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Enhancing Mathematics Achievement through Motivational Techniques in Community-Based Schools: A Case Study

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Abstract

This underperformance, which stems from a lack of motivation among learners, is worsened by delays in their engagement and overall academic progress in mathematics. The problem addressed in this study is the consistently low mathematics achievement among students in community-based schools, despite various educational interventions. This case study examines the motivational techniques utilized by mathematics teachers at Birendra Secondary School, a community-based school in Nuwakot, Nepal. Through qualitative methods, including classroom observations, interviews, and open-ended questionnaires, the study investigates how these strategies influence student achievement in mathematics. The Findings reveal that employing modern teaching approaches, positive reinforcement, humour, inadequate infrastructure, and strong teacher-student relationships significantly enhance students' motivation and performance. Despite challenges such limited parental involvement, the school demonstrates commendable efforts in fostering a supportive learning environment. This research contribution offers insights into the role of motivation in enhancing mathematics education within these settings, providing recommendations for policy and practice.

Keywords: achievement, community, mathematics, motivational techniques

Introduction

Motivation plays an essential role in influencing a student's academic success, especially in mathematics. Since math often demands practice, patience, and tackling challenging problems, motivated students are more likely to stay engaged, put in effort, and persist when faced with difficulties. When students are interested in learning or believe they can succeed, they tend to perform better. Motivation plays a vital role in shaping students' academic performance, especially in mathematics, where sustained engagement and effort are essential for success (Pintrich & Schunk, 2002). At the secondary level, students face increasing academic demands, and their ability to stay motivated directly impacts their learning outcomes. In community-based schools, where resources may be limited and student backgrounds vary widely, effective motivational techniques become even more critical. These techniques not only enhance students' interest in mathematics but also improve their confidence, perseverance, and overall achievement. This case study focuses on Birendra Secondary School in Nuwakot, Nepal, a community-based institution that has shown commendable efforts in promoting motivation among its students, particularly in mathematics. By examining the strategies employed by mathematics teachers at this school, this research aims to analyse how motivational techniques contribute to student success and what factors influence their effectiveness.

The significance of this study lies in its focus on community-based schools, which often operate under challenging conditions compared to private institutions. Despite these

challenges, some community-based schools have managed to foster a supportive learning environment that enhances student achievement. Understanding the motivational strategies such as setting clear learning goals, providing constructive feedback, fostering a growth mindset, encouraging student autonomy, modern teaching approach, strong teacher-students relationship, using real-life applications of mathematics, and recognizing effort and progress, can provide valuable insights for educators, policymakers, and curriculum developers aiming to improve student engagement and academic outcomes in mathematics, especially in similar educational contexts (Ryan & Deci, 2000). Mathematics is in a central position in secondary education due to its foundational role in various disciplines and its application in daily life (Lahey, 2009). However, many students struggle with mathematics, particularly in community-based schools in Nepal, where low achievement levels are commonly observed in national examinations such as the Secondary Education Examination (SEE)where a significant number of students struggle to meet basic proficiency standards (MOE, 2023).

This challenge underscores the importance of identifying effective strategies to enhance student engagement and performance in mathematics. Among the numerous factors influencing academic success, motivation emerges as a critical element that determines students' persistence, effort, and overall learning outcomes (Lehey, 2009). When students are motivated, they are more likely to engage actively in classroom activities, develop a deeper understanding of mathematical concepts, and exhibit greater resilience in problem-solving tasks. Therefore, understanding how motivation influences mathematics learning is essential for improving educational practices in community-based schools.

Motivation, defined as an internal part that activates behaviour toward a goal (Lehey, 2009), significantly affects students' willingness to learn and persist in challenging tasks. In the context of mathematics education, motivation can be categorized into intrinsic and extrinsic types. While extrinsic motivation is provided by external rewards like grades, salary, or recognition, intrinsic incentive arises when students learn for personal fulfilment, curiosity, or sincere dedication to the subject matter (Deci & Ryan, 2000). Both forms of motivation play a role in shaping students' academic behaviours, but fostering intrinsic motivation is particularly important for long-term engagement and deep conceptual understanding in mathematics. Teachers who employ strategies that cultivate intrinsic motivation, such as making lessons relevant, encouraging autonomy, reinforcement, and providing meaningful feedback, can help students develop a positive attitude toward mathematics and improve their performance(Lehey, 2009).

