# Gender Responsive Pedagogy in Mathematics: A Practice in Nepal

Hom Kumari Adhikari

A Dissertation for the Degree of Doctor of Philosophy in Mathematics Education

Submitted to

Graduate School of Education

Office of the Dean

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Roll No 23-2073 (MPhil Leading to PhD Programme)

TU Regd. No. 9-1-9-414-97


A Dissertation for the Degree of Doctor of Philosophy in Mathematics Education

Supervisor

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Faculty of Education, Tribhuvan University, Kathmandu, Nepal

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## Abstract

An abstract of the dissertation presented by Hom Kumari Adhikari for the degree of Doctor of Philosophy in Mathematics Education on June 03, 2025, with the title 'Gender Responsive Pedagogy in Mathematics: A Practice in Nepal', approved by

Prof. Hari Prasad Upadhyay, PhD

Supervisor

This study aimed to examine gender responsive pedagogy (GRP) practices among mathematics teachers in Nepalese community secondary schools. In addition, it explored students' preferences regarding mathematical contents and their perceptions about teachers' behavior related to GRP. An explanatory sequential mixed methods approach was adopted, integrating quantitative data from surveys of 237 mathematics teachers and 471 students with qualitative insights from classroom observations and semi-structured interviews with six mathematics teachers and twelve students. Quantitative data were analyzed using descriptive statistics (percentage, mean, standard deviation) and inferential statistics (independent sample t-test, Hedge's g, ANOVA, and Post Hoc tests) via SPSS software version 23. Moreover, qualitative data were thematically analyzed using ATLAS.ti software. Both quantitative and qualitative data helped to determine the teachers' GRP practices in their respective classrooms.

The survey findings revealed that both boys and girls showed similar preferences across eight mathematical content areas, with no significant gender-based differences in overall satisfaction levels. Both groups expressed high satisfaction and preference for Set and Statistics—but reported greater difficulty and lower satisfaction

with Geometry and Trigonometry—among all mathematical content areas. They found Geometry particularly difficult and challenging due to lack of foundational understanding of geometrical concepts —especially when it came to proving theorems. Both teachers and students acknowledged the importance of all mathematical content for students' future lives; however, they expressed a strong preference for practical and daily life related areas such as Arithmetic and Mensuration.

Moreover, mathematics teachers demonstrated only partial awareness towards the true spirit of GRP, with only 35.1% teachers correctly identifying its meaning. Nevertheless, survey results yielded that mathematics teachers have good GRP practices in classroom, with no statistically significant differences between male and female teachers ($p = 0.408 < 0.05$) overall GRP practices. Among the five GRP components, the strongest GRP practices were observed in "language used", while "teacher-student interaction" was identified as the lowest, among both male and female teachers. A statistically significant difference was emerged in only one component "teachers' classroom activities" ($p = 0.014 < 0.05$). In addition, the analysis revealed statistically significant differences in teachers' GRP practices across districts ($p = 0.042 < 0.05$), with teachers from Sindhuli district demonstrating the highest level of GRP practices, and those from Kathmandu the lowest. Likewise, a statistically significant difference was observed in students' realization of teachers' behavior regarding GRP across gender ($p = 0.000 < 0.05$), with differences noted between boy and girl students.

Looking at a glance, while mathematics teachers' overall GRP practices and students' realization towards teachers' behavior in classroom were positive, but an exhibition of their GRP ingredients and learning support in actual classroom were not

perfectly utilized. In the inner aspect, deeper analysis revealed persistent issues such as gender stereotypes, gender stigma, cultural stigma, masculinity, and femininity—prevalent by both teachers, even female teachers and both boy and girl students — implicitly hinder full and effective GRP implementation. The study concludes that teacher fairness alone is insufficient for achieving gender equity; intentional, context-sensitive gender responsive strategies are essential.

To enhance GRP in mathematics classrooms, the study recommends professional training and targeted awareness programs for teachers, students, parents, and school administrators. Additionally, the development of comprehensive GRP policies, gender responsive models, and clear implementation strategies is crucial to institutionalize gender responsive practices and foster equitable learning environments in mathematics.

# गणितमा लैङ्गिक उत्तरदायी शिक्षण : नेपालमा एक अभ्यास

## शोधसार

प्रस्तुत शोधमा नेपालका सामुदायिक विद्यालयमा माध्यमिक तहमा अध्यापनरत शिक्षकहरूको लैङ्गिक उत्तरदायी शिक्षण र त्यसप्रति विद्यार्थीहरूको बोध र अनुभवको विमर्श गरिएको छ। यस अध्ययनको उद्देश्य नेपालका सामुदायिक माध्यमिक विद्यालयहरूमा अध्यापन गर्ने गणित शिक्षकहरूको लैङ्गिक उत्तरदायी शिक्षण (Gender Responsive Pedagogy) अभ्यासको परीक्षण गर्नु रहेको छ। यसका साथै गणित विषयक्षेत्रमा विद्यार्थीहरूको प्राथमिकता र सम्बन्धित शिक्षकहरूको GRP व्यवहारका बारेमा उनीहरूका दृष्टिकोणको खोजी गर्नु रहेको छ। प्रस्तुत अध्ययनमा २३७ जना गणित शिक्षक र ४७१ जना विद्यार्थीबाट सङ्ख्यात्मक तथ्याङ्क सङ्कलन गरिएको छ। यसका साथ छ जना गणित शिक्षक एवं बाह्र जना विद्यार्थीसँग अर्ध-संरचित अन्तर्वार्ता र कक्षाकोठा अवलोकनबाट गुणात्मक तथ्याङ्क सङ्कलन गरिएको छ। यी दुवै प्रकारका तथ्याङ्कलाई एकीकृत र विश्लेषण गर्न व्याख्यात्मक अनुक्रमिक मिश्रित विधि (Explanatory Sequential Mixed Methods) अँगालिएको छ। सङ्ख्यात्मक तथ्याङ्क विश्लेषणअन्तर्गत व्याख्यात्मक तथ्याङ्क (Percentage, Mean, Standard Deviation) र अनुमानित तथ्याङ्क (Independent Sample t-test, Hedge's g, ANOVA, and Post Hoc tests) गर्न SPSS सफ्टवेयरको तेइसौँ संस्करण प्रयोग गरिएको छ भने प्रस्तुत शोधका गुणात्मक तथ्याङ्कको विश्लेषण गर्न ATLAS.ti सफ्टवेयर प्रयोग गरिएको छ। उपर्युक्त विधिका आधारमा सङ्ख्यात्मक र गुणात्मक दुवै तथ्याङ्कको विश्लेषणका आधारमा कक्षाकोठामा शिक्षकहरूको GRP अभ्यासको मापन गरिएको छ।

प्रश्नावली सर्वेक्षण विश्लेषणले छात्र र छात्रा दुवैको आठओटा गणितीय विषयक्षेत्रमा समान प्राथमिकता र समग्र सन्तुष्टि स्तरमा लैङ्गिक भिन्नता नरहेको देखाएको छ। आठ

वटा गणितीय विषयक्षेत्रमध्ये केटा र केटी दुवैले समूह र तथ्याङ्कशास्त्र विषयक्षेत्रमा उच्च प्राथमिकता र उच्च सन्तुष्टि देखाएको तर ज्यामितीय र त्रिकोणमितीय विषयक्षेत्रमा बढी कठिनाइ र कम सन्तुष्टि व्यक्त गरेको देखिन्छ । प्रस्तुत अध्ययनबाट आधारभूत अवधारणा बुझाइको अभावका कारण ज्यामितीय सिद्धान्त प्रमाणित गर्न विशेष गाह्रो र चुनौतीपूर्ण भएको देखिन्छ । शिक्षक र विद्यार्थी दुवै पक्षले विद्यार्थीको भावी जीवनका लागि सबै गणितीय सामग्रीको महत्त्वलाई स्वीकार गरेको देखिन्छ। यद्यपि अङ्कगणित र मापन जस्ता व्यावहारिक र दैनिक जीवनसँग सम्बन्धित विषयक्षेत्रलाई दुवै पक्षले बढी प्राथमिकता दिएको पाइन्छ ।

