



THE CAUSES OF POOR PERFORMANCE IN MATHEMATICS AMONG CLASS VI STUDENTS IN SAMTSE DZONGKHAG, BHUTAN

Prakash Gurung^{1*}, Dr. Rinchen Tshewang², Ten Gyeltshen³

Abstract

This study aimed to examine the underlying causes of poor performance in mathematics among class VI students in Samtse Dzongkhag. The sample consisted of 219 students (110 girls & 109 boys) and 6 mathematics teachers (3 male & 3 female), which were selected from the population of 8 schools in Samtse Dzongkhag. A mixed-methods design was employed for the study. Survey questionnaires and interviews were used to collect data. The mean and standard deviation were used in the analysis of the survey data. The results of the data analysis included survey results and interview results. The findings of the study led to the conclusion that improper teachers' approaches, inadequate supervision, inadequately qualified teachers, inadequate teaching materials and facilities, and a lack of parental involvement contribute to the causes of poor performance in mathematics in the study area. The study also found that developing students' attitudes, training mathematics teachers, effective teaching methodologies, available TLM, classroom and library facilities, administration supervision, parental involvement, technology integration, and constant constructive assessments are the ways of improving performance in mathematics in the study area. The study recommended that teachers should focus on adopting constructive assessment practices; teachers should make efforts to develop a positive attitude towards mathematics among students; teachers should utilize suitable teaching methods for mathematics instruction; adequate supervision and inspection of teaching and learning practices should be ensured; and administrators should make efforts to address the shortage of qualified mathematics teachers. Schools should ensure the provision of sufficient teaching materials and resources for mathematics teachers. Parents should be encouraged to get involved in their children's learning, particularly in mathematics. By addressing this recommendation, teachers, parents, and students will know the underlying causes that hinder achievement in mathematics.

Keywords: Mathematics; performance; Education; Student; Improvement; Teacher; Parent; Supervisor; attitude; Causes; Assessment; Facility; Method; quality; TLM.

¹M.E.D. (Teacher), Paro Collge Of Education, Bhutan

²P.H.D.(Scholar),Paro College Of Education, Paro, Bhutan

³M.E.D.(School Principal),Sherub Gatshel Middle Secoundary School, Samtse, Bhutan

***Corresponding Author:** Prakash Gurung

^{*}M.E.D. (Teacher), Paro Collge Of Education, Bhutan

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1 Introduction

Bhutan, like any other developing nation, is no different in formulating, developing, and implementing school education curricula to provide quality, wholesome education. Mathematics was an area of study even in the monastic education system prior to the introduction of modern education in 1961. Mathematics occupies a special status in the education system of Bhutan, with high-end school curriculum expectations from pre-primary to higher secondary levels guided by timely policy decisions. The Department of Curriculum and Professional Development (2022) stated that the goal of school mathematics education in Bhutan is to develop learners with a mathematical mindset and skills vital for the development of competent mathematicians, statisticians, and data scientists as citizens. Towards this end, the mathematics curriculum is envisioned to achieve the following goals:

- *Equip learners with the mathematical competencies needed to apply mathematical concepts, fundamentals, and principles in the real world of work and life.*
- *Through real-time experimental learning experiences, they facilitate the development of intellectual, social, emotional, physical, and digital competencies as competent, socially responsible, and productive citizens.*
- *Learning experiences in mathematics provide learners the opportunity to test and generalize to create or generate new mathematical knowledge and skills.*
- *Engagement of learners in mathematical concepts and processes facilitates the development of an individual as a lifelong learner.*
- *enabled with the mathematical competency required to work in a society that is technologically oriented and information-rich, either within Bhutan or outside.*
- *They demonstrate the understanding of various mathematical concepts and procedural skills; the ability to explore a variety of strategies for problem solving; and the ability to think and reason logically to enable them to cope with everyday mathematics and the mathematics required in the world of work.*
- *This provides a foundation for those students who may continue studies in mathematics or other areas requiring a strong mathematical background and also helps to foster and develop mathematical talent.*

- *To increase their understanding of the value of mathematics and its usefulness to them, to nurture confidence in their own mathematical ability, and to encourage a continuing interest in learning and doing mathematics.*

It is evident that, mathematics education at school level in Bhutan is designed to create opportunities for students to develop key competencies that are important in the 21st century, such as formulating, applying and interpreting mathematical concept in real world context. Also, the national school curriculum framework lays out Science, Technology, Engineering, and Mathematics as one of the key learning areas (Department of Curriculum and Professional Development, 2022). Therefore, mathematics is one of the core subjects for all primary and secondary school children in Bhutan.

The Department of Curriculum and Professional Development involves mathematics teachers across the country to design and develop the curriculum to meet the needs of current generation, while the Bhutan Council for School Examinations and Assessment assesses students' levels of competency. The students' learning is categorized into four important stages (Classes VI, VIII, X, and XII), and at the completion of each stage, students are required to take competency-based assessment tests at the primary level and public examinations (high stakes exams) at the secondary level as set by the Bhutan Council for School Examinations and Assessment. According to the Bhutan Council for School Examinations and Assessment Bhutan (2022), there is a need for organizations to develop and administer competency-based assessment items and to provide professional support to schools. Similarly, the findings from Bhutan's participation in PISA-D also underscore the need to strengthen competency-based activities and items in both formative and summative assessments.

1.1 Problem statement

According to the Bhutan Education Blueprint (2014–2024) a substantial proportion of students in Bhutan complete the primary cycle without achieving proficiency in foundational literacy and numeracy skills. In order to assess students' competencies, the Bhutan Council for School Examination and Assessment (BCSEA) administers the Competency-Based Assessment Test (CBAT) to class VI students. This

assessment provides an overview of students' performance at the primary level.

Regarding mathematics performance specifically, the BCSEA (2019) reports that class VI students consistently exhibit the lowest levels of achievement in this subject, in comparison to other subjects, with a slight improvement noted in

2018. Table 1.1 provides a representation of the overall performance trend among class VI students, indicating that the mean score for mathematics consistently remains the lowest across the years 2016 to 2018.

