

Research Paper



Issue and challenges of mathematics education in Vyas Municipality Ward No-1, Nepal

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ABSTRACT

Mathematics is not a subject that can be enjoyed easily like other subjects because other subjects contain different stories, poems and themes that touch different emotions. Although it is found that the beginning of mathematics education started from ancient times, it is found that it was tried to be organized from the year 1537. In this study, an attempt has been made to investigate the real challenges and issues in mathematics education. Although many problems were seen in mathematics teaching, I was forced to think about various questions. Is it because of incompetent teachers that the students' academic loss is happening in mathematics? Is there a decrease in achievement due to the lack of interest of students in mathematics? Various research questions were prepared and objectives were prepared and the research work was carried forward. This study proceeded to explore the reality of teachers' real issues and challenges in mathematics education. It was possible to identify many issues and challenges through the tests conducted on certain schools and certain students and teachers. Studying based on the 3-year academic achievement of the students selected in the sample from the research, although only 3 students have improved, the scores have been declining year after year. It seems that only 7 percent of the students like mathematics. A total of 40 students and 2 schools in rural areas and 2 schools in urban areas have been selected in the sample selection. Although every educational aspect of the teachers is good, the failure of mathematics subject to become a subject of interest and the annual educational loss in mathematics is a challenge and issue of mathematics teachers. It is expected that the mathematics education can be improved if the stakeholders make strategies and plans based on the results obtained from this research.

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1. INTRODUCTION

People are afraid of mathematics. Even before children go to school, they already know that mathematics is very difficult. It was not necessary to do such unnecessary things in front of small children. From the school level, students seem to be less interested in mathematics. Since I am a mathematics teacher, my long-term experience in mathematics education will be the main basis of this research. In this study, the issues, challenges and problems encountered in mathematics education have been identified and necessary management measures have also been included.

The history of mathematics can be integrated into classroom teaching in both implicit and explicit ways. Exploring the historical aspects of mathematics has the potential to enhance the comprehensive education and training of students. This paper's objective is to examine a suggested historical activity centered around Tartaglia's work "Nova Scientia" (1537) that can be implemented in mathematics classrooms. This examination will illustrate the utilization of a Renaissance-era mathematical tool for measuring the height of a mountain, serving as a means to inspire the study of trigonometry in mathematics classes. Additionally, it will demonstrate to students the explanatory role of mathematics in understanding the natural world [1].

The abacus tradition, algebra, arithmetic, ethno mathematics, geometry, the International Commission on Mathematics Instruction, mathematical competency, mathematics, mathematics curriculum, mathematics education, mathematics learning, mathematics students, mathematics teaching, mathematics textbook, mathematizing, psychology, research, school mathematics reform, and technology are all relevant topics. Elementary mathematics formed a fundamental component of the educational systems in numerous ancient civilizations, including ancient Egypt, China, the Vedic society in India prior to 500 BCE, ancient Greece, the Roman Empire, and more. Typically, formal education was accessible exclusively to male children who possessed a sufficiently high social status, wealth, or caste. The initial professional group in history that necessitated the application of mathematical knowledge was that of the scribes. Their work facilitated the organized administration of societies in Mesopotamia and Egypt. Many ancient texts on mathematics and its methodologies trace back to around 1800 BCE. The inception of mathematics and writing can be attributed to the same social process, as they both evolved to establish bookkeeping methods for tracking taxes based on goods contributed by the population, with records inscribed on clay tablets [2].

The history of mathematics serves as a potent tool for disseminating a profound understanding of the subject. Mathematics education in Nepal traces its origins to the ancient "Gurukula" system, while the modern education system in Nepal aligns with global standards. This paper aims to provide a concise historical overview of Nepalese mathematicians up to the nineteenth century and their significant contributions to mathematics in Nepal. In 1918 A.D., the formal and systematic teaching of mathematics at the intermediate level was introduced in a Western manner at Tri-Chandra College. However, as far back as 1853 A.D., Durbar School initiated the teaching of mathematics in English medium, albeit limited to higher-level students. During the era of Prime Minister Dev Samser in the Rana regime, several schools were established throughout the country, integrating the teaching of mathematics alongside astrology. Durbar School was affiliated with Calcutta University, requiring students to travel to Calcutta for matriculation examinations. In 1890 A.D., Prime Minister Chandra Samser became the first Nepali to pass the Calcutta University matriculation examination with a specialization in mathematics at the age of 20. The primary subjects in the mathematics curriculum during this period included Algebra, Arithmetic, and Geometry, with textbooks sourced from renowned British mathematicians of the time. Algebra from Knight and Hall (1887 A.D.) had not yet been introduced. In 1877 A.D., the first Sanskrit school was established, teaching basic mathematics within the context of jyotish shastra. These schools had dedicated