Despite increasing recognition of motivation as a vital factor in student learning, many community-based schools in Nepal still struggle to develop and maintain meaningful motivational practices in the classroom. In these environments, persistent structural challenges such as poorly maintained school infrastructure, shortages of basic teaching and learning materials, over-crowed classroom, undertrained teacher, a lack of learning materials, minimal academic support at home and limited opportunities for teacher professional development make it difficult for both students and teachers to stay engaged and motivated (Panthi, 2020). These systemic issues often lead to monotonous teaching methods, rote memorization, and minimal student interaction, which further reduce intrinsic motivation, especially in demanding subjects like mathematics. Added to these problems are deep-seated socioeconomic disparities among students. While some learners come from supportive home environments that prioritize and encourage education, others come from families facing economic hardship, where schooling may take a back seat to immediate household needs or income-generating activities. For these students, attending school regularly, completing homework, or maintaining focus in class can be significantly more challenging due to responsibilities at home, lack of parental involvement, or issues, like food and transportation insecurity (Neupane, 2011). These realities emphasize that low motivation in mathematics is

not merely a matter of individual attitude but is shaped by overlapping personal, family, and institutional challenges. Addressing this issue requires more than generic motivational slogans; it demands context-sensitive, equity-focused solutions that support both students and teachers within the actual conditions of Nepal's diverse educational landscape.

Birendra Secondary School in Nuwakot serves as a convincing case study for examining motivational techniques in community-based education. Unlike many other schools in similar settings, Birendra Secondary School has demonstrated relatively consistently high SEE pass rates, 89.4% to 95.9 % from 2079- 2081 (Nuwakot District Education Office, 2082),despite operating within a resource-constrained environment. This suggests that the school's educators have successfully implemented strategies that enhance student motivation and engagement in mathematics. Investigating the specific motivational techniques used by mathematics teachers at this school can provide valuable insights into effective pedagogical practices that can be replicated in other community-based institutions. Furthermore, understanding how these techniques align with established theories of motivation, such as expectancy theory and reinforcement theory, can offer a theoretical foundation for refining teaching approaches in mathematics education.

By examining the relationship between motivation and academic achievement in mathematics, this study contributes to the broader discussion on enhancing educational outcomes in community-based schools. Identifying successful motivational strategies not only benefits students but also informs policy and practice by highlighting effective approaches that can be integrated into teacher training programs and curriculum development initiatives. As expectations for quality education in Nepal increase, it becomes increasingly important to ensure that all students, especially those from disadvantaged backgrounds, have access to mathematics instruction that is not only academically difficult but also engaging, supportive, and aimed at improving motivation.

In many rural and community schools, students from low-income families, marginalized communities, or households with limited education often face additional barriers: overcrowded classrooms, undertrained teachers, a lack of learning materials, and minimal academic support at home. These factors can lead to disengagement, low confidence, and poor performance in mathematics. The school demonstrates strong institutional governance through a functional School Management Committee (SMC) and active Parent Teacher Association (PTA) with quarterly SMC meetings and PTA involvement in examination monitoring and academic planning (SMC Minutes, 2080-2081).

Therefore, creating equitable learning opportunities means going beyond equal access to schooling. It requires intentional efforts to make math teaching more interactive, relevant, and encouraging, real-life problem solving, positive feedback, collaborative learning, and recognizing effort to help every student, regardless of their background, feel capable and motivated to learn. Addressing this gap is not just a matter of fairness; it is essential for improving national education outcomes and building a more inclusive system.

This research aims to shed light on how community-based schools like Birendra Secondary School can serve as models for fostering student motivation and enhancing academic success in mathematics. The objective of this study was to examine the current status of motivational techniques promoted by mathematics teachers at Birendra Secondary School, a community-based institution in Nuwakot, Nepal. Given the critical role of motivation in enhancing student achievement, especially in mathematics, understanding the strategies used by educators in this setting is essential for identifying effective practices that can be applied in similar educational environments. The study aimed to explore how these motivational techniques influence students' engagement, interest, and academic performance in mathematics, as well as how they align with established psychological and pedagogical theories of motivation. Additionally, the research sought to gather insights from multiple

stakeholders, including students, teachers, and parents, to obtain a comprehensive understanding of the factors that contribute to student motivation in mathematics education.

To achieve these objectives, the study was guided by the following research questions:

- What motivational techniques are currently used by mathematics teachers at Birendra Secondary School?
- How do these motivational techniques influence students' achievement in mathematics?
- What are the perceptions of students, teachers, and parents regarding the effectiveness of these motivational strategies?

These questions were designed to provide a detailed examination of the motivational strategies employed in the classroom, their impact on student learning, and the perspectives of different stakeholders involved in the educational process. By addressing these inquiries, the study aimed to generate actionable insights that could inform future teaching practices and policy decisions related to mathematics education in community-based schools.