Table 1.1: Overall performance trend among class VI students

Subject	2016	2017	2018
Dzongkha	59.12	57.96	55.48
English	47.72	54.33	46.86
Mathematics	41.27	35.33	43.33
Science	54.01	52.31	61.35
Social Studies	51.19	55.83	54.47

Source: Bhutan Council for School Examination and Assessment, 2019

Furthermore, based on my 10 years of experience teaching primary mathematics in Samtse Dzongkhag, I have personally encountered challenges in ensuring that class VI students attain the minimum required mean mark in mathematics, as stipulated in the Annual Performance Agreement ($\geq 60\%$). The consistent low performance in mathematics among class VI

students could potentially be a contributing factor to the overall academic performance decline observed in Samtse Dzongkhag in recent years. Table 2.1 illustrates the trend in mathematics performance among class VI students in Samtse Dzongkhag, indicating a mean mark below 60% from 2016 to 2018.

Table 1.2: Mathematics performance trend of class VI students in Samtse Dzongkhag

Year	2016	2017	2018
Mean mark	43.46 %	52.28%	44.51%

According to a study conducted by Varaidzai Makondo and Makondo (2020), several causes contribute to poor academic performance in mathematics. These causes include ineffective utilization of teaching methods, students' negative attitudes towards the subject, and insufficient teaching experience. The study also highlights the impact of teacher instability and a lack of adequate resources on students' performance in mathematics. Michal (2015) emphasizes that the teaching and learning of mathematics face various challenges. These challenges include an unfavorable teaching environment, poorly managed mathematics departments, a lack of opportunities for self-practice, and students with inadequate mathematical backgrounds. These causes hinder the effective delivery and comprehension of mathematical concepts. Dukpa (2015) points out that the attitude of Bhutanese students towards mathematics is generally average, with no significant difference observed between male and female students. Moreover, the study reveals that urban students tend to have a more positive attitude towards mathematics compared to their rural counterparts.

The Ministry of Education and the Samtse Dzongkhag Administration have undertaken initiatives to address the issue of poor performance in mathematics among students. These initiatives include the provision of adequate boarding facilities and meals, orientation programs on changes in the prescribed syllabus, and the adoption of competence-based teaching practices in the curriculum. However, despite these efforts by stakeholders, the performance of students in mathematics has not shown significant improvement. The persistent challenges associated with students' poor performance in mathematics pose an ongoing concern for the education sector in Samtse Dzongkhag, necessitating immediate attention to find practical solutions to reverse this downward trend.

Although several studies have been conducted on the causes of poor performance in mathematics and potential remedies, these findings are often based on interpretations that may not be directly applicable to the learning environment in Bhutanese schools. Consequently, it is essential to undertake further research to explore the specific causes of poor performance in mathematics among class VI students and propose effective

measures to enhance their mathematical achievement in Samtse Dzongkhag.

2. Objectives of the study

The main objectives of this study are to:

- i. examine the causes of poor performance in mathematics among class VI students.
- ii. identify ways of improving students' mathematics performance.

2.1 Research Questions

The study attempts to answer the following questions:

1. What are the causes of poor performance in mathematics among grade VI Students?
2. What are ways of improving students' mathematics performance?

3. Limitation of the study

It is essential to acknowledge the limitations inherent in the research process. The following limitations should be considered:

1. **Sample Size and Representativeness:** The study was conducted in a specific region (Samtse Dzongkhag) and focused on class VI students. The sample size might not be representative of the entire population, limiting the generalizability of the findings. The study's findings may not be applicable to students in other grade levels or different regions.
2. **Self-Reported Data:** The data collected through student surveys relied on self-reporting, which introduces the possibility of response bias and inaccuracies. Students' responses may be influenced by social desirability bias or personal interpretations, affecting the reliability of the findings.
3. **Teacher Bias:** The teacher interviews, while providing valuable insights, may be subject to teacher bias. Teachers' personal opinions and experiences can influence their responses, potentially affecting the objectivity of the data. The presence of socially desirable responses or limited disclosure of certain issues could impact the comprehensiveness of the findings.
4. **Lack of External Validation:** The study relied primarily on internal data sources, such as student surveys and teacher interviews. While these sources provide valuable perspectives, the absence of external validation methods, such as classroom observations or standardized tests, limits the strength of the findings. External validation could provide a more comprehensive and objective assessment of students' mathematics performance.

5. **Contextual Factors:** The study focused on the context of Samtse Dzongkhag, which may have unique characteristics and educational challenges. The findings and recommendations may not be directly transferable to other contexts with different socio-cultural, economic, or educational settings. The specific contextual factors in Samtse Dzongkhag may have influenced the causes of poor performance and ways to improve students' mathematics performance.

6. **Causality and Longitudinal Study Design:** The study's cross-sectional design limits the ability to establish causal relationships between variables. While the study identified potential causes of poor performance and ways to improve students' performance, further research using longitudinal or experimental designs would be necessary to establish causal links and determine the effectiveness of specific interventions.

7. **Limitations of Secondary Sources:** The literature review relied on previously published studies and sources, which may have their own limitations. The accuracy, reliability, and relevance of the literature cited could impact the validity of the study's discussions and recommendations.

Despite these limitations, this study provides valuable insights into the causes of poor performance in mathematics among class VI students and proposes recommendations to address these challenges. Future research could build upon these findings by addressing the identified limitations and exploring additional causes of poor performance in mathematics and ways to improve students' mathematics performance.

4. Methods

4.1 Research Design

In this research, a convergent mixed-method design was employed to examine the causes of poor performance in mathematics among grade six students in Samtse Dzongkhag. This design aims to compare and integrate both quantitative and qualitative data in order to examine if the findings from each approach converge and provide similar results (Creswell, 2015).

In the study of qualitative research, I have employed phenomenology as a philosophical root to anchor my study. A phenomenological study describes the meaning for several individuals of their lived experiences of a concept or phenomenon (Creswell, 2014). Thus, this phenomenological study provides teachers' experiences with regard to the causes of poor

performance in mathematics among class VI students, allowing me to better understand the problem.

The quantitative research part in this study examines the causes of poor performance in mathematics. The study focus on descriptive survey research design. Creswell (2014) stated that the descriptive survey research design allows researchers to elicit a wide range of responses to the studied phenomenon. It helps to explain and predict the probable relationship between independent and dependent variables. The study describes a trend. It means that the research problem can be answered best by a study in which the researcher seeks to establish the overall tendency of responses from individuals and note how this tendency varies among people. It further explains how one variable affects another. Explaining a relationship among variables determines whether one or more variables might influence another variable.

