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Exploring the role of Mathematics teachers in Secondary-level education in Nepal: A case study analysis on Geometric study within Bagamati province in Nepal

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Abstract

Geometry is one of the major topics of Mathematic education requires hard work and practice to get the desired result in the Nepalese context. This study aims to find out the role of teachers in Geometry teaching at the secondary level within the Government schools of Ramechhap, Sindhupalchok and Chitwan districts respectively. A cross-sectional study was designed to find out the findings of the study. The study was conducted in March 2023 applying various research tools of Questionnaires, FGD, and KII questionnaires.

The result shows a trend of education within the Government system is following the national curriculum, and teachers are well aware of the education system trained, educated and holding positions after completing competitive ways that also prove the competent ability of teachers. The teachers are playing a vital role in rural-urban schools in the study area, paying hard times and ongoing providing efforts. However, various social and economic issues are associated with Geometry education, lack of funding and human resources and priorities to mathematics are minimal. Teachers' skills and efforts are remarkable, additional classes and time-to-time tests are ongoing. The study further concluded mathematics education is no-doubt a challenge in government schools and limited access on human resources among schools with lack of financial support and material-access found limited and insufficient in the present context. Investment on teaching practices with instrumental support and multi sectoral efforts is advised.

Keywords: Geometry education; Mathematics; Curriculum; Social; Economic situation

1. Introduction

The field of mathematics is broad. Therefore, both teaching and mathematical practices should be used for the study to be productive. The use of symbols, representations, and the justification of mathematical concepts are examples of mathematical practices (RAND Mathematics study panel, 2003) (Lavi & Shriki, 2008). The use of mathematical teaching methods is also crucial for successful outcomes. These behaviours resemble the two halves of a single coin. For pupils to have greater mathematical proficiency and understanding, each should proceed in parallel. Discussions about the teaching process have taken place all around the world (Brodie, 2008). The way that teachers teach has a big impact on the quality of education that pupils receive. The two primary categories of the teaching process are conventional and modern. This split between traditional and reform establishes a contradiction that can be utilized to support the claim that numerous. A review by Basnet et al., (2018) highlight that most students of secondary level, mathematics simply means memorizing formulas and procedures to solve the problems (Basnet et al., 2018). The review shows that really mathematic is critical to learn and teaching this subject is not easy from the one single methods, Hence a comprehensive

As part of member state of United Nations, Nepal is diverse with Urban and rural areas where the education set up and teachers are facing challenges due to social economic reasons. After being a member of UN Nepal is following all the acts