Methodology

This case study used a qualitative descriptive approach, focusing on a community-based secondary school in Nuwakot. Data were gathered through classroom observations, semi-structured interviews, and open-ended questionnaires involving three students of class X, one mathematics teachers, and two parents. A case study was chosen as the most suitable research method because it permits a detailed examination of motivational techniques within a specific educational setting. According to Creswell (2014), case studies are especially valuable when researchers want to understand complex phenomena in real-life contexts. In this case, the study focused on Birendra Secondary School, a community-based institution recognized for its relatively high mathematics achievement despite limited resources. This method allowed the researcher to gather rich, detailed insights into how mathematics teachers apply motivational strategies and how these strategies influence student engagement and learning outcomes.

Birendra Secondary School, Chainpur, Chharghare, has been selected as a case study due to its exceptional and sustained performance in secondary education, particularly in a rural context where resource limitations often hinder academic outcomes. The school exhibits several distinctive characteristics that make it a standout example of educational excellence and institutional effectiveness. First and foremost, it has demonstrated consistently high SEE performance, with a pass rate rising from 89.4% in 2079 to 95.9% in 2081, surpassing both the Nuwakot district average (89.5%) and the national average (83.7%) in the most recent examination cycle (Nuwakot District Education Office, 2081)

This upward trend shows that the school has a culture focused on always getting better and strong leadership in academics. Second, the school has been officially named a Model School (School Improvement Plan (SIP) 2081–2085, p.32), which means it plays an important role in helping students do well and also supports teachers and students in the northern part of the district. Third, the school has a very low failure rate, which went down from 10. 6% in 2079 to just 4. 1% in 2081(Birendra Secondary School report, 2081). This shows how effective the school's special teaching programs, early help strategies, and support for individual students are. All these things together show that Birendra Secondary School is a top-performing, officially recognized, and well-organized school. It makes it a great example to study in detail to find out what works best in education in rural areas. It identifies Birendra Secondary School as a priority model school for serving as a teacher training hub, SEE preparation center, and pilot site for digital learning in the northern cluster of Nuwakot (Nuwakot DEO, 2081, p. 32).

The study included Grade X students, mathematics teachers, parents, and the headteacher of Birendra Secondary School. A purposive sampling method was used to select participants based on their relevance to the research goals. Specifically, Grade X students were selected because they were preparing for the Secondary Education Examination (SEE), an important academic milestone in Nepal. Mathematics teachers were chosen based on their experience and role in instruction, while parents and the headteacher offered additional insights into school policies and student support systems. Three main data collection tools were utilized in this study.

Classroom Observation. Structured classroom observation was conducted to assess how mathematics teachers implemented motivational techniques in the existing time. The observation form was developed based on Weller's (2005) principles of motivation, covering aspects such as classroom environment, instructional methods, and evaluation practices. Observations were carried out over multiple sessions to ensure consistency and reliability.

Semi-Structured Interviews. Semi-structured interviews were conducted with mathematics teachers, the headteacher, students, and parents to gather in-depth perspectives on motivational techniques. Interview guides were prepared based on the research questions and theoretical frameworks, allowing flexibility for participants to express their views freely. Each interview lasted approximately 30–45 minutes and was recorded with the consent of the respondents.

Open-Ended Questionnaires. Open-ended questionnaires were administered to students to collect their opinions on motivational strategies used by their mathematics teachers. These questionnaires allowed students to describe their experiences in their own words, providing valuable qualitative insights into how they perceive and respond to different motivational techniques.

Qualitative data were analyzed using a thematic analysis approach. First, interview recordings and observational notes were transcribed verbatim (Braun and Clarke, 2006). Then, the researcher coded the data by identifying recurring themes and patterns related to motivational techniques, student engagement, and perceived effectiveness. Thematic categories were derived from both the literature review and emerging insights from the data. These themes were organized into broader constructs such as classroom environment, instructional methods, assessment practices, and communication with guardians. Finally, findings were interpreted about existing motivational theories and the research questions to provide a comprehensive understanding of how motivational techniques influenced student achievement in mathematics.

Ethical considerations were strictly followed throughout the research process. Participants were informed about the purpose of the study, and written consent was obtained before data collection. All responses were kept confidential, and pseudonyms were used to protect the identities of participants. Additionally, participants had the right to withdraw from the study at any time without consequences. By employing a rigorous qualitative methodology, this study ensured a thorough exploration of motivational techniques used by mathematics teachers at Birendra Secondary School. The next section presents the findings related to the current status of these motivational strategies in the classroom.