4.2 Population

The study involves all the primary mathematics teachers and class VI students in Samtse Dzongkhag schools. There are 32 schools in Samtse Dzongkhag that provides class VI education. However, for the convenience of the investigation, 8 (eight) schools were selected for the study that includes 481 students (228 females and 253 males) as a targeted population for the quantitative research, and 6 (six) primary mathematics teachers from different schools were chosen for the qualitative research.

4.3 Sample

The sample size for quantitative research is 219. It is calculated by using the Yamane formula ($n = \frac{N}{1+N(e)^2}$), where N is the targeted total population (481), and e is the precision level (5%=0.05). A random sampling technique were employed to choose students in the identified schools, and six teachers were identified by doing random sampling among the primary mathematics teachers of Samtse Dzongkhag. The table 3.2 below shows the distribution of the sample for this study.

Table 3.2: Sample distribution of students used for the study (n = 219)

School	School type	Female	Male	Total
A	HSS	19	21	40
B	HSS	19	17	36
C	LSS	30	27	57
D	LSS	10	9	19
E	MSS	12	14	26
F	MSS	14	13	27
G	PS	3	3	6
H	PS	3	5	8
		110	109	219

Source: Fieldwork, 2022.

5. Validity and Reliability

To ensure the validity and reliability, the adapted questionnaires were submitted to subject experts for content validation and contextual appropriateness and applicability. Upon suggestions from the expert, the items were further simplified and some inappropriate items in the context were excluded. The reliability of both the instruments were tested through a pilot test involving 10 participants from the focused school. The internal consistency of the items were measured by using the Cronbach's Alpha ($\alpha = \frac{Nc}{v+(N-1)c}$) to indicate the items are valid for implementation.

6. Ethical Considerations

The study involves students and teachers in eight different schools in Samtse Dzongkhag. Before commencing the project, a letter of approval was obtained from the Paro College of Education's Ethics Committee. Approval from the Dzongkhag Education Officers and the principals of the participating schools was pursued. Further, the participants were briefed on maintaining the confidentiality of their responses and the safe storage of data obtained from them. Questionnaire items were also explained in Dzongkha during the survey time to avoid discrepancies between the intended measure of the items and the understanding of the items.

7. Data Analysis

7.1 Survey Data Analysis and Results

The survey data were organized and analyzed based on two main themes: causes of poor performance in mathematics among class VI students and ways of improving students' performance in mathematics. Item-wise mean and

standard deviation calculations were performed for each theme. The interpretation of the mean values for each theme was guided by the scale proposed by Sa'ad et al. (2014) as outlined in Table 4.1

Table 4.1: Interpretation of 5-Point Likert Scale Measurements

Sl.No	Scale values of mean	Level of Agreement
1.	1.00 - 1.80	Strongly Disagree
2.	1.81 - 2.60	Disagree
3.	2.61 - 3.40	Neutral
4.	3.41 - 4.20	Agree
5.	4.21 - 5.00	Strongly Agree

7.2 Causes of poor performance in mathematics among class VI students

In this section of the study, the causes that contribute to poor performance in mathematics among class VI students in Samtse Dzongkhag. The student survey questionnaire comprises 10 items and contains 8 interview questions for teachers that specifically address these causes.

The student survey data results presented in Table 4.2 show that item 7 had the highest mean ($M = 3.12$; $SD = 1.37$), while item 9 had the lowest mean ($M = 1.86$; $SD = 1.13$). This reveals that

most of the participating students responded with either a 'neutral' or 'disagree' response, thus indicating the majority of participants did not believe that the causes of poor performance were as indicated by the theme. However, the range of standard deviation (1.09 to 1.37) indicates that there were varying opinions among student participants, indicating that they were not really sure about the causes of poor performance in mathematics.

Table 4.2: Mean and standard deviation on the causes of poor performance in mathematics

Sl.No	Items	Valid N	Mean	SD
1	My attitude toward mathematics cause poor performance in mathematics.	219	2.41	1.09
2	My fear toward mathematics cause poor performance in mathematics.	219	2.57	1.22
3	Inadequate qualified teachers of mathematics cause poor performance in mathematics.	219	1.97	1.10
4	Using poor methods in teaching mathematics by teachers cause poor performance in mathematics.	219	2.21	1.23
5	Inadequate teaching materials of mathematics cause poor performance in the mathematics.	219	2.58	1.22
6	Overcrowded classroom cause poor performance in mathematics.	219	2.63	1.33
7	Inadequate facilities like mathematics books in libraries cause poor performance in mathematics.	219	3.12	1.37
8	Lack of frequent supervision and inspection of mathematics teachers by the administration cause poor performance in mathematics.	219	2.26	1.28
9	Lack of parental involvement in the education of their children cause poor performance in mathematics.	219	1.86	1.13
10	Improper assessment by mathematics teachers cause poor performance in mathematics.	219	2.79	1.35

The teacher interview data revealed different perspectives. In the interview, there were divergent and conflicting views among teacher participants when questioned about their students' attitudes towards learning mathematics. Teacher participant (Tr. 2) observed that his students had a positive attitude towards mathematics and showed eagerness to learn, resulting in productive teaching sessions. Conversely, the teacher participant (Tr. 5) expressed that her students were highly intrigued by mathematics and displayed a genuine passion for the subject. The

teacher participant (Tr. 1) presents an opposing viewpoint.

The attitude towards learning mathematics has been a challenge over many years, not only in our school but in our society as a whole. It has been a challenge for different schools, especially in Bhutan, where mathematics is considered a difficult subject. The negative attitude towards learning mathematics has grown because of the belief that it involves only numbers, and we cannot remember all the formulas.

The findings from the teacher interviews indicate that there is a difference in the way students perceive and approach mathematics. While some teachers reported that their students showed enthusiasm and interest in learning the subject, others had a different perspective. This reveals that students' attitudes towards learning mathematics may vary based on their teachers' approach and teaching style. Therefore, it is crucial for mathematics teachers to be aware of their influence in shaping students' attitudes towards the subject.

In regard to the lack of frequent supervision and inspection of mathematics teachers, most teacher participants had a positive view of the frequency of monitoring by school supervisors. Five teacher participants (Tr. 5, Tr. 1, Tr. 6, Tr. 3, and Tr. 2) stated that their lessons were observed quite frequently by the head of department, vice principal, and principal. However, the teacher participant (Tr. 4) expressed a different opinion on the matter.