instructors for mathematics and astrology, teaching popular mathematics books in Sanskrit. Approximately 125 years ago, there were no locally-authored mathematics textbooks in Nepal. Students would travel to Kashi (Banaras) to study Sanskrit, where they were educated in famous mathematical works such as Bhaskaracharya II's "Siddhanta Siromani." Among its four units, "Lilavati" and "Bijganita" (Algebra) were particularly renowned [3].

Classroom teachers also encounter challenges in the assessment domain, with an average score of 3.47 in this area. The most significant difficulties faced by class teachers regarding assessment include the following: analyzing exam results in a statistical manner, crafting questions that promote mathematical thinking, and creating achievement tests. The findings from this study highlight the need for teacher preparation programs, whether they are pre-service or in-service, to place greater emphasis on enhancing the mathematics teaching skills of educators. This should particularly focus on skills such as setting clear lesson objectives, analyzing the mathematical content within lessons, the ability to ask questions that stimulate mathematical thinking, utilizing technology for teaching and learning mathematics, addressing the diverse needs of students, designing achievement tests, and conducting statistical analysis and interpretation of exam results [4].

The concern at hand pertains to the performance outcomes of the students under the instruction of these educators. It is within this context that the present research was undertaken to investigate the obstacles experienced by students pursuing a mathematics education program during their macro-teaching sessions. In pursuit of the study's goal, a descriptive survey approach was utilized. A sample of 35 final-year students enrolled in the Bachelor of Education (Mathematics) program was chosen through a random sampling method. Questionnaires were employed as the primary tools for data collection throughout the research process. Findings from the investigation revealed that student-teachers grapple with challenges falling into the categories of environmental, instructional, and supervisory issues. Environmental challenges encompassed issues like insufficient resources for teaching and learning mathematics, as well as transportation difficulties to reach the schools. The study further addresses additional challenges encountered, draws conclusions, provides recommendations, and explores the implications of the findings [5].

Conventional approaches to professional development for mathematics teachers, such as traditional show-and-tell methods, often lead to a culture of dependency. In this culture, teachers come to expect that new teaching ideas or strategies, following initial training, will be handed to them in a ready-made format for direct implementation in their classrooms. In contrast, recent programs emphasize practice-based professional learning communities in which teachers actively participate in their own educational growth. This approach seems more promising for achieving sustainability and continuous learning. These programs should acknowledge and arise from teachers' own thoughts and experiences, granting them extended opportunities to construct valuable knowledge and methods for transforming their teaching independently. Once teachers are on their own, they face challenging circumstances that can hinder the sustainability of ongoing change and learning, especially when such change and learning involve unfamiliar ways of teaching and knowing compared to their past experiences. These challenges can stem from external and internal factors. For example, if not all math teachers in a school are aligned with the same change, it can hinder individual efforts. Moreover, if the change isn't consistent across all grade levels in a school, teachers trying to transition to reform-oriented teaching strategies may face resistance from students who are more accustomed to traditional teacher-directed classrooms [6].

Is it because the math teachers are incompetent in teaching that the students get less marks? Are students not motivated towards mathematics due to the difference in the government's view on mathematics education? Because mathematics is not a fun subject like other language subjects, don't students think it is boring? Because the future of mathematics is not clear, students do not give importance to mathematics education, isn't it? Isn't the morale of the students falling because they have to work hard on mathematics? Do they not want to work hard because of the government's policy that they can get higher education even if they get less than the minimum grade in mathematics? Such research questions arose in my mind and this research has been prepared in search of answers to the above questions.

The primary objective of this study is to investigate the actual factors behind the diminishing

interest of secondary-level students in mathematics, their declining enthusiasm for the subject, and their inability to achieve even the minimum passing grades in exams. To delve deeper into this research, we aim to assess students' levels of interest, identify disparities in their academic performance to pinpoint the root causes, gather their insights, and analyze both student and mathematics teacher perspectives, including their challenges and recommendations. In this study, a total of 40 students from 4 schools have been taken as the basis of the average availability score. Teachers have selected 4 schools in each sample selection and studied their ideas. The results obtained in this way will be presented. Only problems, challenges and management measures will be explored.