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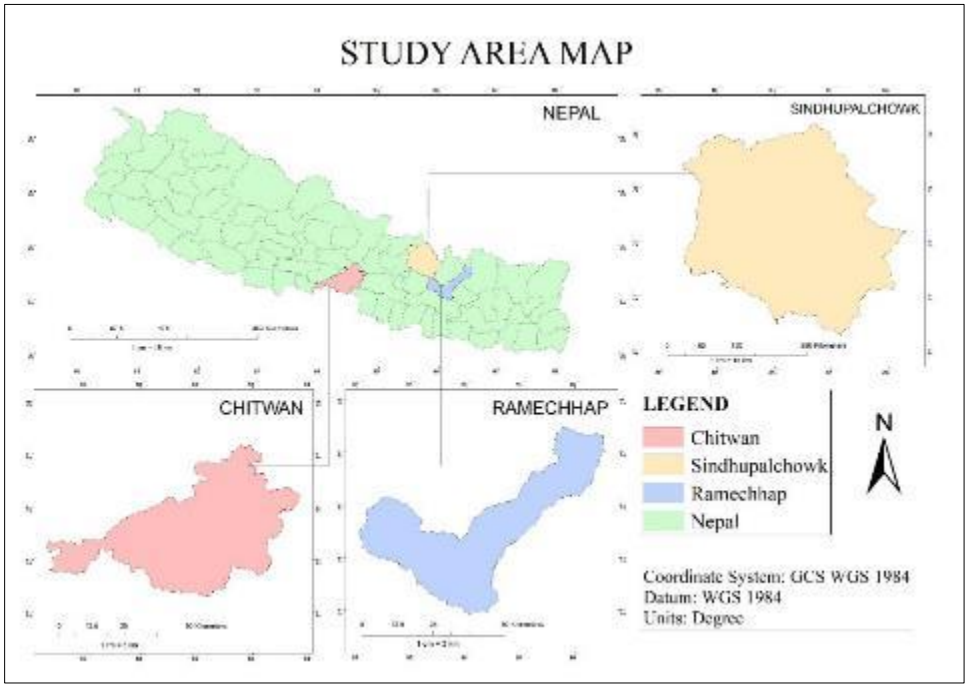
and regulation that made for the humanity purpose globally and seeking support from the international country in education, other development sectors. As a result, Nepal adopted the Education for All 2000 and Dakar Framework of Action (2000) (UNESCO, 2015). The Curriculum Development Center (CDC) of Nepal which is a part of Ministry of Education at the Federal Level also prepared and implemented a National Curriculum Framework for School Education in Nepal 2007. This framework speaks of various provisions of school education focusing "globalization, modernization, decentralization, and localization of curriculum in the Nepalese context" ((CDC, 2007, p. 1). The framework was based on the following current issues of school education in Nepal – socio-cultural, curricular, educational (norms, values, life skills, employment), technological, linguistic, instructional, assessment related, research-based, and quality and relevancy based. The basis of curriculum development has outlined many important points including diversity-language, culture, norms and so on, IT supported, and life skill oriented (CDC, 2007). Despite Nepal's commitment to providing quality education in general and mathematics education by ensuring equity and access, there are so many issues of teaching and learning mathematics in Nepalese context. Some of these issues are related to theories, and others are practical in nature. These issues are related to classroom management, ethnicity, lack of trained teachers, inequity, lack of teaching aids and materials, lack of textbooks, lack of time for students, lack of clear objectives, gender issues, and issues of mathematical contents and pedagogy.

After federal act 2015, all three-tiers of Government role were important to support in educational activities in Nepal. The Province and LG's role is vital (Chhetri & Manandhar, 2023).

In our understanding, most of the public schools in Nepal do not have proper management of the classrooms. They have an inappropriate size of classes, not inclusive seating arrangement, and there is also the lack of technology for learning and teaching mathematics. There is a misuse of technological tools even if it is available (Panthi & Belbase, 2018)

2. Methods



(Source: - GIS self-prepared map, 2024)

Figure 1 Study area

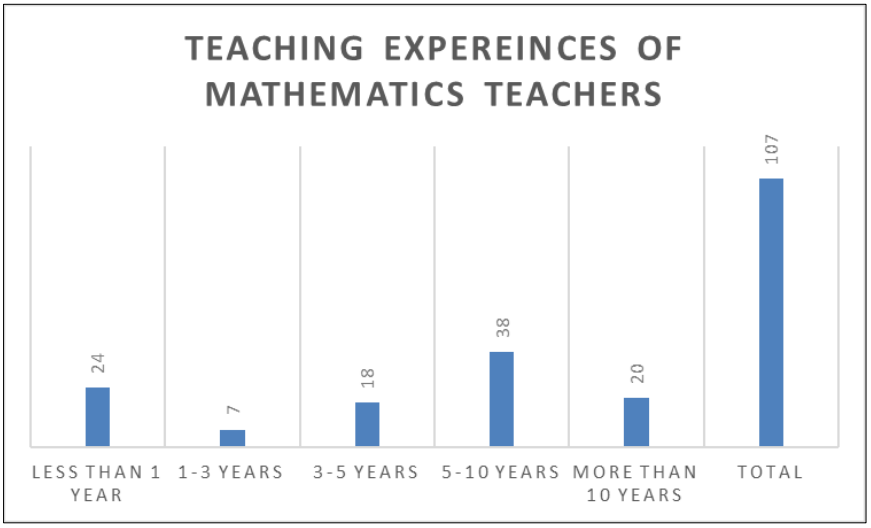
This is cross sectional study following mixed method approach-Qualitative and Quantitative both in analysis section. The study area randomly selected based on the geography of the Bagamati Province purposively selected because all three types of Climates-Hills, Mountain and Teari are existing within the Bagamati province. Sindhupalchok from the hilly district, Ramechhap from the Mountain and Chitwan representing Terai district (*figure-1*) are representatives' sample to validate this study. A total of 107 Teachers responses (Ramechhap-35, Sindhupalchok-28, Chitwan-44) drawn from the strata set from the secondary schools of surveyed area. The Primary respondents were only Mathematics teachers of the Government schools who were appointed in the school and at least teaching from the last one years and older time. A total of 6 FGD (2 from each district) was conducted participating local guardian of the schools, KII with