Results and Discussion

The findings from the study reveal that mathematics teachers at Birendra Secondary School utilize a diverse array of motivational techniques to engage students and enhance their learning experience. Key contributing factors include regular diagnostic testing, subject-wise teacher mentoring, active School Management Committee (SMC) involvement, use of NEB model questions, and extra coaching for weak students, infrastructure through SIP grants, initiation of digital learning programs, improvement of teacher retention, and strengthening parental engagement. These strategies encompass various aspects of classroom instruction,

from lesson planning to assessment practices, creating a holistic approach to motivation that supports student achievement in mathematics.

Revision of Lessons

In the classroom observations, the researcher aimed to achieve the goal based on learning theory, supervisor recommendations, personal experience, and a variety of literature reviews. One effective technique involves revising lessons regularly. Teachers often review previous topics to reinforce understanding, making sure students have a strong foundation before introducing new material. This approach not only helps with retention but also boosts students' confidence in their math skills. For example, during classroom observations, it was noted that teachers frequently start lessons with a quick review of the previous day's content, helping students connect new ideas with what they already know. This strategy creates a sense of continuity and makes students feel more secure in their learning process.

Effective Classroom Management

During classroom observations, it was evident that maintaining a well-managed classroom environment is crucial for student engagement. Teachers establish clear expectations for behaviour and consistently enforce rules, which contributes to a safe and focused learning space. Students reported feeling more motivated to participate in discussions and activities when they understood the boundaries and felt respected by their peers and instructors (Ambrose et al., 2010). Another significant aspect of the motivational landscape at Birendra Secondary School is effective classroom management, such as centred on discipline, organization, and routine, strongly supported by decades of educational research. Teachers emphasize discipline and organization, creating a conducive atmosphere, practices maximize instructional time, reduce behavioural disruptions, enhance student focus, and an achievement for learning.

Modern Teaching Methods

The integration of modern teaching methods has transformed traditional mathematics instruction at Birendra Secondary School. Teachers utilize multimedia presentations, online resources, and interactive activities to make complex concepts more accessible and engaging. For example, during a geometry lesson, a teacher employed an interactive whiteboard to demonstrate various shapes and their properties, allowing students to manipulate images and visualize abstract concepts. This innovative approach not only captures students' attention but also encourages active participation, leading to enhanced understanding and retention of mathematical principles.

Use of Instructional Materials

Teachers also place a strong emphasis on the use of instructional materials to illustrate mathematical concepts. Visual aids, manipulatives, and real-life examples are commonly employed by using multimedia presentation, and online resources to make abstract ideas relatable and easier to grasp. During classroom observations, it was noted that teachers would often bring in physical objects, such as measuring tapes or geometric shapes, to facilitate hands-on learning experiences. Students expressed appreciation for these tangible connections to mathematics, stating that they helped them better understand complex topics. The incorporation of such materials not only enhances comprehension but also makes learning more enjoyable, thereby increasing motivation and engagement.

Reward and Punishment Systems

Implementing a system of rewards and punishments is another strategy utilized by teachers to motivate students. Positive reinforcement, such as verbal praise or small incentives, is given for good behaviour and achievements, while clear consequences are established for misbehaviour. Implementing a system of rewards and punishments encourages students to strive for excellence while maintaining accountability (Ryan & Deci, 2000). This balance encourages students to strive for excellence while maintaining

accountability. Students acknowledged that receiving recognition for their efforts boosted their morale and encouraged them to continue performing well.

Research supports using motivational strategies such as autonomy-supportive choices, effort-based praise, and collaborative recognition, which enhance engagement without undermining intrinsic motivation (Ryan & Deci, 2000). Using motivational rewards in the classroom helps foster a positive and engaging learning environment by focusing on encouragement rather than punishment. Instead of saying simply "Good job," teachers used specific, meaningful phrases like *"Great job staying focused during independent work time".* These statements highlight effort, progress, and positive behavior, which study shows boosts students' intrinsic motivation and self-confidence.

Incorporation of Humor and Music

To create a lively and enjoyable learning atmosphere, teachers frequently incorporate humor and music into their lessons. Jokes, songs, and chants are used to lighten the mood and make complex concepts memorable. Humor and music are creative tools used to make complex mathematical concepts more memorable and engaging (Berk, 2002). During interviews, students shared that they appreciated the use of humor, as it made the class more engaging and less threatening. Setting academic content to melody enhances information retention, recall, and engagement, especially in subjects like mathematics that often induce anxiety or disengagement (Hyde, 2007). One teacher described how he would use catchy tunes to teach mathematical formulas, enabling students to remember key concepts through melody. This creative approach not only enhances student enjoyment but also reinforces learning through auditory cues.