2. RELATED WORK

To give more credibility to the research work and for experience, article papers with suitable titles have been downloaded and studied from various journals. For this study it has been downloaded from Google Scholar, IEEE, Research Gate etc. The main themes of the studied paper are presented as follows.

Challenges-stemming from theories like social and radical constructivism indicate that teachers lack training in implementing such approaches for mathematics instruction, and there is a shortage of educational resources, teaching materials, and technological tools. Concerns related to social dimensions encompass gender-related issues, language barriers, matters of social justice, and the achievement gap. Cultural concerns revolve around linguistic and ethnic diversity. Political factors introduce issues of fairness and accessibility, economic disparities, pedagogical choices, and the roles of professional organizations and unions. Technological issues encompass skills, technology utilization, and available resources. In conclusion, we recommend that all stakeholders address these concerns by enhancing the curriculum, providing teacher training, and furnishing classrooms with locally sourced and modern technological resources [7].

In a multicultural classroom, students hail from diverse backgrounds, experiences, and ethnicities. Often, due to underperformance in conventional math assessments, English language learners are erroneously perceived as weak students by teachers. Employing a qualitative research design, specifically a phenomenological approach, I conducted in-depth interviews with six primary-level mathematics teachers in Kirtipur Municipality. Thematic analysis was employed for data management. The key finding of this study is that teachers employed diverse strategies that encouraged students to engage in mathematical reasoning, communication, and problem-solving. They assumed the role of facilitators to fulfill their professional responsibilities. Additionally, the study revealed that students, teachers, parents, the learning environment, and national policies collectively influence students' learning experiences. Furthermore, the experiences of teachers play a pivotal role in motivating learners and enhancing teaching and learning activities within the multicultural classroom [8]. Various psychologists and educators have identified multiple motivational techniques that can assist teachers in inspiring their students during mathematics instruction. This study aimed to explore teachers' perspectives and current application of motivational techniques in secondary-level mathematics classrooms. Qualitative data underwent general inductive analysis and descriptive assessment, while quantitative data was analyzed through frequency, percentage, and Chi-square tests. The study encompassed all mathematics teachers and students at the secondary level in Devchuli municipality, Nawalpur district, across five schools. A purposive sampling method selected three mathematics teachers from each school, and ten students were randomly sampled from each school. All the mathematics teachers exhibited a positive perception of motivational techniques and incorporated them into their teaching strategies. These techniques included warm-up activities, fostering positive relationships with students, creating a supportive and competitive learning environment through relevant examples, encouraging active student participation, offering constructive feedback, summarizing sessions, addressing student concerns, achieving intended objectives, and expressing gratitude to students for their cooperation [9].

The teachers involved in our experimental project demonstrated a clear willingness to explore novel approaches, with some showing genuine enthusiasm for the potential of open problem solving. Several teachers even made substantial progress in this area, indicating their readiness to incorporate this

method in future teaching. The emergence of constructivism has accentuated the significance of teachers' beliefs related to mathematics. In this context, "belief" is defined as knowledge and emotions shaped by prior experiences. Beliefs govern and organize all aspects of the teaching and learning processes. To facilitate changes in teaching and learning approaches, it becomes essential to evolve and transform teachers' beliefs concerning effective and successful instruction. The literature contains numerous research accounts detailing the prerequisites for changing and enhancing teacher practices. Nevertheless, it appears that none of the intervention methods described are entirely devoid of challenges [10]. In recent times, there has been a significant focus on the kind of knowledge that teachers should possess for effective mathematics instruction. Teachers are required not only to have their own problem-solving skills but also to be capable of guiding students to become proficient problem solvers. Consequently, a teacher's knowledge of how to teach problem solving must extend beyond their general problem-solving ability. This article adopts a category-based perspective to explore the various forms of knowledge that should be encompassed within mathematical problem-solving knowledge for teaching. Specifically, it delves into what teachers need to understand to foster problem-solving proficiency in their students. The perspective on mathematical problem-solving knowledge for teaching, as delineated in this article, offers a framework for identifying the key knowledge that mathematics teachers need. This framework can be further developed to facilitate practice-based exploration and the design of learning experiences, which will help teachers acquire and enhance the necessary mathematics knowledge for teaching problem-solving proficiency [10].