सङ्ख्यात्मक अनुसन्धानको नतिजाले केवल ३५.१% गणित शिक्षकहरूले मात्र GRP को सही उत्तर छनोट गरेको पाइन्छ । यसकारण GRP का बारेमा उनीहरूको आंशिक बोध रहेको देखिन्छ। यद्यपि प्रश्नावली सर्वेक्षणको नतिजाले कक्षाकोठामा गणित शिक्षकहरूले GRP को राम्रो अभ्यास गरेको देखाएको छ । समग्र GRP अभ्यासमा पुरुष शिक्षक र महिला शिक्षकबिच तथ्याङ्कीय रूपमा कुनै विशेष भिन्नता रहेको देखिँदैन ($p = 0.408 < 0.05$) । पाँचओटा GRP घटकहरूमध्ये *भाषिक प्रयोग*मा सबैभन्दा बढी GRP अभ्यास गरिएको देखिन्छ भने *शिक्षक-विद्यार्थी अन्तरक्रियामा* सबैभन्दा कम GRP अभ्यास गरिएको देखिन्छ । केवल एउटा घटक *शिक्षकहरूको कक्षाकोठा गतिविधि*मा तथ्याङ्कीय रूपमा भिन्नता देखिन्छ ($p = 0.014 < 0.05$) । त्यसै गरी जिल्लागत रूपमा गणित शिक्षकहरूको GRP अभ्यासमा तथ्याङ्कीय भिन्नता रहेको देखिन्छ ($p = 0.042 < 0.05$) । यसअनुसार सिन्धुली जिल्लाका शिक्षकले उच्चतम स्तरमा तर काठमाडौँ जिल्लाका शिक्षकहरूले सबैभन्दा न्यून स्तरमा GRP अभ्यास गरेको देखिन्छ । त्यस्तै शिक्षकको GRP व्यवहारका सम्बन्धमा छात्र र छात्राको बुझाइमा तथ्याङ्कीय भिन्नता देखिन्छ ($p = 0.000 < 0.05$)।

गुणात्मक अध्ययनको नतिजाले समग्रमा गणित शिक्षकहरूको GRP अभ्यास र कक्षाकोठाको व्यवहार प्रभावकारी रहेको र त्यसप्रतिको विद्यार्थीहरूको बुझाइस्तर पनि सकारात्मक रहेको देखाउँछ तर शिक्षकहरूले GRP सामग्रीहरूको प्रदर्शन र विद्यार्थीको सिकाइमा GRP अभ्यास पूर्ण रूपमा प्रयोग नगरेको देखिन्छ। गहिरिएर विश्लेषण गर्दा शिक्षक विशेषतः महिला शिक्षक, छात्र र छात्राले लैङ्गिक रुढि, लैङ्गिक विभेद, सांस्कृतिक विभेद, पुरुषत्व र स्त्रीत्व जस्ता ज्वलन्त समस्याका कारण GRP अभ्यासको पूर्ण कार्यान्वयनमा बाधा पुऱ्याएको मत अभिव्यक्त गरेको पाइन्छ। निचोडमा लैङ्गिक समता प्राप्त गर्न शिक्षकको लैङ्गिक निष्पक्षता मात्र अपर्याप्त छ। यसका लागि लैङ्गिक सचेतना, संवेदनशीलता र उत्तरदायी रणनीति आवश्यक देखिन्छ।

गणित कक्षाकोठामा GRP अभ्यासको स्तरवृद्धि गर्न शिक्षक, विद्यार्थी, अभिभावक तथा विद्यालय प्रशासनलाई पेसागत तालिम र लैङ्गिक जागरुकताका कार्यक्रमहरू प्रभावकारी रूपमा सञ्चालन गर्नु आवश्यक छ। साथै, गणित कक्षाकोठामा लैङ्गिक उत्तरदायी अभ्यासलाई संस्थागत गर्न र समतामूलक सिकाइ वातावरणलाई बढावा दिन व्यापक रूपमा GRP नीति, लैङ्गिक उत्तरदायी ढाँचा र स्पष्ट कार्यान्वयन रणनीतिको विकास आवश्यक रहेको देखिन्छ।

## Declaration

I hereby declare that, to the best of my knowledge, this dissertation entitled 'Gender Responsive Pedagogy in Mathematics: A Practice in Nepal' is my original work except where otherwise stated. This work has not previously been accepted, and is not being currently submitted in candidature for any other research degree to any university.

I understand that my dissertation will be part of Tribhuvan University Library collection. My signature below gives consent for my dissertation to be available to any reader upon request for scholarly purpose.

..................

Hom Kumari Adhikari

PhD Candidate

May 25, 2025 (2082-02-11)

**Recommendation**

It is my pleasure to certify that Ms. Hom Kumari Adhikari has prepared and submitted her dissertation entitled 'Gender responsive Pedagogy in mathematics: A practice in Nepal' for the Doctor of Philosophy (PhD) degree in Mathematics Education. I have found the dissertation to be in conformity with the required standard prescribed by the Graduate School of Education, Faculty of Education, Tribhuvan University, Kathmandu, Nepal. I recommend the dissertation to the Research Committee of the Faculty of Education, Tribhuvan University for acceptance.

……………………………

Prof. Hari Prasad Upadhyay, PhD

Supervisor

Faculty of Education, Tribhuvan University, Kathmandu, Nepal

May 25, 2025 (2082-02-11)

Faculty of Education
Office of the Dean
Balkhu, Kathmandu

**Approval Letter**

This Dissertation entitled 'Gender Responsive Pedagogy in Mathematics: A Practice in Nepal' presented by Ms. Hom Kumari Adhikari to the Faculty of Education for the Degree of Doctor of Philosophy (PhD) has been approved.

………………………….

Prof. Bed Raj Acharya, PhD
Chair, Research Committee
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June 03, 2025 (2082-02-20)

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Moreover, I would like to express my sincere gratitude to Tribhuvan University for granting me study leave during my PhD journey. Furthermore, my appreciation goes to the professors, educators, and administrative personnels at the Graduate School of Education, Faculty of Education, TU, Kirtipur. I wish to convey my heartfelt gratitude to Dr. Rabindra Shiwakoti, the Acting Director of GSE, as well as former Directors Prof. Dr. Binod Prasad Dhakal and Prof. Dr. Ganesh Bahadur Singh Thakuri, and former Deputy Director prof. Dr. Eka Ratna Acharya, for their continuous academic support and valuable suggestions on my research work.

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## List of Acronyms and Abbreviations

| | |
|---|---|
| ADE | : Association for the Development of Education |
| AIR | : American Institute of Research |
| ANOVA | : Analysis of Variances |
| ATLAS.ti | : Archiv fur Technik, Lebenswelt, Alltage Sprache.text Interpretation (a Computer-Aided Qualitative Data Analysis Software) |
| CDC | : Curriculum Development Centre |
| CPD | : Continuous Professional Development |
| DOE | : Department of Education |
| EFA | : Education for All |
| FAWE | : Forum for African Women Educationalist |
| GEP | : Gender in Education Policy |
| GESI | : Gender Equality and Social Inclusion |
| GRP | : Gender Responsive Pedagogy |
| KWDI | : Korean's Women's Development Institute |
| LRCs | : Lead Resource Centres |
| MKO | : More Knowledgeable Other |
| MOE | : Ministry of Education |
| MOEST | : Ministry of Education, Science, and Technology |
| MOEYS | : Ministry of Education, Youth and Sports's |
| NAEP | : National Assessment of Educational Progress |
| NASA | : National Assessment for Student Achievements |
| NBER | : National Bureau of Economic Research |
| NCED | : National Center of Educational Development |
| NEP | : National Education Policy |

| | |
|---|---|
| NIRT | : National Institute for Research and Training |
| OECD | : Organization for Economic Cooperation and Development |
| PISA | : Programme for International Student Assessment |
| SDG | : Sustainable Development Goals |
| SDRC | : Social Development and Research Center |
| SESP | : School Education Sector Plan |
| SMT | : Science, Mathematics, and Technology |
| SSDP | : School Sector Development Plan |
| SSRP | : School Sector Reform Plan |
| STEM | : Science, Technology, Engineering, and Mathematics |
| TIGER | : Teaching for Improved Gender Equality and Responsiveness |
| TPAP | : Teacher Policy Action Plan |
| TTCs | : Teacher Training Colleges |
| UN | : United Nations |
| UNESCO | : United Nations Educational, Scientific, and Cultural Organization |
| ZPD | : Zone of Proximal Development |

# Chapter I

# Introduction

## Background of the Study

This chapter offers an introduction and necessity to conduct research on the topic Gender Responsive Pedagogy (GRP). This chapter begins with my motivation for undertaking this study. In addition, it states the problems with conducting the study and accordingly its objectives and research questions. Moreover, the delimitation of this study, the rationale and significance of the research, and operational definitions of key terms employed in this study are presented in this chapter.

