance of linking new knowledge to existing knowledge in order to enhance the effectiveness of mathematics teaching. Furthermore, the standard deviations, which range from 0.94 to 1.43, demonstrate the extent of variation in teachers' experiences, highlighting the wide range of circumstances in which they work.

2. To examine the effectiveness of current teaching strategies employed by teachers during the student transition phase from primary to upper-primary mathematics education.

The aim of this objective is to explore the challenges teachers encounter regarding teaching strategies effectively within the context of mathematics education.

Table 2

Responses of Teachers Regarding Teaching Strategies

Items	**Mean**	**SD**
Time constraints in covering the syllabus limit the implementation of effective teaching strategies in mathematics classrooms	3.50	1.19
Relying solely on the lecture method in mathematics instruction poses a challenge to engaging students and promoting deeper understanding	3.25	1.21
Fostering student interest and engagement in mathematics learning is a significant challenge in many classrooms	3.25	1.25
Transitioning students from concrete to abstract mathematical concepts and preparing them to handle abstraction is a difficult task	3.80	0.95
Implementing the constructivist approach in mathematics instruction, which emphasizes student-centered learning and active construction of knowledge, can be a challenging task	3.25	1.02
Overall	**3.41**	**1.13**

ISSN: 0030-5324
UGC CARE Group 1

The data in Table 2 illustrates teachers' responses concerning the application of various teaching strategies in the mathematics classroom. The highest mean score (3.80) relates to the difficulty in attracting students to abstract concepts and preparing them to handle the abstraction of mathematics. This highlights a significant challenge in bridging the gap between concrete and abstract mathematical thinking, consistent with the literature on mathematical abstraction (Sfard, 1991). The second highest mean score of 3.50 for the difficulty in applying good strategies due to the pressure of completing the syllabus in limited time underscores a common issue in education: the balance between depth of understanding and curriculum coverage (Hiebert & Grouws, 2007). Teachers often face the dilemma of either rushing through topics to meet curriculum deadlines or sacrificing comprehensive understanding to ensure all content is covered.

The mean scores for difficulty in using the lecture method exclusively (3.25) and the constructivist approach (3.25) reflect the neutral challenges teachers face in employing diverse teaching methods. The lecture method, while efficient for covering material quickly, often fails to engage students actively (Prince, 2004). Conversely, the constructivist approach, which emphasizes student-centered learning and active participation, can be time-consuming and demanding in terms of preparation and classroom management (Richardson, 2003). Moreover, the teacher face neutral challenges in developing student interest and engagement in mathematics, with a mean score of 3.25, highlights an ongoing challenge in making mathematics appealing and accessible to all students. This aligns with studies that emphasize the need for engaging and relevant teaching methods to foster a positive attitude towards mathematics (Boaler, 2016).

The overall mean score of 3.41 indicates that teachers generally find it moderately challenging to implement effective teaching strategies. The standard deviations, ranging from 0.95 to 1.25, indicate variability in teachers' experiences and perceptions. This suggests that while some teachers may find certain strategies more challenging than others, there is a general consensus on the difficulties faced.

ISSN: 0030-5324
UGC CARE Group 1

3. **To explore the challenges faced by teachers in mathematics related to the learning preferences of students during the transition from primary to upper-primary.**

The aim of this objective is to investigate the challenges teachers face regarding students' preferences in learning mathematics.

Table 3

Responses of Teachers regarding Learning Preferences of Students

Items	**Mean**	**SD**
Accommodating diverse learning preferences and styles in mathematics instruction poses a significant challenge	3.50	0.83
Designing and implementing engaging activities that align with mathematics learning objectives at this level is difficult	3.55	1.00
Making formula-based mathematics instruction enjoyable and interactive for students is a challenging task	3.45	1.05
Effectively integrating teaching and learning materials to enhance interactivity in mathematics lessons is difficult	3.05	1.32
Connecting mathematical concepts to real-life scenarios and applications to enhance student engagement and understanding is a challenging endeavour	2.40	1.39
Overall	**3.19**	**1.20**

Table 3 presents teachers' responses regarding the challenges they face in accommodating the diverse learning preferences of students in mathematics. The highest mean score (3.55) is associated with the difficulty in using activities in mathematics, which indicates a significant challenge in integrating interactive and engaging activities into the mathematics curriculum. This aligns with findings that emphasize the importance and difficulty of incorporating hands-on and participatory learning in mathematics to enhance student engagement and understanding (Hiebert & Grouws, 2007). The second highest mean score (3.50) pertains to the difficulty in dealing with different learning preferences. This reflects the inherent challenge in differentiating instruction to meet the varied needs of students, which is crucial for effective teaching (Tomlinson, 2001). The difficulty in making mathematics enjoyable with formula-based teaching, with a mean score of 3.45, further underscores the struggle to make abstract and procedural content engaging (Boaler, 2016).