Although the articles presented above are compatible with my subject matter, it does not seem that many subjects could be covered in it. Research conducted in developed countries cannot cover all areas of education in Nepal. Even the research conducted in urban areas in Nepal did not represent all areas. None of the above research papers were able to cover the size of Vyas Municipality of Tanahun district. This research has been done to broaden the scope of the research paper presented above. Quantitative research was not done in any of the above papers but in my research paper qualitative and quantitative or mixed methods have been studied.

2.1. The Conceptual Framework

Various elements have been recognized to enhance the condition of mathematics education in secondary level.

Table 1. Research Factors and Evaluation Scales

Factors	Scale
Evaluate instructional Method	Investigate the instructional methods and strategies used by mathematics teachers in the specified ward, focusing on their impact on students' engagement, motivation, and comprehension of mathematical concepts.
Analyze student performance	Access the academic performance of secondary- level students in mathematics through a thorough analysis of their test scores, assignments, and assessments. Identify trends and patterns in student achievement.
Examine socio-economic	Investigate how socio-economic factors specific to Vyas Municipality Ward No-1 influence the quality of mathematics education, including disparities in access to educational resources and learning opportunities.
Explore Teacher Training	Evaluate the extent to which teachers receive adequate training and professional development opportunities to enhance their pedagogical skills and improve mathematics instruction.
Students' and Teacher perspectives	Obtain insights from students in Vyas Municipality Ward No-1 about their perceptions of mathematics education. Understand

	their attitudes, preference, and suggestions for improvement.
Assess Technology integration	Examine the integration of technology, such as digital tools and educational software, in mathematics instruction and its impact on students' learning experiences and outcomes.
Improvement strategies	Based the findings, formulate actionable recommendations for enhancing the quality of mathematics education in Vyas Municipality ward No-1. Provide suggestions for curriculum enhancement, teacher support, resource allocation, and community engagement.
Promote Equity and inclusion	Develop strategies to address potential disparities in mathematics education quality among students of different backgrounds, abilities, and demographics within the specific ward.

3. METHODOLOGY

3.1. Research Design

The necessary format has been created to give more credibility and validity to this research. Although the method of research is qualitative and quantitative, i.e. mixed method is used, the research design has been prepared for convenience. First of all, after searching for the problems, the objective has been prepared. The research has been designed to make the research objective oriented. The study area and sample collection method were prepared for data collection so that all areas are represented. Vyas Municipality and its two urban secondary schools and two rural secondary schools have been selected within my teaching area. Out of the 14 wards of the municipality, 4 wards, 2 rural and 2 urban wards have been selected through the random sampling method. A total of 40 students were included in the sample selection. Dalits, ethic, women and men have been selected from each school in proportion to the total number of students in the school. Mathematics teachers of each school have been selected at the rate of 1 person. The above sample collection method has random sampling. The mean value of the compiled statistics has been analyzed. Based on the results obtained, the problems and challenges in mathematics education have been analyzed and necessary management measures have also been presented.

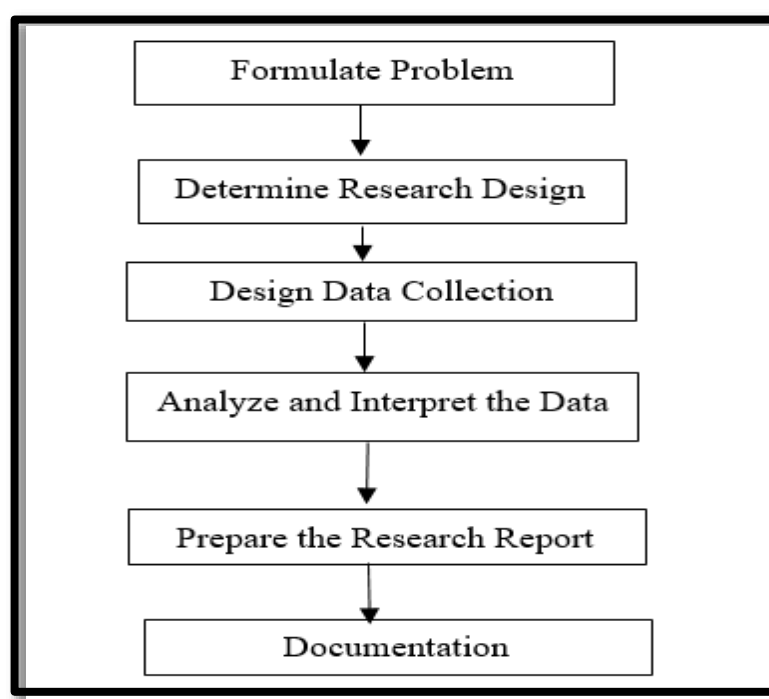


Figure 1. Research Design

3.2. Area and Population

The study area and sample collection method were prepared for data collection so that all areas are represented. Vyas Municipality ward No-1 and its one urban secondary school and one rural secondary school have been selected. A total of 40 students were included in the sample selection. Dalits, ethnic, women and men have been selected from each school in proportion to the total number of students in the school. Mathematics teachers of each school have been selected at the rate of 2 person. The above sample collection method has random sampling.