Physical Infrastructure

The school's physical infrastructure also plays a significant role in student motivation. The physical and material resources available at Birendra Secondary School, Chainpur, Chharghare, Nuwakot, play a significant role in fostering a positive, engaging, and effective learning environment. Based on school records, field observations, and interviews with teachers and students, the following facilities and resources are provided: The school provides well-ventilated and structurally sound classrooms with adequate lighting and seating for all students, ensuring a comfortable space for instruction. Well-managed classrooms minimize disruptions, maximize instructional time, and create a predictable environment where students feel safe and focused, thereby enhancing learning outcomes (Emmer and Stough, 2001). A library with reference texts, storybooks, and SEE preparation model questions promotes reading and academic support. The computer lab, teaching aids such as a projector, television, and audio player, enhance multimedia-based learning. Visible learning environments where goals, progress, and achievements are displayed help students understand expectations and track their growth (Fisher, Frey, and Hattie, 2018).

Essential facilities, are as clean drinking water, gender-segregated toilets, and a playground, support student health, dignity, and physical development. Access to safe, clean, and well-maintained school facilities is a foundational element of inclusive and effective education. The presence of toilets, clean drinking water, and adequate classrooms at Birendra School emphasizes that even basic infrastructure significantly impacts attendance, dignity, and health, especially for girls (UNESCO, 2014).

Classrooms are enriched with visual learning displays of student work, subject charts, and motivational posters, fostering pride and engagement.
A school garden and green spaces contribute to environmental education and aesthetic value. Additionally, a well-organized school office and staff room provide necessary administrative and professional support, reflecting a holistic investment in both infrastructure and school culture. Students reported feeling more motivated to learn in an environment that feels welcoming and stimulating.

Assessment System

Regular assessments, including quizzes, tests, and projects, allow teachers to monitor student progress and provide timely feedback. With the proper planning, such as weekly mini-quizzes, unit tests at the end of the month, and term-based projects, teachers can maintain an academic calendar. The importance of balanced, continuous assessment for enhancing student engagement, providing timely feedback, and improving learning outcomes (Popham, 2008).This continuous evaluation system keeps students engaged and motivated to improve their performance. Teachers emphasized the importance of formative assessments, which enable them to identify areas where students may need additional support. Students appreciated the opportunity to receive constructive feedback, as it helped them understand their strengths and areas for improvement. This ongoing dialogue between teachers and students fosters a growth mindset, encouraging learners to view challenges as opportunities for development.

School Policy and Communication

Effective communication between teachers, students, and parents fosters a collaborative learning environment. Teachers regularly update parents on their children's progress, encouraging parental involvement and support. During interviews, parents expressed appreciation for the open lines of communication, noting that staying informed about their children's academic performance allowed them to provide more effective support at home. This partnership between school and home creates a cohesive support system that enhances student motivation and achievement.

In summary, the findings indicate that the motivational techniques employed by mathematics teachers at Birendra Secondary School are multifaceted and impactful. Through a combination of revision, effective classroom management, modern teaching methods, instructional materials, reward systems, humor, and music, along with supportive physical infrastructure and assessment practices, teachers create an engaging and motivating learning environment. These strategies not only enhance student achievement in mathematics but also contribute to a positive educational experience for all stakeholders involved.

Impact of Motivational Techniques on Student Achievement

The analysis of the collected data revealed that the motivational techniques employed by mathematics teachers at Birendra Secondary School have a significant positive impact on student achievement. The improvements in student engagement, academic performance, self-efficacy, teacher-student relationships, and parental involvement in mathematics at Birendra Secondary School can be directly linked to specific, evidence-based interventions implemented. The intervention was the weekly mini-quizzes every Friday, where teachers used games and real-life problem-solving tasks to make abstract concepts more accessible and engaging. This innovation was observed to increase participation, especially among previously disengaged students. Additionally, weekly diagnostic quizzes with personalized feedback allowed teachers to identify learning gaps and provide targeted remedial support, while student progress trackers fostered a sense of self-efficacy and ownership over learning.

Teachers also initiated monthly parent-teacher-math student triad meetings, where learners presented their work and set improvement goals, significantly strengthening parental awareness and involvement. Furthermore, the use of peer tutoring, where high-performing students mentored peers in small groups, built collaborative relationships and improved classroom dynamics. These structured, sustained interventions were documented in the school's 2080–2081 SIP (School Improvement Plan) and supported by classroom observations and interview data, and findings on the impact of feedback, self-reported grades, and teacher-student relationships on achievement, thereby justifying the observed positive changes in mathematics learning outcomes (Hattie, 2009). Students reported increased engagement, improved academic performance, enhanced self-efficacy, stronger teacher-

student relationships, and greater parental involvement, all of which contribute to better learning outcomes in mathematics. These findings align with established theories of motivation, demonstrating how intrinsic and extrinsic motivational strategies can shape students' attitudes and behaviours toward learning.