When conducting an observation, it is important to follow eight indicators. These indicators are observed in two terms: the first four indicators are observed before the mid-term, and the remaining four indicators are observed after the mid-term of the academic year. Besides that, I don't believe they have attended my class for any other reason.

Based on the teacher interview data results, it is evident that the supervision and inspection of teaching and learning practices are only carried out to comply with the Bhutan Professional Standards for Teachers (BPST) as mandated by the Ministry of Education. Therefore, it is crucial to conduct timely supervision and inspection of teaching and learning practices, in addition to adhering to BPST regulations. The absence of adequate supervision and inspection of teaching and learning practices is a significant contributor to poor performance in mathematics.

In an interview with inadequately qualified teachers of mathematics, the teacher participants (Tr. 1, Tr. 2, Tr. 3, Tr. 5, and Tr. 6) stated that they had enough qualified mathematics teachers in their school. who were well-trained teachers with strong mathematics content knowledge. However, the teacher participant (Tr. 4) has a different view:

Actually, I'm a science teacher, but I choose this because in our school there's shortages of

Mathematics teachers. So I chose to teach mathematics.

These teacher interviews indicate that most of the mathematics classes were taught by teachers who were qualified in mathematics. However, there were still some classes that were assigned to teachers who were not trained in mathematics. This could potentially have an impact on the poor performance of students in mathematics. This is because untrained teachers may lack the necessary skills and knowledge to effectively teach the subject, which could lead to students struggling to understand the concepts being taught.

With regards to inadequate teaching materials, resources, and facilities in school, the participants expressed contradictory views. The teacher participant (Tr. 4) said that their school has adequate teaching and learning materials, which are readily available in the school store, like counters, linking cubes, base ten blocks, and worksheets. Another teacher participant (Tr. 5) commented that it was difficult to get readily available materials due to limited stock. However, the teacher participant (Tr. 3) simply said that teachers have to improvise teaching and learning materials for most of the topics. On the issue of comparing the availability of teaching materials, resources, and facilities in remote and urban schools, the teacher participant (Tr. 4) commented as follows:

If you look at the facilities, we are equally equipped like other schools. We can utilize the internet and other resources to have more video lessons and make learning more interactive for our students. Overall, our school has the necessary tools to provide quality education to our students' despite being located in a remote area.

The results of the teacher interviews indicate that although schools are equipped with ready-made teaching and learning materials (TLM) and internet facilities, there are still some mathematics topics that require TLM that are not readily available in the school stores. As a result, mathematics teachers are required to improvise with these materials, which consumes extra time in preparing for their lessons. This leads to a shortage of teaching materials, resources, and facilities in schools, which can be linked to poor performance in mathematics. When there is a lack of appropriate teaching materials and resources, students may not be able to fully understand the subject matter, which can have a negative impact on their performance. Therefore, it is crucial for

schools to ensure that sufficient teaching materials and resources are provided to mathematics teachers to help enhance students' understanding and performance in mathematics.

In view of lack of parental involvement in the education of their children, the teacher participant (Tr. 3) commented that "most of the parents don't get involved in the students learning. Only a handful of them participate in the learning of their own child". Other teacher participants commented as follows:

In my personal opinion, the role of parents is crucial for the improvement of math skills in students. A student may learn a concept in the classroom, but if they do not practice what they have learned, they may miss a crucial step and fail to understand the entire concept. Therefore, if parents can spare at least an hour for their children to practice math and attempt at least two or three questions, it can lead to significant improvements in their math skills. This way, parents can play an essential role in helping their children achieve success in mathematics(Tr.3).

In my experience, many parents of students are not well-educated and may not have a good understanding of mathematics. However, they can still provide valuable support to their children and to us as teachers. One way parents can help is by allowing their children to do their homework and assignments at home for at least an hour. This consistent practice can lead to significant improvements in their performance over time. Even though some parents may not have a strong background in mathematics, they can still encourage their children to practice and work on assignments regularly. This way, both parents and teachers can work together to help students improve their math skills (Tr.6).

The teacher interview data result indicates that parental involvement is a crucial factor in promoting students' success in mathematics.

When parents show interest in their children's education, provide support, and participate in their learning process, students are more likely to perform better in mathematics. Conversely, when parents do not engage in their children's education, students may feel unsupported and uninterested in learning, which can lead to poor performance in mathematics.

To conclude, based on students' survey and teacher interview data results, The study revealed that improper teachers' approach and teaching style, inadequate supervision and inspection of teaching and learning practices, inadequately qualified teachers of mathematics, inadequate teaching materials, resources, and facilities, and a lack of parental involvement in the education of their children are some of the causes that contributed to poor performance in mathematics among class VI students under Samtse Dzongkhag.

7.3 The ways of improving of students' performance in mathematics

This theme examines various areas that contribute to improving students' performance in mathematics. These areas include developing students' attitudes, trained mathematics teachers, teaching methodologies, available teaching and learning materials (TLM), classroom and library facilities, administration supervision of mathematics teachers, parents' active participation in mathematics education, incorporating technology in mathematics education, and constant constructive assessments. Table 4.3 displays the results of the data collected from class VI students in terms of mean and standard deviation. Data collection involved administering a student survey questionnaire comprising 10 items and conducting 4 interview questions for teachers that specifically addressed these areas.

Table 4.3: Mean and standard deviation on students' perception

Sl.No.	Items	Valid N	Mean	SD
1	Developing a positive attitude towards mathematics is a key contributor in enhancing students' academic success in mathematics subject.	219	4.26	1.07
2	The availability of trained mathematics teachers is crucial to enhancing students' academic performance in mathematics.	219	4.02	1.09
3	Utilizing suitable teaching methods for mathematics, such as child-centered approaches, has the potential to advance students' academic performance in mathematics subject.	219	4.21	0.95
4	The provision of sufficient and pertinent mathematics materials is a vital contributor in enhancing students' academic achievement in mathematics.	219	3.94	1.03
5	The provision of appropriate classroom facilities, including sufficient furniture and ample space, is essential to fostering students' academic achievement in mathematics.	219	3.57	1.23
6	Access to mathematics libraries is a significant factor in enhancing students'	219	3.86	1.07

	academic performance in mathematics.			
7	On time administration supervision of mathematics teachers can improve the performance in mathematics of both the teachers and students.	219	3.77	0.98
8	Parents' active participation in mathematics education is essential in promoting academic success in mathematics.	219	3.84	1.04
9	Incorporating technology in mathematics education by teachers is essential to promote academic achievement in mathematics.	219	4.15	1.03
10	Constant constructive assessment by my mathematics teachers helps in mathematics performance.	219	4.43	0.85

The students Survey data result indicates the mean values of constant constructive assessment by mathematics teachers (mean = 4.43) is important in improving students' academic performance in mathematics. Developing a positive attitude towards mathematics (mean = 4.26) and utilizing suitable teaching methods for mathematics (mean = 4.21) are also important areas. On the other hand, the provision of appropriate classroom facilities (mean = 3.57) is ranked the least among the contributor on students' mathematics performance items.