Head of the school, SMC body, Local representatives, Ward Chairman and Educational focal person of Local government officer further taken notes to clarify the facts of the ongoing teaching practicesThe study was conducted during March 2023, a pilot test prior to the data collection was conducted to check and validate the prepared questionnaires was tested validated.

The data was further entered into SPSS Vol 24 and tables, graphs and various statistics teste were done to show the relationship of the teacher's education that proves role of teachers in Mathematics education.

3. Results

In this section, data from the field will further be processed and converted into different maps, and table that will be illustrated and some KII and FGD notes will be drawn jointly to better understand field reality.



Source: Field visit, 2023

Figure 2 Teaching experiences of Mathematics teachers in the study area

During field visit, it was found that the majority of Mathematics teachers was assigned in the respective schools from the last 5-10 years, experienced, and very professional on the subject. Some were new who recently joining and an average of teachers have almost completed 10 years of Mathematics teaching experienced. The figure silently showing a trend that the number of teaching experiences are enough to teachers on a subject matter but the number of teachers in each school was nearly 1 to 3 in average. In Urban city of Chitwan and Ramechhap district, number of mathematics teachers recorded up to 5 and in rural section of the surveyed district found with only 1 or 2 teachers.

Table 1 Various opinions of Mathematics teachers on a study of Geometry Teaching

Legend	SA	A	N	DA	SD
The current teaching methods effectively engage students in learning Geometry	36	60	11	0	0
The students are punctual	16	46	32	13	0
I have an access on teaching materials and resources	5	64	25	13	0
Professional trainings and opportunities for Geometry teaching are available and beneficial.	0	30	49	28	0
Students actively participate and show interest in Geometry lessons	38	35	23	11	0
The classroom space and layout are conducive to effective Geometry teaching and learning	0	31	52	24	0

(Source: Field visit, 2023)

Parents of local community added through FGD mode that Mathematics teachers are average but not sufficient but the mathematics teaching is concern about practice, theory and teaching practice and carefully attentions, this is challenging for the students.

Chairman and Head of visited school argued that lack of materials for the geometry is another reason of low interest among the students but they fully supported the efforts of teachers, paying enough time in teaching, illustrating the practical classes and giving additional time.

In a question of five-Likard scale questions, various responses obtained after conducting interview with Mathematics teachers of secondary levels. The current teaching methods are following text book and using practical classes, in some school's digital screen are using to explain students, theorems, geometry and mathematical contents found teaching applying black or white board mostly.

The student punctuality found regular as the students of rural and urban areas are often attending classes.

About the teaching materials, limited materials are found in the most of the schools, books, instruments and most of the updated instruments found lacking or limited in the schools as a result the majority agreed on this. Professional trainings on Geometry are average functioning as Mathematics is vast and technical subjects. The Government teaching methods are following the quantity and quality of teaching engaged on trainings, several training institutes are established, as per Government rules, teachers have a mandatory to attend the training time to time but this trainings and relevancy is not matching the school grounds and learning of Mathematics education. Students have a weak background, looking for another approach to learn Mathematics but teachers' knowledge is vast but no resources and instruments are available.