### *Motivation for Undertaking This Study*

The government of Nepal has concentrated its efforts and resources to achieve the goal of gender equality and then equity in education. Due to the government's efforts, there has been significant improvement in girls' enrollment (Ministry of Education Science and Technology [MOEST], 2021b). Gender parity has been achieved in enrollment at all levels of school education (MOEST, 2021a). Both boys and girls should have equal rights to achieve quality education. The government has adopted goals to promote gender equality, equity, and women's empowerment (MOEST, 2022). Moreover, to eliminate gender disparity, the government has also developed policies, strategies, plans, and programs to support girls' education (Ministry of Education [MOE], 2016; MOEST, 2022; Social Development and Research Center [SDRC], 2007). Despite these policies, plans of action, and programs, there is still a gender disparity, mostly in access, participation, and learning outcomes in school education (MOE, 2014a). At present, the government of Nepal has taken priority continuously in students' access, participation, and learning attainment to ensure an equitable and inclusive education system (MOEST, 2021a, 2021b). Moreover, different research studies (Gr∅ ver Aukrust, 2008; Iwu & Azoro, 2017; Leder, 2019; Mandina et al., 2013) found that there is less participation of girls in technical subjects like mathematics and science.

In my school education, I felt that most of the students, especially girls, fear or perform poorly in mathematics. Compared with high achiever boys and girls, many boys were motivated to choose mathematics as the optional subject, whereas only a minimum number of girls were motivated to choose mathematics in grade IX. Most people, including teachers thought and told mathematics is very hard and is a time-consuming subject, boys only could study mathematics. They did not motivate and encourage students to study mathematics. They did not give equal value to boys and girls in teaching and learning planning, applying teaching methods, classroom arrangement, raising questions and answering. They prioritized boys over girls in various classroom activities. Such discriminatory behaviors lead to some degree of mathematical anxiety and frustration. It disproportionately disables and disempowers girls and minority students in learning mathematics rather than others. Such fear creates a mental block against mathematics, that hinders their engagement with the subject.

In my first class of bachelor's degree, my mathematics teachers told me mathematics is difficult for me and suggested me change the subject, if it was possible. I was a single female student taking mathematics as a major subject in bachelor. Though I was tense, I was confident "I can do mathematics, and I can learn mathematics". Hence, I decided not to leave and continue my study in major mathematics. Such type of teacher's insulting and discouraging behavior results in girls' low involvement, low motivation, and high anxiety towards mathematics.

Furthermore, I have four years of experience teaching Grade IX and X students in community schools in rural areas of Nepal. During this time, I observed that significantly fewer girls rather than boys chose mathematics as an optional subject during the subject selection in Grade IX, although many of the girls were performing well in the subject mathematics in their previous classes. The school administration and mathematics teachers did not understand their specific needs, did not ask them to study mathematics, and did not encourage and motivate them to pursue mathematics.

Moreover, in 2018, I conducted a research study on the participation of girls in learning mathematics, taking female students of master's degrees at Tribhuvan University. The girls as participants shared that during their school years, their mathematics teachers often taught only when boys were present in the classroom. In their absence, mathematics classes were frequently skipped. Additionally, when it came to classroom interaction, boys were consistently given priority —boys were prioritized more often in questioning and answering, and engaging them more actively. Girls were often asked questions later on only for formality, but did not give priority to girls as girls are also knowable. Teachers never motivated for the recognition of girls' capabilities or potential in mathematics. They operated with a fixed mindset, believing that only boys were naturally excellent and talented in the subject.

As a teacher, I also did not feel about the existence of gender equity in mathematics classroom. This disparity creates the need to be sensitive towards GRP in mathematics at the school level. That's why, all these events motivated me to conduct research on the topic related to GRP. Hence, I decided to undertake this study having the purpose to state the awareness and practices of teachers towards GRP and exploring students' realization towards teachers' behavior regarding GRP in mathematics at the secondary level.

***Gender Responsive Pedagogy: Concept and Understanding***

To understand GRP, it is essential to have a clear-cut understanding of gender. Likewise, understanding gender requires knowledge of understanding sex and gender. Gender is an emerging issue across the world. The roles given to sex (male, female) are socially constructed and determined by society rather than natural or biological (MOE, 2014b). Moreover, "intersex, transgender, non-binary identities defy the binary sex system, it is not natural" (Zarza, 2018, p. 7). Gender is a social, cultural and psychological body given to males and females in society rather than biological connotations. There is a clear distinction between the two terms sex and gender. Sex is a binary system that typically refers to female and male, biological differences, chromosomes, hormones, or brain chemistry. Whereas, gender pertains to the traits of femininity and masculinity, which are characteristics influenced by culture and society and attributed to individuals based on their identification as men or women (Zarza, 2018). Gender is the socially and culturally constructed roles and responsibilities, access to and controlling resources between boys and girls in a particular society (Ministry of Education and Sports, 2016). Gender encompasses the roles and responsibilities attributed to male and female within societies, families, and cultures. Based on the given roles their participation, representations, and rights to use power related to their individual and family lives are guided by the given roles in the societies (Zarza, 2018). Therefore, gender is a quite broad concept that every teacher, educationist and every human being needs to understand properly. As a result, gender roles are therefore flexible and change both across different communities and over time.

According to Mlama et al. (2005), “GRP refers to teaching and learning processes that pay attention to specific learning needs of girls and boys” (p. 7). They added that GRP encourages teachers to incorporate gender considerations into their teaching, lesson planning, classroom management approaches, and assessment practices. Gender inequalities in the classroom are initiated due to prevailing pedagogical practices like unawareness about the inclusion issue and unable to enable both boys and girls actively in the teaching and learning process. Hence, GRP addresses such issues by persuading gender into the fabric of teaching learning by including the “processes of curriculum design, the management and facilitation of learners in the classroom, and approaches to assessment” (Chapin & Warne, 2020, p. 1) .

The goal of GRP is to challenge and remove gender stereotypes by encouraging both teachers and students to replace negative gender attitudes and stereotypes with positive attitudes and gender responsive behavior that support gender equality. According to Njuguna (2016), the GRP model may equip instructors with the knowledge, skill, and attitudes they need to adapt to the educational needs of boys and girls by implementing gender-sensitive classroom procedures. Moreover, reducing prevailing inequality between girls and boys in all dimensions like curriculum, textbooks and other learning materials, teaching learning process, evaluation and assessment, involvement in extracurricular activities, and language used inside and outside the classroom are the concerns of GRP (Mlama et al., 2005; Njuguna, 2016).

GRP further brings some necessary changes in the curricular contents, and in the textbooks and develops materials gender responsive for students (Paudal, n.d.). It also helps school administrators raise awareness and sensitize about gender issues and enables them to develop a conducive learning atmosphere. This fosters a gender-responsive teaching environment that promotes equal engagement and participation among boys and girls (Njuguna, 2016; Paudal, n.d.). More importantly, it also improves and increases the relationships between students-teachers and students-students. To do this, teachers have to analyze the curricular contents, develop effective instructional strategies, and organize them in a more meaningful way by engaging the children sufficiently. GRP can help enhance girls' retention rates, academic performance, and overall learning quality (Forum for African Women Educationalists [FAWE], 2008; Njuguna, 2016). Gender sensitive teachers should point out gender stereotypes, gender inequalities and biases from the gender blind curriculum of school education (Nabbuye, 2018). Moreover, the gender-blind curriculum initiates that it is fair and treats every student the same contents without focusing on each student's specific learning needs. Such curriculum ignores gender norms, relations, and gender roles while developing it and that reinforces gender inequalities, gender stereotypes, discriminations, and gender biases.