Increased Engagement

One of the most notable effects of the motivational techniques was the heightened level of student engagement in mathematics classes. Students expressed enthusiasm for participating in discussions, problem-solving activities, and hands-on learning experiences facilitated by their teachers. During interviews, several students mentioned that the use of humour, music, and interactive teaching methods made mathematics lessons more enjoyable and less intimidating. For example, one high performer student stated, "When our teacher uses songs to explain formulas, I remember them easily and look forward to math class." Another medium performer student added, "*I used to think math was boring, but now I enjoy solving problems because our teacher makes it fun with games and group activities.*" These responses suggest that incorporating varied instructional techniques effectively sustains students' interest and encourages active participation in the learning process.

Improved Academic Performance

The study found a direct correlation between the implementation of motivational techniques and improvements in students' academic performance. Regular assessments, immediate feedback, and personalized encouragement helped students track their progress and identify areas for improvement. Teachers emphasized the importance of recognizing students' efforts rather than solely focusing on final results, which contributed to a more supportive learning environment. Several students noted that frequent quizzes and assignments, combined with constructive feedback, allowed them to gauge their understanding and build confidence over time. One low-performing student remarked, *"*My teacher gives me extra practice sheets if I struggle with a topic, and that helps me improve my scores." *(Interview with C students on dated 4/7/20)*. Parents also observed improvements in their children's mathematics performance, attributing this progress to the school's proactive approach in reinforcing learning through motivational strategies.

Enhanced Self-Efficacy

Students' belief in their ability to succeed in mathematics, referred to as self-efficacy, was significantly strengthened through the motivational techniques employed by teachers. By setting achievable goals, providing positive reinforcement, and acknowledging incremental progress, teachers helped students develop a growth mindset. During interviews, students frequently mentioned feeling more confident in their mathematical abilities, particularly after overcoming initial difficulties. One student shared,

"At first, I didn't understand algebra, but my teacher kept encouraging me and gave me step-by-step guidance. Now I feel much better about solving equations." Another medium performer student added, "Knowing that mistakes are part of learning makes me try harder instead of giving up." These sentiments reflect the effectiveness of motivational strategies in fostering resilience and perseverance among learners, ultimately contributing to higher academic achievement.

Positive Teacher-Student Relationships

Strong relationships between teachers and students emerged as a key factor in sustaining student motivation and academic success. Teachers at Birendra Secondary School prioritized building trust, empathy, and mutual respect in the classroom. Many students highlighted the supportive nature of their mathematics teachers, describing them as approachable, patient, and genuinely invested in their learning. One student noted,

"*Our teacher always listens to us and explains things until we understand. That makes me feel comfortable asking questions." Another student emphasized the importance of*

encouragement, stating, "When I struggled with geometry, my teacher stayed after class to help me, and that made me want to keep trying." (Interview with A student on dated 3/7/2025). These interactions fostered a sense of belonging and security, encouraging students to take risks in their learning and seek assistance when needed.

Parental Involvement

Teachers maintained regular communication with parents through meetings, progress reports, and informal discussions, ensuring that families remained informed about their children's learning journey. Parental involvement played a crucial role in reinforcing students' motivation and academic progress (Pokhrel, 2008). Parents appreciated being actively engaged in their children's education, as it allowed them to provide additional support at home. One parent explained, who is the mother of a student performing at a moderate level (CGPA 2.0–3.0), as teachers reported that performance updates and home-support advice were most frequently communicated to parents of students who showed potential but needed reinforcement in core subject like mathematics. she receives specific, actionable feedback from teachers. She is part of the school's targeted parental engagement strategy, which includes quarterly progress reports, SMS updates, and face-to-face consultations during parent-teacher meetings.