3.3. Instrument

Several tools were developed to facilitate this study. This conceptual framework considered various factors, and based on these factors, close questionnaires were designed to ensure easy observation and data collection. To enhance the research's reliability and validity, a group discussion was conducted among selected sample participants.

3.4. Data Collection Procedure

While collecting data for this research, closed-ended and open-ended questionnaires were constructed based on the research questions and objectives. This necessary data was collected by providing the questionnaire to all the stakeholders involved in the sample collection. Similarly, problems and objectives were discussed between school and related stakeholders such as parents, students representatives, teachers. The data obtained from the discussion was collected. Similarly, the physical study of the school was also done. Such as adequacy of educational materials, classroom management and other materials.

3.5. Data Analysis Process

The data obtained in this research have collected separately from schools in urban areas and schools in rural areas. The data collected in this way has been comparatively studied. The objectives and methods have been analyzed with special care. The mean value of the compiled statistics has been analyzed. Based on the results obtained, the problems and challenges in mathematics education have been analyzed and necessary management measures have also been presented.

4. RESULTS AND DISCUSSION

In line with the principal aims of this research, this section delves into the examination of the outcomes. The primary focus for investigating actual issues and obstacles in mathematics instruction hinges on the students' performance scores. The study involves the collection and analysis of student scores in mathematics for three academic levels: grade 8, grade 9, and grade 10. The collected data is then segregated for analysis, differentiating between rural and urban students, as well as calculating the overall average scores.

Among the 12 students in the sample of schools in rural areas, analyzing the 3-year scores of the same students in class eight, class nine and class ten, the score of the student who managed to get the highest score of 80 in class eight was 65 points in class nine and 48 points in class 10. received. The average score in Class VIII is only 21.8. When that number reaches class 10, a total of 13.8 points have been obtained.

3 students have scored more than 35 percent marks in the collected sample obtained in class 8. Even in class 9 of the same students, only 3 have scored more than 35 percent. Looking at the marks obtained in class 10 of the same students, it is very low but only 3 students have obtained more than 35 percent. The results obtained in this way are presented in the diagram as follows.