Teachers are always responsible for delivering the curriculum. They must be conscious when choosing appropriate teaching methods, materials, classroom activities, and other aspects that support teaching learning process. To achieve equitable learning outcomes for students, teachers are encouraged to implement pedagogical methods that are responsive to gender differences. Teachers must understand and address the specific learning needs of boys and girls, promoting equal participation and involvement in the classroom activities, and ensuring equal access to learning resources (Kahamba et al., 2017).

The teacher is one of the honorable people, who must create a student-friendly environment in and out of the classroom in schools. The empowerment of students, especially girls, towards learning depends on an inclusive, safe, supportive, and valuable school and classroom environment. United Nations Educational Scientific and Cultural Organization (UNESCO, 2017) explained the concept of a gender responsive environment in schools as:

> Teachers will provide positive feedback, value the participation of all students, and draw on the diversity of students' backgrounds and experiences. To foster engaging and effective teaching practice, teachers need to be trained and supported in the use of flexible teaching styles, incorporating a combination of whole class, group and pair work, as well as diverse learning materials beyond the textbook. The students then have opportunities to discuss, ask questions and work collaboratively with their peers, as well as the teacher, on a range of tasks. (p. 12)

The absence of gender-sensitive teaching fosters negative classroom environments where girls may encounter violence, exploitation, or corporal punishment, exacerbated by a shortage of female teachers (Kahamba et al., 2017). Gender-sensitive pedagogical practice demands teachers' introspection. Forum for African Women Educationalists (FAWE) integrates cultural values, institutional structurers, and influential role models to shape the development and implementation of lesson plans. These efforts aim to systematically dismantle barriers that hinder women and girls in classroom environments, promoting their equal participation and reach their full academic potential. (Patel-Campillo & Reyes, n.d.).

Most of the women didn't take mathematics courses as an optional subject at the secondary level, due to the misconception that mathematics is the "masculine or male domain subject" and a more appropriate subject for boys (Mandina et al., 2013). Most of the mathematicians who say mathematics is a "masculine" subject believe that girls and women are less capable than boys in the fields of science, mathematics, and technology (SMT) (Jones, 2015). In countries where girls lag in STEM subjects during secondary education, gender representation in STEM fields is notably unequal (UNESCO, 2017). Girls face discriminatory attitudes, beliefs, and values through their homes and communities that expand schools. Researchers contend that one of the major barriers to girls' participation in STEM fields is the lack of gender responsive pedagogy applied in schools (FAWE, 2008). The gender responsive teacher encourages both boys and girls to participate in classroom activity and to understand and respond to their specific needs related to teaching learning processes.

Therefore, every teacher and educationist need to understand the concept of gender properly. The teachers must have knowledge about gender and then GRP, to apply GRP in mathematics classrooms. However, in Nepal, teachers are unaware of the specific educational needs related to gender for both boys and girls (Paudal, n.d.). In Tanzania, the university instructors have partial awareness of gender sensitive teaching and new teachers do not have GRP knowledge which creates problems in implementing the GRP module (Kahamba et al., 2017). Likewise in Bhutan, secondary level teachers did not know much and did not aware on gender and the GRP (Dorji, 2020; Yuden et al., 2020). On the other hand, in some cases, GRP-trained teachers have a lack of commitment to train newcomers on the GRP model (Njuguna, 2016). In Africa, "after gender sensitization, the parents were aware of the unfair distribution of household chores between girls and boys and sensitized other parents to share household activities equally among boys and girls" (Njuguna, 2016, p. 7). In Nepal, certain government stakeholders have shown comprehension, awareness, capability, and dedication regarding gender equality during stakeholder interviews within the MOE and DOE, but others did not (Terry & Thapa, 2012). Such a finding indicates that stakeholders have very little knowledge regarding gender.

***GRP Need and Practice***

In their earliest years, girls felt challenged in ‘lower status’ subjects and were discouraged from speaking on which boys absorb teacher’s energy and leave schools due to a lack of role model female teachers in ‘high status’ subjects like mathematics (Chapin & Warne, 2020). Gender inequality in the classroom initiated if teachers practice ‘gender blind’ teaching. In this sense, in Sub-Saharan Africa, FAWE established Science, Mathematics, and Technology (SMT) models for the girls who do not participate and do not perform better in these subjects. Hence, FAWE established SMT models to boost girls' interest in, access to, participation in, and performance in SMT topics in all subjects (Mlama et al., 2005). This model teaches teachers how to use gender-responsive SMT curricula, instructional materials, and classroom procedures. Aside from education planners, curriculum developers, publishers, and female leaders, this model also educates parents and other stakeholders about the value of girls participating in SMT. Similarly, a gender-responsive school environment is necessary which can allow an opportunity for all students to express their emotions and feelings and enhance their motivation actively in their learning (Mlama et al., 2005).

Research studies also explained the necessity of GRP in the classroom. Teachers and schools should not discriminate against boys and girls based on gender. Obasi (2017) recommended that GRP should be utilized in mathematics instruction and mathematics teachers should participate in workshops, seminars and conferences on gender responsiveness in science, technology, engineering and mathematics. To maintain full gender equality in education, United Nations Educational Scientific and

Cultural Organization (UNESCO, 2014), in its Education for All (EFA) goals, emphasized that schools should ensure equitable opportunities for both girls and boys, implement teacher training in gender sensitivity, aim for a gender balance among educators, and revise textbooks and curriculum to eliminate gender stereotypes.

The case study by Njuguna (2016) suggested improving the training of trainers' components to ensure ongoing and consistent implementation of GRP practice. Further, she added the pre-service training should be strengthened by integrating GRP into Teacher Training Colleges (TTCs). Moreover, "Continuous training of teachers in GRP schools will ensure the continuity and sustainability of the programme and better performance and retention of the pupils in schools" (Njugana, 2016, p. 8). Gender Audit of schools of Nepal asserted that teachers, head teachers, and school management committees need to be knowledgeable about the practice of GRP in schools. Additionally, teachers should be committed to foster more gender-sensitive learning environments, and understanding how their behavior impacts both girls and boys (Terry & Thapa, 2012). Likewise, Abraha et al. (2019) suggested the implementation of GRP in classroom practices for eliminating gender bias in the teaching learning process.

Before the development of the GRP model by FAWE in South Africa, gender biases were evident in teaching and learning practices. An observation of classrooms conducted by FAWE found that teachers were using negative language, outdated teaching methods, and gender-insensitive teaching and learning resources, that did not provide equal participation opportunities for both boys and girls. Some textbooks used in schools reinforce stereotypes by portraying girls and women in traditional, restricted, and subordinate roles, such as domestic, caregiving, and supportive roles (Njuguna, 2016). Korean Women's Development Institute (KWDI) in 2003 showed that teacher-student interaction in classroom shows boys have more opportunities for interaction with teachers than girls. The teaching learning materials conveyed housework for females and office work for males and gender discriminative language was used in the classroom teaching (Jung & Chung, 2005). Most teachers are unaware about the language they use in the classroom which fosters unfavorable gender stereotypes towards students (FAWE, 2015).

Although gender is socially constructed, gender inequality has been observed in society. This inequality automatically transforms into the school environment, particularly in terms of teaching methods, teacher student interactions, school management, and the design and structure of physical facilities. Both teachers and students, whether intentionally or unintentionally, incorporate these gender roles into the dynamics of the classroom (Mlama et al., 2005). They may knowingly or unknowingly engage in discriminatory behavior based on gender. Teachers often lack the necessary skills for gender-sensitive instruction and discriminatory practices against girls occur in the classroom participation, feedback systems, and overall learning process (Paudal, n.d.). Such type of discrimination may discourage students, particularly girls, from participating and engaging effectively in the learning process.

Gender disparity still remains in mathematics due to teachers' gender stereotype beliefs. Each student in mathematics classroom couldn't get an equal opportunity to learn mathematics because many mathematics teachers predominantly use traditional methods such as lecture methods and expository approaches (Panthi & Belbase, 2017; Panthi et al., 2018). They also explained that most mathematics teachers focus on good and intelligent students but do not care about weak students in the classroom. Teachers exhibit discriminatory behavior both inside and outside the classroom, showings less attention and support to girls compared to boys (Mathema, 2007; Mathema & Bista, 2006). It is a fact that most teachers in Nepal perceive female students as incompetent, lazy, submissive, and less intelligent compared to male students (Mathema, 2007). According to the NASA report, male students consistently outperformed female students in mathematics and all mathematical content areas across all geographical regions of Nepal (Education Review Office [ERO], 2015b).