The school sends updates about my child's performance, and if there are areas needing improvement, the teacher advises us on how to help at home." Another parent who stated, "We talk to our child about their math assignments and celebrate their small victories, which keeps them motivated," is likely a supportive parent. Based on field observations and interview data from the 2081 case study, this parent is aged to be 37. He belongs to a low-income agrarian household, where daily livelihoods depend on subsistence farming. This parent is found emotionally invested in their child's learning journey, taking time to discuss homework and parent-teacher meetings, and creating a positive reinforcement environment at home by acknowledging progress. The findings underscore the profound impact of motivational techniques on student achievement in mathematics. By fostering engagement, improving academic performance, enhancing self-efficacy, strengthening teacher-student relationships, and promoting parental involvement, these strategies collectively contribute to a positive and productive learning environment. These insights highlight the importance of integrating motivational practices into mathematics instruction, particularly in community-based schools where student engagement and perseverance can be critical determinants of academic success.

Challenges and Limitations

Despite the positive outcomes associated with the motivational techniques employed at Birendra Secondary School, several challenges persist that hinder the full realization of these strategies. The lack of adequate mathematics laboratory facilities restricts opportunities for hands-on learning experiences (NCTM, 2009). The school's overall infrastructure is sufficient for effective general education, justifying its model school status. However, the lack of a mathematics laboratory remains a valid and significant limitation for experiential learning in mathematics. Acknowledging this gap does not undermine the school's achievements but highlights an area for targeted improvement, one that aligns with national goals for enhancing STEM education through active, student-centered pedagogy. While teachers strive to make mathematics engaging through interactive methods and real-life applications, the absence of a dedicated mathematics laboratory restricts students' opportunities for hands-on learning experiences.

Laboratories typically provide students with concrete, experiential learning that reinforces abstract mathematical concepts. Without such a facility, teachers must rely primarily on theoretical explanations and limited physical demonstrations, which may not fully capture students' interest or deepen their understanding of complex topics. This

constraint underscores the need for investment in educational infrastructure to support more dynamic and immersive learning experiences.

Another challenge pertains to parental involvement, which, while generally supportive, remains inconsistent across families. Although the school maintains regular communication with parents and encourages their participation in their children's education, some parents remain disengaged due to socioeconomic constraints or limited awareness of their role in academic support. Three sample students noted that while some parents actively assist with homework and encourage academic discussions at home, others lack the time, resources, or educational background to provide meaningful support. One student shared, "Some of my friends don't get help at home because their parents are busy working or don't know much about math." This disparity highlights the importance of equipping parents with strategies to support their children's learning, particularly in households where formal education may not be a priority. Implementing workshops or informational sessions for parents could bridge this gap and strengthen home-school collaboration.

Additionally, one mathematics teacher shared : It's tough to give extra help to students who are falling behind because I have to teach the whole syllabus to everyone. If there were more teachers, we could split the class into smaller groups and give each student the support they need. This teacher is showing a strong desire to do better, which shows they care a lot about their students. The study found that top-performing schools often work at the edge of what teachers can handle, where teachers' personal efforts cover for system weaknesses. These schools are good at getting high pass rates, but they often do so at a cost, like teacher exhaustion, less one-on-one time with students, and fewer chances for new teaching methods (Acharya et al., 2020).

This schools also face challenges like having only one teacher for each subject in Grade X and big class sizes. This makes it hard to give different kinds of instruction or support to each student. But this isn't a contradiction; it shows how teachers in rural areas achieve good results through their hard work and smart ways of adapting, even with limited resources. As teachers said in interviews, it's hard to balance teaching the whole curriculum with giving extra help to students who need it. This doesn't mean the quality is bad. It shows that more teachers and better school structures are needed to keep these successes going without burning out the teachers.

Furthermore, while the school demonstrates commendable efforts in fostering motivation, there is a need for ongoing professional development for teachers. Ongoing professional development for teachers ensures they remain updated on best practices in motivational strategies and mathematics education (Hattie,2009). Continuous training ensures that educators remain updated on best practices in mathematics education and motivational strategies. Although teachers at Birendra Secondary School employ various motivational techniques, some expressed a desire for more formal training on innovative teaching methods and student engagement strategies. Math's teacher mentioned,

"I try my best, but sometimes I feel stuck with the same approaches. Learning new ways to motivate students would help us adapt to changing classroom dynamics." Providing access to workshops, using GeoGebra, mentorship programs, and collaborative teaching forums could empower educators to refine their instructional practices and sustain student motivation effectively.

These challenges and limitations illustrate the complexities of implementing motivational strategies in a community-based school setting. Addressing these issues requires a multifaceted approach that includes infrastructure development, enhanced parental engagement, staffing adjustments, and continuous teacher training. Overcoming these obstacles will be essential in maximizing the effectiveness of motivational techniques and ensuring equitable opportunities for all students to succeed in mathematics.