ISSN: 0030-5324
UGC CARE Group 1

A mean score of 3.05 indicated that teachers face neutral difficulty in using teaching learning materials to make lessons more interactive indicates that while these materials can enhance learning, effectively integrating them into lessons remains challenging. This finding is consistent with the literature that highlights the need for adequate resources and training to utilise teaching aids effectively (Ball et al., 2008). Interestingly, the lowest mean score (2.40) suggests that teachers find it relatively easier to contextualize mathematical concepts with real-world applications, which is essential for making mathematics relevant and relatable (Mousoulides, Christou, & Sriraman, 2008). However, the high standard deviation (1.39) for this item indicates significant variability in teachers' experiences and perceptions, suggesting that while some may find it straightforward, others face considerable challenges.

The overall mean score of 3.19 suggests a moderate level of difficulty in addressing these preferences effectively. The standard deviations for the other items, ranging from 0.82 to 1.39, reflect a degree of variability in the challenges faced by teachers, indicating that experiences and effectiveness in dealing with different learning preferences vary among teachers.

Conclusion

This study examined the difficulties faced by mathematics teachers when transitioning from elementary to upper-primary levels. It specifically focused on three main aspects: students' prior knowledge, teaching methods, and learning preferences. The findings indicate that teachers face moderate to high degrees of challenge in many parts of mathematics instruction. Teachers face challenges in evaluating students' prior knowledge, applying previously acquired formulas to new topics, and fostering a comprehensive understanding of the interconnectedness of mathematics. These problems highlight the significance of implementing efficient evaluation and teaching methods that capitalize on students' preexisting knowledge. Teachers encounter challenges when it comes to engaging students with abstract concepts, getting them ready for mathematical abstraction, and use of various teaching methodologies, such as the constructivist approach. These findings emphasize the importance for teacher to promote innovative and engaging approaches that accommodate a wide range of learning requirements. Teachers face difficulties in adapting to various learning styles, successfully use of activities and instructional materials, and ensuring that

ISSN: 0030-5324
UGC CARE Group 1

mathematics is entertaining. Nevertheless, they discover that it is comparatively simpler to relate mathematical principles to practical situations.

These findings indicate that teachers need professional development opportunities to enhance their skills in assessment and instruction. This includes learning novel teaching methods and tactics to differentiate instruction and make mathematics more interesting and accessible for all students. By addressing these challenges, teachers provide better facilitate students' mathematics learning and development throughout the crucial shift from primary to upper-primary school.

Findings

This study reveals significant challenges faced by mathematics teachers during the critical primary to upper-primary transition in India, centering on three key dimensions:

1. **Students' Prior Knowledge:** Teachers encounter moderate difficulty overall (Mean=3.17) in leveraging students' existing knowledge. The most pronounced challenge is *assessing individual students' prior knowledge* (Mean=3.55), likely due to diverse backgrounds and learning paces. Difficulty in helping students *apply previously learned formulas to new concepts* (Mean=3.35) underscores the struggle with mathematical abstraction and transfer. While fostering connections between concepts (Mean=3.10) and using concrete examples for abstraction (Mean=2.95) present challenges, developing links to *previous* concepts was perceived as slightly less difficult (Mean=2.90). High Standard Deviations (0.94-1.43) indicate considerable variability in teacher experiences, reflecting diverse classroom contexts. These findings align with research emphasizing the critical role of building on prior knowledge (Hiebert & Grouws, 2007) and the inherent difficulties in accurately diagnosing it (Pashler et al., 2008).

2. **Teaching Strategies:** Teachers faced the highest overall challenge here (Mean=3.41). The most significant hurdle is *transitioning students from concrete to abstract thinking* and preparing them for mathematical abstraction (Mean=3.80), confirming the well-documented leap in cognitive demand at this stage (Sfard, 1991). *Time constraints* limiting effective strategy implementation due to syllabus pressure (Mean=3.50) highlight a

ISSN: 0030-5324
UGC CARE Group 1

systemic tension between curriculum coverage and deep understanding (Hiebert & Grouws, 2007). Neutral to moderate challenges were reported in moving beyond lecture methods (Mean=3.25), fostering student engagement (Mean=3.25), and implementing constructivist approaches (Mean=3.25), suggesting teachers recognize the limitations of traditional methods but find alternatives demanding in terms of time and classroom management (Richardson, 2003; Prince, 2004). Variability (SDs 0.95-1.25) persists across experiences.