In Nepal, there is limited inclusion of gender issues in teachers' professional development programs for gender sensitization. As a result, teachers often rely on outdated approaches and methods instead of child-centered pedagogy in their teaching practices (Terry & Thapa, 2012). For gender awareness and gender sensitization of teachers, "the new Gender Awareness module for master trainers involved in the teachers' professional development module, which has been produced by the National Centre for Educational Development (NCED)" (Terry &Thapa, 2012, p. 57). These resources have been distributed on a limited scale, and their content is often too abstract to effectively assist teachers address and overcome gender bias in their interactions with students. This justifies the lack of GRP related policy and training materials in the context of Nepal. Most of the research studies showed that the existing pedagogical practices in developing countries and also in Nepalese classroom revealed that we need more efforts to make our classroom gender responsive. To maintain equality, equity, justice, and give equal values to both boys and girls, the knowledge and skills to implement GRP in classroom is necessary. This demands research and studies in the field of GRP.

Ensuring equitable educational opportunities for all girls and boys have been a high priority globally. Nepal government has also given high priority for equitable educational policy, plans, and regulations in school education (MOE, 2016). Gender parity in community schools in Nepal has been maintained and improved girls' participation at all levels in school education (MOEST, 2021a). Teachers are unaware about GRP in the teaching learning process. It is seen that the government has given little attention to teacher training about GRP but it is not sufficient. Hence, it is justifiable to study about GRP in mathematics in the context of Nepal.

However, all persons are equal and should have the same opportunities and the freedom to pursue education and careers in their preferred fields. Both boys and girls have equal rights and efforts to participate and to obtain quality education. Without addressing the gender dimension inside and outside the classroom, the quality of education couldn't be achieved. Whereas pedagogy is an important tool to address the specific learning needs of both gender groups inside the classroom, teacher is the prominent factor to fulfil this. Gender responsive teachers may be an important resource for developing students especially girls' mathematical identities. They enable students to cultivate a positive attitude on mathematics and such attitude increases comfort and develops confidence in their ability to comprehend and engage with the subject mathematics.

That's why GRP has become one of the most important topics to address gender responsiveness in mathematics classrooms and schools. To develop gender responsiveness in classrooms and schools, various issues related to the teaching and learning process such as lesson planning, teaching materials, methodology, teacher's activities in classroom, teacher-student interaction, classroom set up, and language use in the classroom must be gender responsive. Hence, to address the common features such as gender-based violence, harassment, dropouts, and gender stereotypes, and for access to education, meaningful engagement and participation in education, school administrations and pedagogies must follow the principle of gender responsiveness and must change the pedagogy accordingly. To ensure quality education for students, particularly girls, government education policies must be redefined and implemented accordingly.

**Statement of the Problem**

Numerous studies conducted worldwide have explored the issue of gender differences in mathematics class participation and consistently found that boys have active participation rather than girls (e. g., Gr∅ ver Aukrust, 2008; Hall, 2012; Mandina et al., 2013). A large number of studies found gender differences on teachers' attitude and behavior, since boys received more attention from their teachers than do girls (Bista, 2004; DeBare, 2005; Hulley, 2001; Leder, 1987; Renne, 2001). Numerous research studies (e. g. Mlama et al., 2005; Njuguna, 2016; Obasi, 2017) found teaching and learning processes were largely gender biased, gender insensitive teaching learning materials were used, and boys got more interaction opportunities in the classroom rather than girls. Also, teachers used abusive and negative language in the classroom (Njuguna, 2016), creating an unfavorable classroom environment for girls. It was also found that students have lack of confidence and motivation to obtain mathematics, yet this is an educational issue all over the world which is contextual in mathematics.

Teachers are the most powerful influencers in students' learning. They significantly influence students' learning outcomes, including academic achievement, future career paths, and attitudes towards mathematics (Leder et al., 2014). In mathematics, boys were treated and encouraged more often than girls (Fennema et al., 1990; Ghosh, 2004). According to Ghosh (2004), "teacher's interaction with the individual student may be frequently influenced by gender stereotypes, and teachers perhaps quite unconsciously may show differential treatment toward the male students and female students" (p. 3). The discriminating behavior of teachers confronts the low participation and involvement of students, especially girls, in mathematics which leads to the necessity of GRP practices in mathematics classrooms.

In the context of Nepal, a smaller number of girls take mathematics course as a major, resulting in a low number of female mathematics teachers at both the school levels as well as university levels. Female teachers are underrepresented even at primary level, and their numbers further diminish by the secondary level (MOEST, 2021a; Terry & Thapa, 2012). Among all teachers, female teachers comprise only 18.9% in community schools and 26.3% in institutional schools at the secondary level at Grade IX and X (MOEST, 2021a). However, the presence of female teachers positively impacts girls' educational attainment (Witenstein & Palmer, 2013). Globally, research indicates that girls participate more in classes taught by female teachers than in those taught by male teachers (Bista, 2004; Gr∅ ver Aukrust, 2008), whereas boys participate equally in classes led by both male and female teachers (Gr∅ ver Aukrust, 2008). Consequently, in such instances, girls often show less interest in pursuing mathematics as a major subject and may struggle to actively participate in discussions and interactions in mathematics classrooms with teachers and peers of the opposite sex.

Gender differences in mathematics are primarily observed at the upper levels of education rather than lower levels. According to Ganley (2018), no significant gender differences are found in mathematics at preschool and elementary school; however, differences begin to emerge in high school and college. Most research studies indicate that female students often outperform male students in mathematics during elementary school; however, by the end of middle or junior high school, male students tend to outperform female students (Ghosh, 2004). In certain instances, researchers argue that the gap begins as early as elementary school, persists among many middle school-aged girls and boys, and solidifies among most high school-aged young men and women (Upadhyay & DeFranco, 2008). When subject selection becomes available in upper secondary education, gender differences in participation in STEM education become more pronounced (UNESCO, 2017).

A large number of studies have shown gender imbalances in enrollment, participation, and retention in mathematics subjects. In the context of Nepal, the Flash Report 2020─2021 indicates that an equal number of girls (50%) and boys (50%) are enrolled at the secondary level; however, 53.6% of girls are in community schools (Grades 9-12); while only 44.1% are in institutional schools at the same grade levels. Eventhough, girls have low access, low participation, and low performance at secondary education in community schools (MOEST, 2021a). Despite achieving a Gender Parity Index (GPI) at all levels (MOEST, 2021a; 2022), significant gender disparities remain in girls' participation, retention, and access to secondary level mathematics (MOEST, 2021b).

Several factors influence the low participation and performance of girls, including psychosocial aspects related to self-perceptions, social expectations and preferences in learning environments (Alkhadrawi, 2015). Additionally, challenges such as domestic responsibilities and issues, cultural marginalization, and stereotypes regarding knowledge and skills hinder girls' effective participation in SMT areas (Iwu & Azoro, 2017). Furthermore, extremely few girls compared to boys select mathematics as an optional subject due to being weak in class, a lack of confidence in their success, and the increased time allocated to domestic work (SDRC, 2007).

Gender differences also exist on content preferences of boy and girl students in mathematics. Students often have distinct preferences for certain mathematical contents, which can influence their participation and performances in mathematics on which gender perspectives can play a crucial role on it. Most research studies indicate that boys tend to perform better in and prefer Geometry (Cheung, 1989; Gallagher et al., 2002; Uwineza et al., 2018), while girls tend to excel in and prefer Algebraic contents (Gallagher et al., 2002; Uwineza et al., 2018). Moreover, boys show a preference for mathematical content related to problem-solving, reasoning, measurement, and problems without formulas; conversely, girls prefer content involving simple calculations and direct applications of formulas (Okan & Arican, 2020; Uwineza et al., 2018). The results from NASA in Nepal also revealed that students at the upper basic level exhibited weaknesses in higher cognitive skills such as problem-solving, reasoning, proving theorem, and formula construction (ERO, 2015b). Therefore, students' content preferences significantly impact their involvement, confidence, and motivation toward mathematics. Likewise, teachers may struggle to implement GRP efficiently and effectively in classroom if they are unaware of their students' (both male and female) mathematical content preferences.