However, it is important to note that the standard deviation values show a considerable variation in responses among the students (SD ranging from 0.85 to 1.23), indicating that the effectiveness of these improvements may vary among individual students. Therefore, a combination of these improvements may be required to achieve optimal results.

In an interview with teachers on ways of improving students' mathematics performance, the teacher participants had divergent perceptions when compared to the student survey data results. However, in the overview of the data results, students and teachers' perceptions had a good correlation in ways of improving students' performance in mathematics.

In the area of developing a positive attitude towards mathematics, when asked about the teacher-student relationship, the teacher participants stated the following comments:

I have a very good relationship with the students, and they find me approachable. Whenever they come across any doubts, they come to me to get them cleared (Tr.3).

My relationship with the students is friendly, and I believe that we share a love for the subject. As a result, my students actively engage in my class, and I feel that our relationship is strong (Tr.6).

Firstly, I would like to say that I am a very friendly person. Students easily find me approachable, which is the main reason they find me very approachable and friendly. If they have any doubts, they just approach me (Tr.4).

These teacher interview data results indicate that a strong teacher-student relationship was present in the classrooms. The teachers reported that the students felt comfortable sharing their doubts and problems with them. The teachers also found it easy to communicate with their students and address their concerns effectively. This positive relationship between teachers and students is important for creating a supportive learning environment where students feel motivated and engaged in their studies. When students feel comfortable with their teachers, they are more likely to participate in classroom activities, ask questions, and seek help when needed. This can lead to improved academic performance and overall success in their studies. Furthermore, the presence of a positive teacher-student relationship can also contribute to the development of important social and emotional skills, such as empathy, communication, and self-regulation. In the view of teacher motivating students, the teacher participants shared the following comments:

We should always reinforce motivation because it is captivating for the students. That's why I make an effort to motivate them all the time. Whenever they struggle with a question, I motivate them by solving it again, clarifying all their doubts, and simplifying the question if necessary. I also redirect their questions to make them understand and help them to do it on their own. By doing so, I believe that they are motivated to learn mathematics (Tr.1).

Every day, in every class, I make sure to motivate my students to learn more and practice more. Motivation is not limited to a specific time or period; it's something I do consistently for my students before leaving the class (Tr.2).

If I talk about myself, I consider myself a very friendly person. I approach my students individually and provide regular advice. Additionally, I create a friendly and engaging classroom environment that allows them to remain attentive during class (Tr.4).

These teacher interview data results indicate that teachers are effective at constantly motivating

their students. They utilize various strategies to keep their students attentive during class and establish a supportive environment to make students feel comfortable seeking help when needed. This strong teacher-student relationship can have a positive impact on students' motivation and engagement in learning mathematics. Additionally, teachers' efforts to maintain a positive classroom atmosphere and build rapport with their students can contribute to a more conducive learning environment, which may ultimately lead to improved performance in mathematics.

In order to improve students' performances in mathematics, the teacher participant shared the following comments:

To improve in mathematics and perform better, students need to practice more and have lots of hands-on experience. This will enable them to apply whatever they learn in the classroom to their day-to-day life (Tr.3).

To improve student performance in mathematics, in my opinion, the first step is to conduct assessments, including formative and summative assessments. We should use a responsive assessment approach. Before conducting assessments, we need to make students understand that mathematics is not a difficult subject, and we need to instill this confidence in them. In this way, we can improve their performance in mathematics. (Tr.1)

As a math teacher, I employ various techniques to improve my students' learning experience. For instance, I use a range of teaching materials to make math more accessible. I also strongly promote cooperative learning, whereby students participate equally in class discussions, instead of merely relying on teacher explanations. In my opinion, cooperative learning is the most effective technique for improving student performance. However, as our school is located in a remote area, we face a shortage of facilities that can hinder students' academic performance. Therefore, I believe it is essential for the government to prioritize the provision of adequate materials, especially for math (Tr.4).

These teacher interview results indicate that there are several important areas that can contribute to effective teaching and learning in mathematics. Firstly, it is important to promote cooperative learning in the classroom, where students work together in groups and collaborate with one another to solve problems. This can help improve students' engagement and motivation in the subject. Secondly, having adequate teaching and

learning materials (TLM) is crucial to facilitating effective teaching and learning. Teachers require various types of TLM, such as textbooks, worksheets, charts, models, and manipulatives, to help students understand mathematical concepts effectively.

Thirdly, effective teaching techniques need to be employed, such as using real-life examples, visuals, and hands-on activities to make the subject more interesting and engaging. Fourthly, the assessment process needs to be both formative and summative, allowing teachers to monitor students' progress and provide feedback. Fifthly, teachers should connect the lesson with students' experiences to make the lesson more relevant to their lives and relate it to real-world scenarios to help students understand the practical applications of mathematical concepts. Overall, these findings suggest that a combination of effective teaching strategies, adequate TLM, and appropriate assessment techniques can contribute to better student outcomes in mathematics.

To conclude on the theme "The ways of improving students' performance in mathematics," the students survey and teachers interview data results revealed that developing students' attitudes, trained mathematics teachers, teaching methodologies, available teaching and learning materials (TLM), classroom and library facilities, administration supervision of mathematics teachers, parents' active participation in mathematics education, incorporating technology in mathematics education, and constant constructive assessments were some of the ways of improving students' performance in mathematics among class VI students under Samtse Dzongkhag.