3. **Learning Preferences:** Moderate overall difficulty was reported (Mean=3.19). The biggest challenges were *designing engaging activities aligned with objectives* (Mean=3.55) and *accommodating diverse learning preferences/styles* (Mean=3.50), pointing to the difficulty of differentiation and active learning implementation (Tomlinson, 2001; Hiebert & Grouws, 2007). Making *formula-based instruction enjoyable* was also challenging (Mean=3.45). Integrating teaching materials effectively posed neutral difficulty (Mean=3.05). Interestingly, *connecting concepts to real-life scenarios* was the least challenging (Mean=2.40), though a high SD (1.39) indicates this ease is not universal. This relative strength suggests teachers find contextualization a valuable and somewhat more accessible strategy (Mousoulides et al., 2008), despite overall struggles with engagement.

Discussion

The findings paint a picture of teachers navigating a complex transition period. They grapple with foundational issues like diagnosing and building on varied prior knowledge while simultaneously managing a significant cognitive shift towards abstraction, all under the pressure of a packed syllabus. While recognizing the need for more engaging, student-centered, and differentiated approaches (constructivist, activity-based), implementing these effectively proves challenging. The variability in responses underscores that these challenges are not uniform but are influenced by specific school contexts, student cohorts, and individual teacher capacity. The relative ease of real-world connections offers a potential lever for improving engagement that teachers already utilize.

ISSN: 0030-5324
UGC CARE Group 1

Conclusion

This study conclusively demonstrates that mathematics teachers in the Indian context face moderate to high levels of challenge across critical dimensions—students' prior knowledge, teaching strategies, and learning preferences—during the pivotal transition from primary to upper-primary levels. Key hurdles include accurately assessing diverse students' foundational knowledge, facilitating the difficult leap to abstract mathematical thinking within constrained timeframes, designing and implementing engaging activities that cater to varied learning styles, and moving beyond traditional lecture-based methods towards more effective constructivist and differentiated approaches. The variability in challenge levels reported by teachers highlights the influence of specific contextual factors. These challenges threaten to hinder students' mathematical development and engagement during a crucial phase, potentially contributing to the disengagement noted in Indian mathematics education (NCF, 2005).

Educational Implications

1. **Targeted Professional Development (PD):** Mandatory, sustained PD programs are essential. These must focus on:
    - **Diagnostic Assessment:** Equipping teachers with efficient, practical tools and strategies (e.g., short tasks, interviews, concept maps) to diagnose individual students' prior mathematical knowledge and misconceptions upon entering upper-primary.
    - **Bridging Concrete-Abstract:** Providing explicit training and resources on pedagogical techniques (e.g., visual models, manipulatives, carefully sequenced problems, technology) to scaffold students' transition to abstract thinking effectively.
    - **Differentiation & Engagement:** Developing teachers' skills in differentiating instruction, designing and managing diverse, curriculum-aligned activities (Naaz, 2025), and integrating real-world contexts meaningfully to cater to varied learning preferences and boost engagement.

- **Beyond Lectures:** Deepening understanding and practical application of constructivist, inquiry-based, and collaborative learning strategies suitable for upper-primary mathematics, moving beyond reliance on lectures. The teacher should also use flipped and Blended learning mode (Asagar, 2024a; 2024b). There is lot of benefit flipped learning that make the learning enhance (Asagar 2024b).
- **Curriculum Navigation:** Strategies for managing syllabus pressure while fostering deeper understanding, such as concept prioritization and integrating topics.

2. **Resource Development & Sharing:** Support the creation and dissemination of readily accessible, high-quality resources:
    - **Diagnostic Toolkits:** Standardized (yet adaptable) diagnostic tools for assessing prior knowledge at the transition point.
    - **Activity Banks:** Repositories of engaging differentiated activities and lesson plans specifically designed for upper-primary mathematical concepts and transition challenges.
    - **Manipulatives & Technology:** Ensuring availability and providing training on using concrete materials and relevant digital tools effectively.
3. **Systemic Support & Policy:**
    - **Curriculum Review:** Review the upper-primary mathematics curriculum to ensure logical progression from primary, potentially allowing more flexibility in pacing to accommodate deeper learning and transition needs.
    - **Time Allocation:** Explore realistic adjustments to timetabling or syllabus expectations to alleviate the intense time pressure hindering effective pedagogy.
    - **Collaborative Structures:** Foster professional learning communities (PLCs) within and between schools where teachers can share challenges, strategies, and

resources related to the transition. Mentoring programs pairing experienced upper-primary teachers with those new to the level could be beneficial.

- **Material Allocation:** Ensure schools have adequate budgets for necessary teaching aids, manipulatives, and technology.

Addressing these challenges through comprehensive support for teachers is paramount. By enhancing their capacity to assess prior knowledge, implement effective and engaging strategies, and differentiate instruction, the transition can become smoother, fostering stronger mathematical foundations, sustained interest, and improved outcomes for all students during this critical educational phase.

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