Several government documents of Nepal have given high priority to gender equality and equity in school education (MOE, 2016; MOEST, 2021a; 2021b, 2022). Despite government policies promoting equal educational opportunities for girls, the actual reality is that girls consistently experience lower levels of enrollment rates and academic success across all educational levels (Witenstein & Palmer, 2013). But at present, girls are equally enrolled as boys in all levels of school education, whereas boys' performance in mathematics is better than girls (MOEST, 2021b).

In many instances, education systems and plans are seen as gender-responsive, but do not take into consideration girls' and women's particular needs. In 2005, the government of Nepal introduced gender responsive budgeting for gender equality and equity though its effectiveness is weak (MOEST, 2021b). For teachers' professional development, different teacher training programs were implemented, but not sufficient and effective for improving classroom practices. Recently, Education Sector Analysis (ESA) emphasized the need for programs for providing need-based teacher training and ways of applying the acquired knowledge and skills in actual classrooms (MOEST, 2022). However, limited training was implemented for gender awareness for Nepalese teachers covering various aspects of gender issues and women empowerment. Similarly, the School Education Sector Plan (SESP) 2022 proposes some strategies for gender responsiveness, aiming to enhance the educational environment by ensuring that is safe, inclusive, and free from fear, discrimination, and abuse, while embracing diversity. These efforts are intended to create a child-friendly environment where all students, particularly girls, can actively participate in learning (MOEST, 2022). However, such programs might not be sufficient for implementing GRP in classroom practices, especially in mathematics. Due to the lack of gender responsiveness in school, it is difficult to obtain gender parity, equity, and quality of education for both girls and boys.

When I had taught mathematics for four years at the secondary level, I observed that most of the high scoring girls had not taken mathematics as an optional subject. On the other hand, low scoring boys were interested and had taken mathematics. Girls were less interested, less motivated, less empowered, and were afraid of studying mathematics at secondary level. My twelve years of teaching experience at higher levels; with bachelor's and master's degrees, found low girls' enrollment in mathematics, among them very few girls participated in classroom interaction with teachers and peers. The informal conversations with girl students at higher levels reflect that they do not feel gender responsiveness in teaching learning process in and out of the classroom. They conveyed that teachers practice gender based discriminatory behavior in the mathematics classroom. I experienced that most teachers have gender-stereotypical thought that ‘boys are better in mathematics than girls’, and hence they knowingly or unknowingly give more value to boys in questioning, giving critical answers, solving problems, and interacting in the classroom.

This disjunction between policy and reality, and theory and practice, leads to some imbalances and obstacles in GRP practices in mathematics teaching and learning. Gender stereotypes, beliefs, and attitudes still exist with teachers and students, especially in mathematics subject. Teachers traditionally have lower expectations and biases towards girls. This study would help teachers to engage all students equally and to develop confidence, motivation, encouragement, and empowerment towards mathematics. In addition, this study would help mathematics teachers to be aware of GRP and be gender sensitive at the time of teaching with GRP knowledge. The major rationale of this study is to create knowledge about GRP use in Nepalese mathematics classrooms, which is not yet made academically. Hence, it is necessary to conduct research on the topic of GRP in the context of Nepal. Gender responsive mathematics teachers may consider the distinct learning needs of both gender group students during teaching learning process. That’s why, my study was focused on examining teachers’ awareness and practice towards GRP in mathematics at secondary level community schools in Nepal.

The teacher has not taught if students have not learnt. It is only possible when the teacher addresses students’ curricular needs, interests, motivation, and capacity. The theory expected that learning is maximized only if students are motivated, engaged, valued, interested, responsive, and applying persistent effort in learning, but observed situation of teachers' belief and practices are not matched. Based on my present and past experience, these ideal situations are not observed. So, there is urgent need to conduct a research work to meet the above gap. Since, I observed a gap between theory and peactice, expected so, there is focusing on pedagogical aspects, the present study seeks to examine the actual GRP awareness and practices within mathematics classes. That's why exploring the gap between ideal and present situations and addressing them will contribute to the existing knowledge about GRP.

**Objectives of the Study**

The general objective of the research study was to study the GRP practices conducted by mathematics teachers in community schools. Accordingly, the specific objectives of this study are stated as follows.

1. To investigate the content preferences of both boy and girl students in mathematics.
2. To examine the teacher's awareness and practice towards GRP in mathematics.
3. To explore the student's realization of teacher's behavior towards GRP in mathematics classroom.

**Research Questions**

The overarching question of this study was: 'What is current level of awareness and practice of GRP in mathematics teaching at secondary level community schools in Nepal?' The specific research questions to be addressed in this study included:

1. Do the students' preferences of mathematical contents included in the curriculum differ by gender? Why?
2. What is the status of teacher's awareness towards GRP in mathematics?
3. How do teachers practice GRP in mathematics classroom?

4. To what extent do students realize the teachers’ behavior towards GRP in mathematics classroom?

**Rationale of the Study**

This research is grounded in a comprehensive rationale that aligns with the principles of GRP practices in mathematics classrooms. This study motivated to address educational disparities in mathematics by identifying actual GRP practice situations to promote inclusive and justifiable classrooms. The environmental and social gender disparities persist in lesson planning, demonstrating teaching materials, language used in the classrooms, classroom participation, teacher-student interaction, assessment practices, and teaching methods in mathematics, even though girls and boys have no cognitive or biological differences exist. If teachers are aware of GRP, then they will be able to apply gender sensitive teaching in their everyday classroom practices in mathematics. This study might inform the teachers and students about GRP and its actual situations and what they are doing in their teaching learning process in mathematics classrooms based on gender.

This study would be helpful for the policy developers in formulating effective policies that promote the mainstreaming of GRP in mathematics curricula across schools. By emphasizing gender equity, these policies can help create s more inclusive educational environment. Likewise, curriculum designers and textbook authors will benefit from this study by gaining guidance on how to develop a gender responsive curriculum as well as textbooks in mathematics at school levels. In addition, the study will equip education practitioners with essential knowledge, skills, and attitudes necessary for implementing good GRP practices that transform learning and teaching environments. This transformation is crucial for achieving gender equity, equality, and quality education within mathematics classrooms.

This study would contribute the gender responsive pedagogical action. It helps the mathematics teacher to overcome the use of gender irresponsive pedagogy in mathematics classrooms that causes girls low involvement, low participation and high anxiety towards mathematics subjects. Furthermore, this research could assist mathematics teachers in treating male and female students equitably during their teaching activities. It offers teachers opportunities to reassess their current teaching strategies regarding GRP. In addition, this study would encourage, initiate, and motivate teachers to apply GRP in their day-by-day instructional activities at the school level. It could also prompt district education offices, regional education bureaus, educators, and other stakeholders to enhance the awareness of secondary mathematics teachers regarding GRP by designing and developing training, workshops, and symposiums.

Moreover, students, especially girls, would be empowered to participate in learning mathematics without inhibitions and shyness and with confidence equally as boys in school and higher studies in mathematics. Teachers would equally value girls' abilities, and prioritize girls in questioning and answering the questions like boys in the classroom. Communities would be empowered to take an active role in supporting school infrastructure to enhance learning for both boys and especially girls. Parents would be encouraged to create home environments for gender equity and equality. They would be aware to create a gender free environment at home and motivate girls to take mathematics and use mathematics without fear. Teachers would be alert in maintaining gender parity in and out of mathematics classrooms. The results of the study will serve as a foundation for future program planning and contribute to the expanding knowledge of GRP as a pedagogy to enhance and improve girls' learning in severely marginalized environments.

**Delimitations of the Study**

Every study has its own delimitations. The delimitations of the study are stated as follows:

1. This study covered only community secondary schools in Bagmati Province of Nepal.
2. The study was limited to secondary level mathematics teachers and students, covering all four geographical regions—Mountainous, Hilly, Terai, and Valley—within Bagmati Province.
3. This study included only secondary level mathematics teachers teaching Grades IX and X, along with their Grade X students.
4. This study was delimited from the theoretical point of view, by the liberal feminist theory, the Vygotsky social constructivist theory, the social cognitive theory, and the critical theory while interpreting the information.