Geometry interest by the students is usual as the students who are toppers and more then average following the mathematics as it is concern to the academic career in present and future, but for the average students, this is taught for them.

On the other hand, the classrooms and effective Geometry teaching are average as the majority of respondents agreed on Neutral to Disagree.

KII and FGD strongly agreed that Government schools have a limitation of procurement, and demands are high, Mathematics labs had some cost and local Schools and incomes are constraints, after Federalization, the activities of schools are monitored through Local Government, hence large invest is not possible.

LG added that the priorities of development are much such as road, constructions and other seen development are the topmost priorities of Politics, Mathematics is less prioritized, and this is the reason a mathematics lab is less in priority than a large statue or park in the name of national leaders.

Table 2 Various responses on the geometry teaching

Legend	**SA**	**A**	**N**	**DA**	**SD**
I have access to technology or multimedia resources that enhance Geometry instruction	0	24	18	65	0
Teaching Geometry in secondary schools is crucial for students' overall mathematical understanding	41	66	0	0	0
A strong foundation in Geometry enhances students' problem-solving skills	61	46	0	0	0
Teaching Geometry fosters critical thinking and logical reasoning in students	52	55	0	0	0
Geometry is relevant for students' future academic and career success	62	45	0	0	0
Teachers play a significant role in motivating students to excel in Geometry.	54	53	0	0	0

(Source: Field visit, 2023)

Teachers' opinion can explain (Table-2) the lack of multimedia and technology are common in most of the schools, However, some of the schools have cratered teaching Mathematics through Project display. Teachers are confident is saying that students a learning well s they are trying hard and taking time to teaching is a school.

Problem solving techniques such as extra classes, practical classes, and discussion through various mode such as inside or outside of classes are in practice. This practice is usual process but the overall learning effect grabs by such students are meritorious and sharp in Minds, but for the average students this process help to understand the Mathematics and Geometry teaching.

The teacher's skills help students to learning well and explain and solve the mathematics through logical reasoning, teacher added that test and homework checking, class test and oral tests are the best mode to analysis these skills, and they are conducting this time to time.

The teacher's motivations are high in the classes. Teachers added that they tried to counselling the future of Mathematics and sciences, and they always do positive learning among the students using various case study od education achievement so the schools and the area these techniques inspired students to learn and understand the importances of Mathematics.

Local Guardians added that Science, Social extra classes are the demands of pupils and school conducting classes on time to time.

Head of Schools added that Extra classes for Mathematics and Science subjects are in regular and out teachers are paying additional for this, the students demand are keeping in minds.

Local Government agreed that coordinating with Local Education Units and Provincial government to allocate funding for the Multimedia purchase across the Municipalities are under pipeline and in future very soon all schools will be equipped with digitalization.

During field visit, it was also observed that teachers were taking additional classes in Chitwan, Ramechhap district that indicating that for most of the schools, extra class priorities are given to the students and school management trying best to manage education and teachers are actively following the instructions.

4. Conclusion

Based on the study of some 107 teachers' responses, the following conclusions and analysis are drawn here-

The majority of teachers are experienced, competent and technical sound in a mathematics subject following Government curriculum. The availability of human resources and materials support are critique or discussion points, the teaching process under Government system well-functioning. Urban and Rural teaching following same techniques but the resources availability and students' variations are distinct. Lack of Digitalization and techniques and traditional curriculum might affect the mathematics study to learn, grabs and perform well in the study area somehow reflecting insufficiency in obtaining results as per the desire of the schools. The Diversity, culture and techniques might be a reason and social-economic reasons are other facts derived to teach students in the study area. Parents, Management and teachers all together paying hard time to manage well, despite this still many things are needed such as digital instruments and modern techniques and multi sectoral roles are prerequisite, Hence, a joint effort is advised to conduct a new approach in teaching following local diversity.

Compliance with ethical standards

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Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of ethical approval

This article is a part of a Doctoral study and this paper is one of the findings of the study, this is not published elsewhere and is purely written for Ph.D. study only.

Statement of informed consent

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