8. Discussion

8.1 Causes of poor performance in mathematics among Class VI students

The student survey result on the inadequate facilities like mathematics books in libraries shows the highest mean ($M = 3.12$), indicating that some students were not sure. The lack of parental involvement in the education of their children shows the lowest mean value ($M = 1.86$), indicating disagreement. However, the literature revealed that students' negative attitudes toward mathematics, anxiety and fear of the subject, inadequately qualified teachers, poor teaching methods, inadequate teaching materials, and overcrowded classes hamper student's performance in mathematics (Sa'ad et al., 2014, & Ojimba, 2012).

The standard deviation ranging from 1.09 to 1.37 indicates that there were diverse perspectives among the student participants, and students had varying levels of uncertainty or disagreement when it came to the causes of poor performance in mathematics. Shield and Kelly (1999) pointed out that a lack of learning support, dissatisfaction with teacher training, a perceived shortage of instructional resources, and limited professional development opportunities could affect mathematics performance. These causes could contribute to students' uncertainty or disagreement about the causes of poor performance, as they may have differing experiences with the availability of resources and support.

With regards to students' attitudes towards learning mathematics the teacher interview data result indicates varying perspectives. While Teacher participants (Tr. 2 & Tr. 5) have express positive experiences, highlighting their students' positive attitudes towards mathematics. Teacher participant (Tr. 2) mentions that their students displayed eagerness to learn, indicating a genuine interest in the subject. This enthusiasm from students can create an engaging learning environment and contribute to productive teaching sessions. Teacher participant (Tr. 5) goes further, stating that their students were highly intrigued and even had a genuine passion for mathematics. This level of passion can foster a deeper understanding and enjoyment of the subject, potentially leading to better academic performance.

On the other hand, Teacher participant (Tr. 1) presents a different perspective, stating that building students' attitudes towards mathematics is challenging. While this teacher doesn't provide specific details, it is possible that they have encountered difficulties in motivating students or fostering a positive attitude towards the subject. Various factors could contribute to this challenge, including the students' prior experiences with mathematics, their perceived relevance of the subject, or the teaching methods employed. It is important to consider that individual student differences, such as learning preferences and background, can also impact their attitudes towards mathematics.

To reconcile these differing viewpoints, it is crucial to recognize that student attitudes towards any subject, including mathematics, can vary widely. causes such as teaching methods, classroom environment, student-teacher

relationships, and prior experiences can significantly influence students' attitudes. A positive learning environment, engaging instructional strategies, and relevant real-life applications can contribute to fostering a positive attitude towards mathematics. However, it is also important to acknowledge that not all students may develop the same level of enthusiasm or passion for a particular subject.

To address the challenges expressed by Teacher participant (Tr. 1), it may be beneficial to explore innovative teaching approaches, such as incorporating hands-on activities, real-world examples, and technology-based resources. Moreover, providing opportunities for students to see the practical applications and relevance of mathematics in their daily lives can enhance their motivation and attitude towards the subject. Collaboration among teachers, sharing best practices, and professional development opportunities can also contribute to improving instructional strategies and student engagement.

According to Tshering and Dukpa (2015), mathematics education in Bhutan faces challenges related to student attitudes towards the subject. The study emphasizes that negative attitudes towards mathematics are influenced by perception of mathematics as difficult, the lack of relevance of mathematics in everyday life, and the fear of making mistakes in problem-solving. These contribute to the varying perspectives among teachers regarding their students' attitudes towards learning mathematics.

Rinchen and Garg (2018) discuss the influence of teachers on students' attitudes towards mathematics. The study emphasizes that teachers' instructional practices, enthusiasm, and personal beliefs about mathematics significantly impact students' attitudes. When teachers adopt effective strategies, such as promoting student engagement, creating a positive classroom environment, and providing real-life applications of mathematics, students are more likely to develop positive attitudes towards the subject.

The finding reveals that it is crucial for mathematics teachers to be aware of their role in shaping students' attitudes towards learning mathematics. By employing engaging teaching strategies, emphasizing the relevance of mathematics in real-life contexts, and fostering a positive learning environment, teachers can potentially cultivate positive attitudes among students.

The frequency of monitoring by school supervisors, the teacher interview data results support the fact that most teacher participants had a positive view. Teacher participants mentioned that their lessons were observed quite frequently by the head of department, vice principal, and principal. The indicators are indicated in the Bhutan Professional Standards for Teachers (BPST), as mandated by the Ministry of Education. There are eight indicators that should be observed, with the first four indicators observed before the midterm and the remaining four indicators observed after the midterm of the academic year. These indicators provide a framework for evaluating teaching practices and ensuring quality education (Royal Education Council, 2018). However, the teacher participant (Tr. 4) expressed a different opinion on the matter. The need for timely and regular supervision and inspection of teaching and learning practices. Inadequate supervision and inspection can negatively impact the quality of education and contribute to poor performance in mathematics. When supervision and inspection are solely conducted to comply with BPST regulations without addressing the specific needs and challenges of teaching mathematics, it can limit the effectiveness of the process (Tshering & Dukpa, 2015).

This finding reveals that it is crucial to go beyond mere compliance with BPST regulations and prioritize timely supervision and inspection of teaching and learning practices. Supervisors should provide constructive feedback and support to teachers, focusing on areas that require improvement and addressing the specific challenges related to teaching mathematics. This proactive approach can help enhance teaching quality, address the needs of students, and ultimately contribute to improve performance in mathematics.

The teacher interview data result indicates that they had enough qualified mathematics teachers in their school who were well-trained and had strong mathematics content knowledge. However, the teacher participant (Tr. 4) mentioned being a science teacher but teaching mathematics due to a shortage of mathematics teachers in their school.

The importance of qualified and trained mathematics teachers in improving students' performance in mathematics. Studies have shown that teacher quality, including subject matter knowledge and pedagogical skills, significantly influences students' achievement in mathematics

(Darling-Hammond, 2017; National Mathematics Advisory Panel, 2008). When teachers have strong content knowledge in mathematics and are trained in effective teaching practices specific to the subject, they are better equipped to deliver instruction that promotes understanding and conceptual development among students. On the other hand, untrained teachers who lack expertise in mathematics may struggle to effectively teach the subject, resulting in students facing difficulties grasping mathematical concepts (Ingersoll & May, 2011).