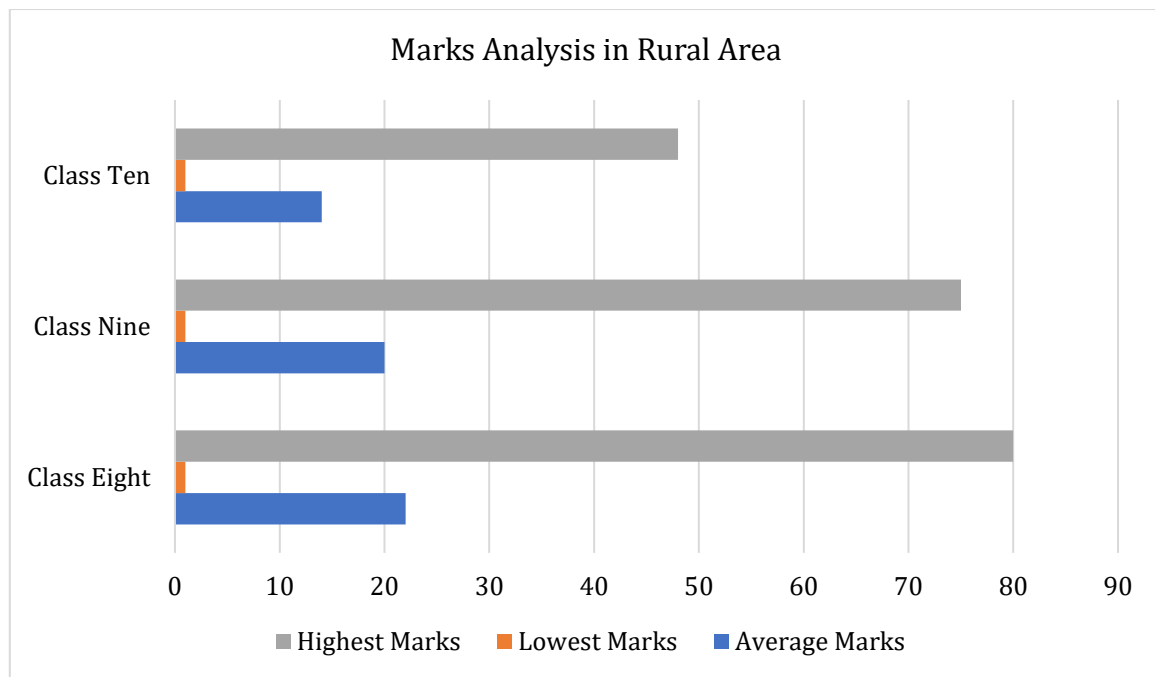


Figure 2. Marks Analysis in Rural Area

In the same way, out of 28 urban students, 6 have scored more than 35 percent while analyzing the marks of class 9 of the same students, only 5 have scored more than 35 percent. Of those students only 3 students have scored 35 marks in class 10th. Looking at the average marks, he scored 17.68 in class 8, 14.43 in class 9 and 11.25 when he reached class 10. The results obtained in this way are presented in the diagram as follows.

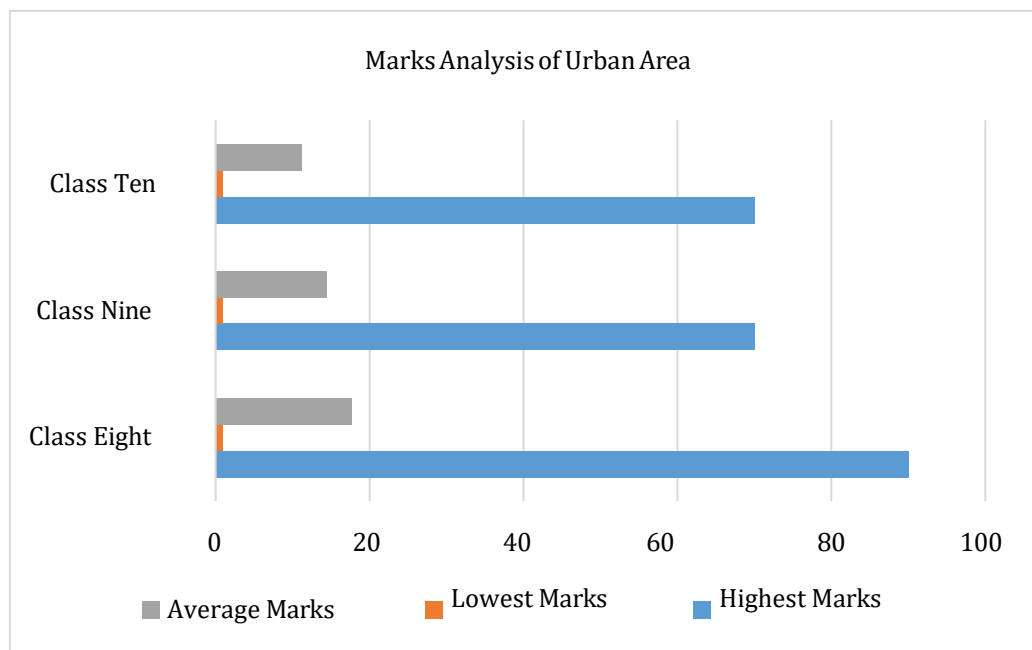


Figure 3. Marks Analysis of Urban Area

When studying the total average of schools in rural and urban areas, they have obtained 18.9 marks in class 8, 16.25 marks in class 9 and 12.025 marks in class 10. The results obtained in this way are presented in the diagram as follows.