**Definitions of the Key Terms**

To have a clear grasp of what the purpose of this study was, it is crucial to define some of the essential terms in the research questions. The key terms used in this study had been defined as follows.

**Awareness:** In this study, awareness means understanding and feeling of mathematics teachers about the concept of GRP. It is determined based on research about teachers' awareness regarding GRP by Abraha et al. (2019) having seven options; one accurate meaning of GRP and remaining related to GRP.

**ATLAS.ti:** It refers to a QAQDAS (Computer-Assisted/Computer-Aided Qualitative Data Analysis Software) 9.0.21.0 version.

**Community school:** Community school indicates the school which receives regular government grant for teachers' salaries and for other administrative purposes.

In this study, it specifically refers to the secondary level schools of thirteen districts from Bagmati Province.

**Content preferences:** In this study, content preferences mean the specific types of mathematical topics or areas that students favor or show greater interest based on their individual tastes, age, gender, educational background, viewing habits, and personal experiences with mathematics.

**EndNote**: It indicates EndNote X9 (version X9.3.3), a citation management software, produced by Clarivate Analytics.

**Gender:** It encompasses the array of socially constructed and determined roles and responsibilities assigned to boys and girls within our families, societies, and cultures. These roles can evolve over time and differ within and across cultures and communities.

**Gender differences:** Gender differences are socially and culturally defined distinctions between boy and girl students in terms of their abilities, accomplishment, motivation, skills, attention, curiosity, memory, competitiveness, imagination, curiosity, and creativity.

**Gender responsive**: In my study, gender responsive refers to the capacity to recognize disparities between boys and girls and act and strategies to address inequality. It is the ability to recognize the diverse needs of girls and boys, or men and women and taking proactive steps and strategies to rectify gender bias and discrimination, aiming to achieve gender equality and equity.

**Gender Responsive Pedagogy (GRP):** It is the holistic educational process on which teaching and learning portrays acts of gender responsiveness and sensitivity for both male and female. It is the teaching and learning processes that pay attention to the specific learning needs of girls and boys (FAWE, 2006; Mlama et al., 2005) on which teachers encompassing gender approach in classroom interaction and classroom setup, language used, teaching materials use in classroom, teachers' classroom activities, and assessment and feedback.

**Gender responsive classroom interaction:** In this study, gender responsive classroom interaction involves considering gender dynamics in all aspects of classroom interaction, including teacher-student interaction, student-student interaction, teachers' presentation (attire, physical appearance, demeanor), teachers' behavior (tone, confidence, punctuality), and the morale of both teachers and students (dedication, motivation).

**Pedagogy:** It is a concept that envelops virtually all teaching and learning processes between the teacher as a facilitator and the student as a learner. It signifies the role of female and male teachers in teaching acting as guides on which they accompany learners through the journey of acquiring knowledge, skills and right attitudes. It is the function or work of teachers teaching in classroom. In this study, pedagogy includes three components aim (awareness towards GRP), methods (practice of GRP), and contents (preferences) in teaching learning process.

**Practice**: Practice means GRP practice of teachers in teaching mathematics in a classroom. It means teachers teaching behavior and activities to address gender issues regarding GRP with the help of the components as teacher- student interaction, teaching materials, teachers' classroom activities and classroom set up, languages used, and assessment and feedback used in mathematics classroom.

**Student's realization:** It refers to the students' feeling about teachers' behavior is either gender responsive or gender biased in mathematics classroom. It involves gaining insights, understanding, recognizing teachers' GRP related behavior presenting in classroom through learning or experience.

**Teachers' classroom activity:** It refers to the actions, behaviors, and instructional strategies employed by teachers ensuring boys and girls participation during the teaching and learning process of mathematics within a classroom setting. This includes activities such as lesson planning, delivering lectures, facilitating discussions, conducting assessments, providing feedback, and managing classroom behavior. These teaching activities might give girls opportunities to participate in learning mathematics equally as boys.

## Organization of the Chapters

This study has been divided into seven chapters. Chapter I (this chapter) is about the problem statement and the reason why it is important to solve it by providing a rationale of the study. Chapter II is a review of the literature relevant to teachers' GRP practices in mathematics classroom and students' realization towards it. This chapter started with GRP introductions along with practices and mostly reviews literature in the field of GRP. The literature on content preferences and classroom participation and gender description have also been reviewed as it also guides the research. Chapter III discusses and outlines the methodology of the study. It detailed descriptions of the research methods, design, sampling procedures, pilot study, tools, and data collection and analysis procedures. This chapter also discusses the reliability and validity of the study as well as ethical issues.

Chapters IV and V present the data and analysis of it. Chapter IV presents the quantitative data analysis and chapter V presents the qualitative analysis of the data based on key themes. Finally, chapter VI presents key findings, discussion on findings, and finally limitations of the study. In final chapter, chapter VII presents the conclusion of the study based on findings, addresses implications, and further direstions of the research.

# Chapter II

# Review of Literature

Review of literature is an integral part of any research. A literature review is a critically crafted summary of scholarly articles, books, and other sources that outlines the historical and current state of information or knowledge on the topic of our study (Creswell, 2012). It shares the result of the other research studies findings related to their study that the one being undertaken. A literature review offers a foundation for highlighting the importance of the study as well as serveing as a standard for comparing the results with existing research findings (Creswell, 2009). The objective of the literature review is to investigate the core issues pertinent to this study and present research findings that justify the rationale behind the research. It is posited that pedagogy plays a critical role in contributing to, reinforcing, or otherwise supporting the existing gap. Additionally, it is further purposed that specific pedagogical approaches, such as GRP, may help mitigate gender disparities and create a more equitable learning environment in mathematics for both boys and girls. Review of literature related on my topics were organized into the following different themes and sub-themes:

## Gender Responsive Pedagogy: Different Models and Practices

The particular subheading of this theme introduces key notions such as models regarding GRP, gender responsive classroom: Teaching and learning process, practice situation of GRP, and gender stereotypes in teaching materials.

### *Models Regarding GRP*

The GRP is a methodology that enhances the teachers to improve the overall quality of teaching for all students, with a particular focus on improving educational outcomes for girls (Okoko et al., 2017). It is crucial to recognize that GRP is not limited to addressing only women's needs. Instead, it focuses on understanding the intersection between gender and the needs of all learners in general-with a significant aim of addressing societal imbalances, which includes enhancing outcomes for women (Chapin & Warne, 2020).For the quality education, FAWE intervention the GRP model that has been implemented since 2005. Likewise, FAWE developed a teacher's handbook on GRP by the year 2005 to contribute to the on-going debate on enhancing the quality of education (Njuguna, 2016). Since the model of GRP was aimed to initiate the gender sensitive teaching and learning environment that would be beneficial for enhancing and facilitating equal participation of both boys and girls. Regarding the role of GRP model, (FAWE, 2015) stated that "GRP as a FAWE model that trains teachers to become more gender aware and to adopt teaching practices that promote equal treatment and participation of boys and girls within the school and classroom environments" (p. 2).

The GRP model was developed to provide teachers with the knowledge, skills, and mindset needed to address the learning needs of both girls and boys through gender-sensitive teaching approaches and practices (FAWE, 2015; Njuguna, 2016). Additionally, this model also initiates training for teachers on gender-sensitive process and practice, aimed at promoting more equitable participation of both girls and boys in the classroom. Moreover, the case study research indicated that the most effective way to replicate and expand the GRP is by integrating it into pre-service training programs (Njuguna, 2016). When employing GRP as a method, teachers who implement it adopt an inclusive gender perspective in lesson planning, teaching, managing classroom activities, and assessing performance (Mlama et al., 2005). That's why, the teachers who impliment GRP model in their teaching methodology, girls will participate equally as boys in mathematics classroom. FAWE's experience showed that, “when girls have gender aware teachers, gender-sensitive learning materials, an encouraging and welcoming school environment and a supportive community context, they excel academically and are better equipped to face life challenges” (FAWE, 2008, p. 22). Likewise, GRP helps teachers to prevent gender stereotypes, develop skills, and helps to improve classroom participation, which can contribute to the empowerment of both boys and girls and for their overall quality of education (Nabbuye, 2018).