The presence of untrained or inadequately qualified teachers in mathematics classrooms can contribute to poor performance in the subject. Students may not receive the necessary guidance, support, and effective instruction required to develop mathematical proficiency. Strategies such as recruiting and retaining qualified mathematics teachers, providing professional development opportunities to enhance their content knowledge and pedagogical skills, and offering incentives to attract individuals with strong mathematics backgrounds can help improve the teaching and learning of mathematics (National Mathematics Advisory Panel, 2008). This finding reveals that the need to ensure a sufficient number of qualified mathematics teachers in schools to promote successful learning experiences for students.

The participants in the interviews expressed contradictory views regarding the availability of teaching materials. Teacher participant (Tr. 4) mentioned that their school has adequate teaching and learning materials, and teacher participant (Tr. 5) commented on the difficulty in obtaining readily available materials due to limited stock. Teacher participant (Tr. 3) acknowledged the need for teachers to improvise materials for various topics.

The significance of ready-made teaching and learning materials (TLM) in mathematics education such as manipulatives, worksheets, and visual aids, support students' conceptual understanding and problem-solving skills (Leinwand, 2000; Van de Walle et al., 2013). Manipulatives, like counters, linking cubes, and base ten blocks, provide students with concrete representations to explore mathematical concepts, facilitating their comprehension and ability to make connections (Clements & Sarama, 2009). When teachers have to improvise materials or work with limited resources, it can create challenges in delivering effective instruction and

impede students' learning experiences. The availability of appropriate teaching materials positively influences students' mathematical achievement and attitudes towards the subject (Ross et al., 2018; White, 1995). Having access to a variety of resources and facilities, including the internet, can further enhance instruction and make learning more interactive for students (Meagher & Siry, 2015).

However, the results of the interviews indicate that despite having some teaching materials and internet facilities, there are still topics in mathematics that require TLM that are not readily available in the school stores. As a result, teachers are forced to improvise, consuming extra time in lesson preparation. This shortage of teaching materials, resources, and facilities in schools can be associated with poor performance in mathematics. Insufficient materials and resources may hinder students' full comprehension of the subject matter, negatively impacting their performance (Hiebert et al., 1996; Sarama & Clements, 2009).

The finding reveals that, it is crucial for schools to ensure the provision of sufficient teaching materials and resources to mathematics teachers. This will support effective instruction, promote student engagement, and enhance their understanding and performance in mathematics.

The teacher participants in the interviews expressed that parental involvement is lacking. Teacher participant (Tr. 3) mentioned that most parents do not get involved in their children's learning, while teacher participant (Tr. 6) suggested the importance of parents allowing their children to practice math at home consistently. The literature suggest that parental involvement has a positive impact on students' achievement in mathematics. When parents show interest in their children's education and participate in their learning process, students are more motivated, engaged, and likely to perform better in mathematics (Desimone, 1999; Sui-Chu & Willms, 1996).

One aspect of parental involvement mentioned in the interviews is parents' role in supporting their children's practice of math skills outside the classroom. Teacher participant (Tr. 3) mentioned that if parents can spare at least an hour for their children to practice math and attempt a few questions, it can lead to significant improvements in their math skills. Similarly, teacher participant (Tr. 6) emphasized the importance of parents allowing their children to do homework and

assignments at home consistently. The literature supports the idea that parental support and involvement in homework and practice activities positively influence students' mathematical achievement (Balli, 1998; Fan & Chen, 2001). When parents provide a supportive environment and allocate time for their children to engage in math-related activities, it helps reinforce concepts learned in the classroom and builds fluency and understanding (Hoover-Dempsey & Sandler, 2005; Jeynes, 2005).

On the other hand, when parents are less involved or do not participate in their children's education, students may lack the necessary support and motivation to excel in mathematics. Research has shown that parental involvement, including monitoring and discussing homework, has a positive impact on students' attitudes, effort, and achievement in mathematics (Epstein, 1995; Hill & Tyson, 2009).

The finding revealed that it is crucial for parental involvement in promoting students' success in mathematics. When parents are engaged, supportive, and provide opportunities for practice and reinforcement at home, students are more likely to excel in the subject. Conversely, when parental involvement is lacking, students may face challenges in their learning and performance in mathematics.

By considering the findings from the students' survey and teacher interviews, along with the literature supporting each causes, it becomes evident that improper teachers' approaches, inadequate supervision, inadequately qualified teachers, inadequate teaching materials and facilities, and a lack of parental involvement contribute to poor performance in mathematics among class VI students in Samtse Dzongkhag.

8.2 The ways of improving of students' performance in mathematics

The mean values obtained from the student survey data result indicate the importance of various ways in improving students' academic performance in mathematics. Constant constructive assessment by mathematics teachers showed the highest mean value (mean = 4.43), followed by developing a positive attitude towards mathematics (mean = 4.26) and utilizing suitable teaching methods for mathematics (mean = 4.21). These findings align with the literature and research on effective mathematics instruction and student achievement.

A study by Crooks (1988) examined the impact of assessment practices on student learning. The

findings indicated that constructive assessment, which involves providing feedback and guidance for improvement, can significantly enhance student performance and learning outcomes. This supports the notion that constant constructive assessment by mathematics teachers is an important contributor to students' academic performance in mathematics.

Regarding the development of a positive attitude towards mathematics, research by Leung and Siu, (2009) emphasized the significance of attitude in mathematics education. They found that students' attitudes towards mathematics were positively associated with their performance in the subject. Cultivating a positive attitude towards mathematics can enhance students' motivation, engagement, and persistence, leading to improved academic outcomes.

In terms of teaching methods for mathematics, a study by Hiebert et al. (2003) examined the effects of instructional approaches on students' mathematical understanding. They found that the use of effective teaching methods, such as problem-solving activities, hands-on manipulatives, and real-world connections positively influenced students' conceptual understanding and problem-solving skills. Utilizing suitable teaching methods aligns with the result ($M=4.21$) from the student survey data, indicating their importance in enhancing students' academic performance in mathematics.

On the other hand, the provision of appropriate classroom facilities received a relatively lower mean value (mean = 3.57) in the student survey data. Although this aspect was ranked lower by the students, it is important to consider the variation in responses indicated by the standard deviation values. The standard deviation values ranging from 0.85 to 1.23 indicates that there is considerable variability in how students perceive the impact of classroom facilities on their mathematics performance. This highlights the need for further investigation and a combination of improvements to achieve optimal results.