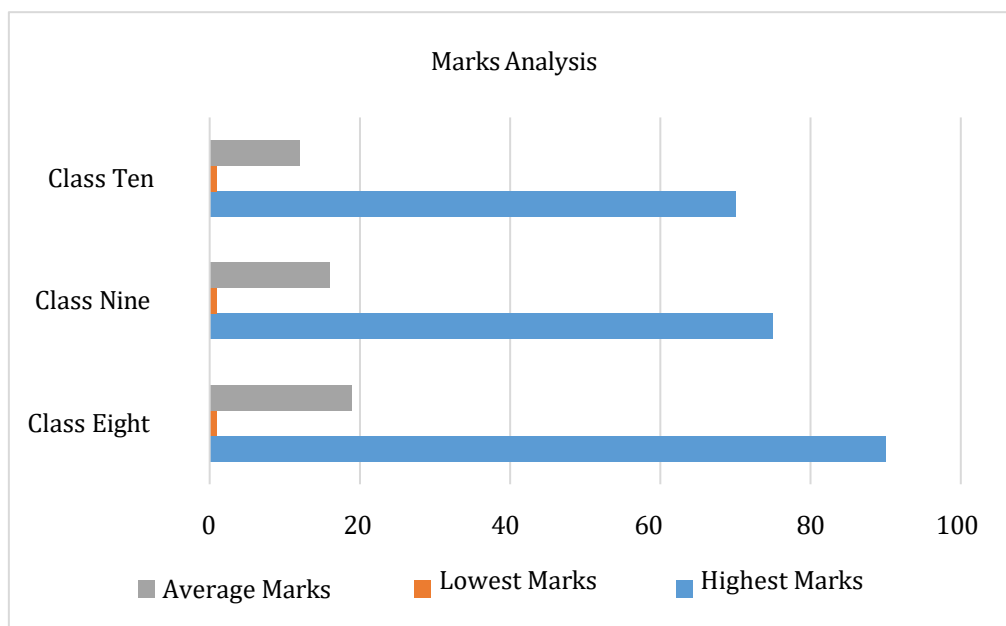


Figure 4. Average Marks Analysis

According to the opinion of the students in the sample collection, 3 students out of 40 students like mathematics very much, 20 students have to study mathematics with difficulty and compulsion, 7 students find it difficult to pass even if they work hard, and 10 students do not think that it has any meaning in the future. Even though there is no difference, there are ideas like why it adds mental burden. This detail is presented in the pie chart as follows.

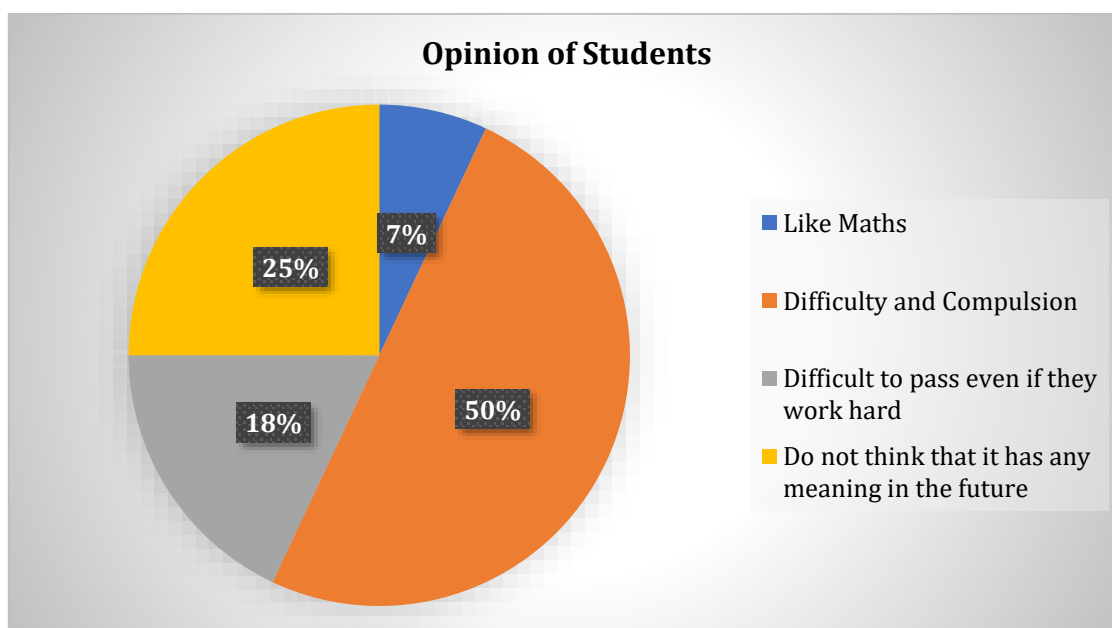


Figure 5. Opinion of Students

In this way, all the teachers in the sample collection in this research have more than 10 years of teaching experience. The educational qualifications of all the teachers were found to be Master's degree. It was found that the teachers were teaching the same subject as mathematics. All the teachers are interested in 100% results, there are also teachers who want to give training and also train mathematics teachers from other schools. Teachers who prefer to teach using ICT and have good knowledge of ICT were found.