Conclusion and Recommendation

The findings of this case study underscore the critical role of motivational techniques in enhancing student achievement in mathematics within community-based educational settings. The study reveals that when teachers prioritize student engagement, employ modern teaching methods, and foster positive relationships, students are more likely to succeed academically. The motivational strategies identified, such as revision of lessons, effective classroom management, use of instructional materials, NEB Model questions, reward systems, incorporation of humor and music, and regular assessments, include extra coaching for weak students. collectively contribute to a supportive learning environment that nurtures student motivation and academic growth. These insights provide valuable implications for both educational practice and policy, particularly in resource-constrained settings where student engagement and perseverance can be critical determinants of academic success.

Practice-Related Recommendations

To enhance the effectiveness of motivational techniques in mathematics instruction, the following recommendations are proposed for classroom practice:

Effective Classroom Environment: Teachers should maintain a well-managed and stimulating classroom environment that supports learning. Creating a structured yet flexible atmosphere where students feel comfortable expressing themselves and taking academic risks is essential for fostering motivation. Clear expectations, consistent routines, and respectful interactions contribute to a positive classroom climate that encourages engagement and reduces anxiety.Visible Learning, the most effective classrooms are not those that are either "strict" or "permissive," but those that exhibit high control *and* high warmth, a model known as the authoritative classroom (Hattie, 2009). A well-managed, disciplined environment is not the opposite of a student-centered one, it is its prerequisite. The evidence from Birendra Secondary School shows that structure enables, rather than inhibits, democratic and motivating classroom practices.

Use of Modern Teaching Methods: Incorporating technology and interactive tools can make complex mathematical concepts more accessible and engaging. Teachers should explore digital /online resources, simulations, and multimedia presentations to enhance visualization and conceptual understanding. Interactive whiteboards, educational apps, and online platforms can provide students with dynamic learning experiences that cater to different learning styles.

Regular Feedback: Providing timely and constructive feedback is crucial for reinforcing learning and building student confidence. Formative assessments, such as weekly quizzes, unit tests at the end of month, and term-based projects, allow teachers to gauge student understanding and adjust instruction accordingly. Encouraging regular communication between parents and teachers strengthens the home-school connection, benefiting student learning (Sapkota, 2008).

Parental Engagement: To establish the Parent Teacher Association (PTA) and PTA aims to improve the parental engagement strategy, which includes quarterly progress reports and face-to-face consultations during parent-teacher meetings. School should provide progress reports, and offer guidance on how parents can support mathematics learning at home. Engaging parents through workshops or informational sessions on effective learning strategies can further reinforce student motivation and academic success.

Policy-Related Recommendations

In addition to classroom-level strategies, broader policy interventions are necessary to support sustainable improvements in mathematics education. The following recommendations are proposed for policymakers and educational administrators:

Infrastructure Development: Investing in dedicated mathematics laboratories and providing essential teaching materials will create a more conducive learning environment for

students. Equipped with manipulatives, interactive software, and real-world applications, mathematics labs can facilitate hands-on exploration and deeper conceptual understanding. Policymakers should prioritize infrastructure upgrades to ensure that community-based schools have access to the resources necessary for effective mathematics instruction.

Professional Development: Implementing continuous teacher training programs focused on innovative teaching strategies and motivational techniques is essential for empowering educators. Workshops, mentorship programs, and collaborative teaching forums can provide teachers with opportunities to refine their instructional practices, share best practices, and stay updated on emerging trends in mathematics education. Professional development initiatives should emphasize student-centered approaches, differentiation strategies, and the integration of technology to enhance motivation and engagement.

Curriculum Reform: Updating the mathematics curriculum to reflect contemporary pedagogical approaches and integrate digital resources can better align instruction with students' needs and interests. Curriculum designers should consider incorporating real-world applications, interdisciplinary connections, and problem-solving tasks that encourage critical thinking and creativity. Emphasizing conceptual understanding over rote memorization will help students develop a deeper appreciation for mathematics and its relevance in everyday life.

Monitoring and Evaluation: Establishing mechanisms for monitoring the implementation of motivational strategies and assessing their impact on student achievement is crucial for ensuring accountability and continuous improvement. Educational authorities should develop standardized evaluation frameworks that measure student engagement, academic performance, and teacher effectiveness in promoting motivation. Data-driven decision-making can inform policy adjustments and resource allocation to optimize educational outcomes.

By adopting these recommendations, community-based schools like Birendra Secondary School can continue to enhance student achievement in mathematics and foster a culture of motivation and success among learners. Strengthening classroom practices, investing in infrastructure, supporting teacher development, and implementing evidence-based policies will contribute to a more equitable and effective mathematics education system, ultimately empowering students to reach their full potential in mathematics and beyond.

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