The teacher interview data result indicates the presence of a strong teacher-student relationship in the classrooms, where students felt comfortable approaching their teachers and sharing their doubts and problems. This aligns with the importance of developing a positive attitude towards mathematics, as a positive teacher-student relationship can contribute to students'

motivation, engagement, and overall academic performance.

Research by Pianta et al. (2007) emphasizes the significance of positive teacher-student relationships in promoting students' academic and social-emotional development. The study found that when students have positive relationships with their teachers, they are more likely to be engaged in their learning, exhibit better self-regulation skills, and demonstrate higher levels of academic achievement. This supports the notion that the strong teacher-student relationships reported in the teacher interview data can contribute to improving students' performance in mathematics.

Additionally, Hughes et al. (2018) conducted a meta-analysis of studies examining the effects of teacher-student relationships on academic outcomes. The findings revealed that positive teacher-student relationships were associated with improved academic achievement across different grade levels and subject areas. This further supports the notion that a positive teacher-student relationship, as observed in the teacher interview data, can have a positive impact on students' mathematics performance.

The finding reveals that the presence of a strong teacher-student relationship are essential for promoting students' positive attitudes towards mathematics and enhancing their overall mathematics performance.

The teacher interview data indicates that the teacher participants are actively involved in motivating their students and creating a positive classroom environment. This aligns with the importance of teacher motivation in promoting students' engagement and performance in mathematics.

Research by Turner et al. (2019) emphasizes the role of teacher motivation in fostering student motivation and achievement. The study found that teachers' enthusiasm and passion for the subject matter positively influenced students' motivation, engagement, and academic performance.

Furthermore, a study by Kunter et al. (2011) examined the relationship between teachers' motivation and students' mathematics achievement. The findings revealed that teachers' enthusiasm and intrinsic motivation significantly predicted students' mathematics achievement. Teachers who were motivated and passionate about mathematics were more likely to create a stimulating learning environment and effectively

support their students' learning process, leading to improved mathematics performance.

The finding reveals that teacher motivation, enthusiasm, and the establishment of a supportive classroom atmosphere are important ways in promoting students' motivation and engagement in mathematics. These ways can contribute to a conducive learning environment, where students feel motivated, confident, and supported, ultimately leading to improved performance in mathematics.

The teacher interview data indicate several ways that can contribute to improving students' performance in mathematics, including cooperative learning, the use of teaching and learning materials (TLM), effective teaching techniques, and a comprehensive assessment process.

According to Slavin (2014) emphasizes the effectiveness of cooperative learning in improving students' academic performance. Cooperative learning involves students working together in groups to achieve shared learning goals. This approach promotes active engagement, peer support, and collaborative problem-solving, which can enhance students' understanding of mathematical concepts and improve their performance.

Regarding the importance of teaching and learning materials, a study by Romadan (2014) suggest that the use of manipulatives, such as models and objects, can enhance students' conceptual understanding and improve their performance in mathematics. Having access to a variety of teaching materials can provide students with multiple representations of mathematical concepts, facilitating deeper comprehension.

Furthermore, effective teaching techniques play a vital role in improving student performance. In a study by Hiebert and Grouws (2007), it was found that using real-life examples, visuals, and hands-on activities can enhance students' learning experiences and promote a deeper understanding of mathematical concepts. These techniques make the subject more meaningful and engaging for students, leading to improved performance.

Additionally, a comprehensive assessment process that includes both formative and summative assessments is crucial for monitoring students' progress and providing feedback. According to Black and Wiliam (2009), formative assessments, such as classroom quizzes and discussions, allow teachers to identify students'

strengths and areas for improvement in real-time, enabling timely interventions. Summative assessments, such as tests and exams, provide an overall measure of students' learning and help evaluate their performance.

The finding reveals that the importance of cooperative learning, the use of teaching and learning materials, effective teaching techniques, and a comprehensive assessment process in improving students' performance in mathematics. Implementing these strategies and ensuring access to adequate resources can create a conducive learning environment and enhance students' engagement, understanding, and achievement in mathematics.

In conclusion, the literature supports the findings from the student survey data result and teacher interview results, highlighting the various ways of improving students' performance in mathematics. Developing students' attitudes, trained mathematics teachers, effective teaching methodologies, available TLM, classroom and library facilities, administration supervision, parental involvement, technology integration, and constant constructive assessments are crucial ways that contribute to enhancing students' performance in mathematics.

9. Recommendation

Based on the findings, the researcher made the following recommendations to address the causes of poor performance in mathematics among Class VI students in Samtse Dzongkhag:

1. Teachers should focus on adopting constructive assessment practices. Regular assessment and timely feedback will help identify areas of improvement and guide students towards better performance.
2. Efforts should be made to develop a positive attitude towards mathematics among students. Encouraging students to develop a positive mindset, promoting the relevance of mathematics in everyday life, and addressing the fear of making mistakes in problem-solving can contribute to improved performance.
3. Teachers should utilize suitable teaching methods for mathematics instruction. Teachers should incorporate these methods into their instructional practices to enhance students' learning experiences.
4. Adequate supervision and inspection of teaching and learning practices should be ensured. Supervisors should provide constructive feedback and support to teachers, focusing on areas that require improvement

and addressing the specific challenges related to teaching mathematics.

5. Efforts should be made to address the shortage of qualified mathematics teachers. Recruiting and retaining qualified mathematics teachers, providing professional development opportunities to enhance their content knowledge and pedagogical skills, and offering incentives to attract individuals with strong mathematics backgrounds can help improve the teaching and learning of mathematics.
6. Schools should ensure the provision of sufficient teaching materials and resources to mathematics teachers. Schools should prioritize the availability of appropriate teaching materials to support effective instruction and enhance students' understanding and performance in mathematics.
7. Parents should be encouraged to get involved in their children's learning, particularly in mathematics. Parents should be educated about the importance of supporting their children's practice of math skills at home and providing a supportive environment for learning. Allocating time for math-related activities, encouraging homework completion, and engaging in discussions about mathematics can reinforce concepts learned in the classroom and enhance students' mathematical proficiency.

By employing these recommendations, teachers, students, parents, and education stakeholders in Samtse Dzongkhag can work together to explore the causes of poor performance in mathematics and implement strategies to improve students' mathematics performance. These recommendations are supported by the discussions, findings, and relevant literature of the study.

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