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4.1. Issue and Challenges

The field of mathematics education at the school level faces several issues and challenges.

- **Lack of Qualified Teacher:** In some regions, there is a shortage of qualified mathematics teachers, leading to inadequate instruction and a lack of enthusiasm for the subject.
- **Outdated Curriculum:** The mathematics curriculum in some schools may be outdated and not aligned with current educational needs and technological advancements.
- **Inequity in Access:** Not all students have equal access to quality mathematics education. This disparity can result from socioeconomic factors, location, or inadequate resources.
- **Standardized Testing Pressure:** The emphasis on standardized testing can lead to a "teach to the test" mentality, neglecting deeper understanding and critical thinking.
- **Integration of Technology:** Incorporating technology into math education is essential, but many schools struggle with providing access to necessary tools and training for teachers.
- **Real-World Relevance:** Students often question the real-world relevance of the mathematics they learn in school. Connecting mathematical concepts to practical applications can be challenging.
- **Teacher Professional Development:** Continuous professional development is essential for mathematics educators to stay up-to-date with best practices and new teaching methodologies.
- **Parental Support:** Lack of parental involvement and support in math education can hinder students' progress. Engaging parents and guardians in the learning process is crucial.
- **Mathematics Anxiety:** Many students experience math anxiety, which hinders their performance and interest in the subject. Teachers must find ways to alleviate this anxiety and make math more approachable. Addressing these issues and challenges in mathematics education at the school level is essential to promote a deeper understanding and appreciation of the subject among students and to prepare them for the demands of a rapidly changing world.

4.2. Discussion

The curiosity of the research questions presented above seems to be evident from the results presented in the analysis. It is proven that the academic achievement of students in mathematics has not declined because the teachers who teach mathematics are incompetent, because the competent teachers in the sample collection seem to have educational qualifications, training, experience and are able to use ICT in educational activities. It was found that the government has developed a separate strategy for mathematics and is treating it in the same way as general subjects. It was also evident that the students considered mathematics as a difficult subject. In the future, the students understood the attitude that there is no point in studying mathematics without any scope by working hard. After the year 2072 BS, even though he got the minimum marks in mathematics and other subjects, after he got the opportunity to get higher education, he also got the idea that he had suffered academic damage in mathematics.

While studying mathematics in higher education, it is essential to study research and other special subjects. Lack of students' desire for such an important subject, taking mathematics as a hassle, developing a misconception that mathematics is very difficult if it is not taught or understood properly in the lower grades, it will be difficult to suddenly change to the upper grades, it is not as fun and enjoyable as other language subjects, special skills are needed to study mathematics, there is a lack of teachers with such skills, the government also does not bring a separate program for mathematics, etc. are the issues, challenges and problems of mathematics education. Similar to this research, stakeholders in other places should conduct more extensive research and prepare a new program.

5. CONCLUSION

It is expected that this paper prepared while researching the issues and challenges of mathematics

teaching teachers will be relevant. Although it is found that the beginning of mathematics education started from ancient times, it is found that it was tried to be organized from the year 1537. Although many problems were seen in mathematics teaching, I was forced to think about various questions. Is it because of incompetent teachers that the students' academic loss is happening in mathematics? Various research questions were prepared and objectives were prepared and the research work was carried forward. This study proceeded to explore the reality of teachers' real issues and challenges in mathematics education. It was possible to identify many issues and challenges through the tests conducted on certain schools and certain students and teachers. It is expected that the mathematics education can be improved if the stakeholders make strategies and plans based on the results obtained from this research.

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Author Contributions Statement

Name of Author	C	M	So	Va	Fo	I	R	D	O	E	Vi	Su	P	Fu
Chandra Maya Mishra (Pantha)	✓	✓	✓	✓		✓		✓	✓	✓	✓			

C : Conceptualization

M : Methodology

So : Software

Va : Validation

Fo : Formal analysis

I : Investigation

R : Resources

D : Data Curation

O : Writing - Original Draft

E : Writing - Review & Editing

Vi : Visualization

Su : Supervision

P : Project administration

Fu : Funding acquisition

Conflict of Interest Statement

The authors declare that there are no conflicts of interest regarding the publication of this paper.

Informed Consent

All participants were informed about the purpose of the study, and their voluntary consent was obtained prior to data collection.

Ethical Approval

Not Applicable.

Data Availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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