The GRP Model includes girls to participate and benefit equally with boys. The aim of GRP might be managing the school environment and developing practical gender awareness in the teaching and learning. This model encourages teachers to become gender responsive in their teaching process and to be curious and enthusiastic enough to adopt transformative pedagogy in teaching learning process (FAWE, 2015). The FAWE GRP model was developed based on three key elements—conducting gender assessments and policy analyses in the targeted institutions and countries, providing GRP training for teachers to enhance their knowledge, attitudes, and practical skills, and offering GRP training for school management teams (FAWE, 2015; Njuguna, 2016). FAWE and Njuguna further noted the six key focus areas of GRP: classroom arrangement, lesson planning, teacher-student interaction, instructional methods, language used, teaching and assessment resources, and school or institutional management. These areas help to make gender responsive classrooms. The GRP model has had a positive impact on primary and secondary schools, as well as teacher training colleges (TTCs), across six different African countries. The impact of the GRP model was change in teachers’ attitudes and practices, increase in access, management, students (both boys and girls) attitude and behavior change, and retention (Njuguna, 2016).

Moreover, the specific features of GRP are that the good teacher-students' relations, good student-student relations, mutual understanding and classroom interactions to eradicate the bad attitudes and behave attained through socialization process and minimizing the gender differences within the classroom setting (Paudal, n.d.). Implementing gender sensitive education in teaching requires addressing existing gender inequalities and ensuring that all people have equal opportunities in both education and future employment. Furthermore, "Gender sensitive pedagogy creates a safe and accepting environment for children to learn. Students are encouraged to question existing gender stereotypes and follow their interests regardless of prevailing gender roles in their society" (Korenius, 2018, p. 10).

Moreover, in Sub-Saharan Africa the maximum number of girls did not perform well in technical subjects like mathematics, science, and technology. Hence, in addition to GRP model, FAWE initiated the SMT model to enhance girls' access, interest, performance, and participation in SMT subjects at all educational levels of school education, through comprehensive teacher training on gender-responsive SMT curricula, classroom practices, and learning materials (FAWE, 2008; Njuguna, 2016). Similarly, FAWE disclosed that the SMT models engaged educational planners, curriculum developers, female leaders and publishers, and to sensitize parents and stakeholder on the usefulness and utilities of girls' participation in SMT related subjects. After utilized SMT models that have positive impacts in learning as "higher rates of girls' participation in SMT subjects, improved performance of girls in national examinations, and improved teachers attitudes towards girls' abilities and participation in SMT" (FAWE, 2008, p. 16).

Though, GRP model and SMT model were initiated especially for school levels teaching learning process. Chapin and Warne (2020) designed a new approach for higher education institutions' lecturers and students for supporting GRP. Based on GRP models, they developed their own framework based on the intersection of the six dimensions of gender—power/empowerment, representation, equality/equity, stereotypes, internalized bias, and intersectionality—with seven key areas of teaching and learning: methodologies and activities, learning materials, classroom interactions, classroom management and setup, language use, learning environments, and assessment. This framework aims to support the implementation of GRP at higher education institutions. This pedagogical approach in higher education, "facilitates a transition from gender blindness to gender awareness, ultimately enabling both lecturers and their students to become gender-responsive professionals" (Chapin & Warne, 2020, p. 6). This analysis suggests that all models regarding GRP would be benefitable for teachers to conduct gender responsive teaching environments in and out of classrooms and for students to learn in gender free environments in school and in colleges levels.

***Gender Responsive Classroom: Teaching and Learning Process***

The social, physical, and academic context is referred to as a school environment in which educational activities and learning happens. The school environment significantly shapes students' academic performance, social behavior, and emotional growth throughout their educational journry. Moreover, it also influences the overall educational qualities in teaching and learning process. A gender-responsive school environment is one in which the academic framework, physical facilities, school community, family involvement, and school surroundings are all should consider gender matters in the teaching and learning process. They should address the distinct learning needs of both boy and girl students (Dorji, 2020; Mlama et al., 2005; Njuguna, 2016) in their teaching and learning process. Gender stereotypes still exist in all human families, society, their careers, professions like institutions. It automatically transforms and exists in school and hence in the classroom. Teachers' awareness and understanding of gender issues are crucial for ensuring the participation, achievement, and success of both female and male students in schools. Mathematics is the critical enabling course on which students' participation and engagement play vital roles. Whereas most of the teachers show discriminatory behavior but most of them are unaware about their discriminating behavior based on gender in their teaching learning process. They also use learning materials perpetuating gender stereotypes either girls or boys that can discourage students specifically girls from fully participating in their learning process (FAWE, 2015).

Schools and teachers need to be aware of their crucial role in shaping a gender sensitive future generation (Ifegbesan, 2010). Teachers take a central part in the teaching and learning processes. Teachers may intentionally or outwardly perpetuate gender discrimination and inequality in the classroom. Likewise, teachers' ignorance about girls' sexuality and intend bias against girls which creates bad impact for girls' access to education for this teacher's awareness and understanding of gender responsiveness play vital role (Timothy, 2022). Teachers must have a deeper understanding of GRP and apply this knowledge to develop their classroom 'gender friendly'. They must first grasp gender dynamics to effectively address them in a gender responsive way within the classroom. To achieve this, teachers should have taken training in GRP to equip them with the necessary knowledge, skills, and attitudes for effectively integrating GRP into their teaching practices. Such GRP training assists teachers to develope and implement gender responsive methods that promote equal participation of both girl and boy students in both the teaching and learning processes. Teachers should equally respond to both boys and girls, develop gender-friendly classroom practices throughout the teaching and learning process, acquire deeper insights into gender-responsive pedagogy, and recognize, help, and address gender stereotyping to prevent it (UNESCO, 2017). UNESCO also reported that the gender responsive teachers don't discriminate regarding sex and should motivate and encourage both boys and girls for equal participation and involvement in classroom activities.

Our society is male dominated, and as a result, our schools are gendered institutions that mirror and perpetuate gender dynamics from wider society (Terry & Thapa, 2012). Individual experiences and school environments are crucial for fostering gender equality, enhancing the quality of education, and empowering girls. Sitting arrangement also play an important role increasing participation of girls equally as boys in the classroom. According to Terry and Thapa (2012), the gender audit conducted in Nepal revealed that most girls were seated in the back rows of the classroom during school education. When they sit at the back of the class "they are less likely to participate unless the teacher makes a special effort to involve them" (Mlama et al., 2005, p. 7). In this sense, subject teachers should arrange seating so that both boys and girls have equal opportunities for class participation and interaction with other peers and teachers (Kahamba et al., 2017). Terry and Thapa (2012) noted that in Nepalese schools, it is common to encounter dark and noisy classrooms with very high teacher-student ratios. But at present the situation of Nepalese classroom is being changed. The Flash Report 2077 B.S. reported that the teacher student ratio at community school is 31:1 at secondary level (Grade 9-10), that ratio is considerably sufficient to provide quality education to all (MOE, 2021a).

The language used by the teacher in the teaching learning process play a vital role in shaping students' participation and involvement in the mathematics classroom. When teachers employ inappropriate language that conveys negative messages, it hinders the learning process (Dorji, 2020). The teacher who frequently uses harsh, abusive, or threatening language may instill fear in students, impeding communication between teacher and student and leading to diminished interaction (Dorji, 2020; Mlama et al., 2005). According to Mlama et al. (2005), the use of gender-insensitive language can perpetuate gender differences and inequalities between boys and girls. Moreover, the classroom environment becomes male-dominated, placing females in a subordinate position in classroom teaching learning process (Kahamba et al., 2017). That's why it is very important for teachers to use gender inclusive and encouraging language (Dorji, 2020; Kahamba et al., 2017) that enhances student's performance and involvement in learning process.

To enhance learning, teachers might employ a range of teaching methods, ranging from traditional lectures to classroom discussions, case studies, films, interactive activities, research, quizzes, student presentations, and active participation (Faust & Paulson, 1998) according to students' interest and nature of subject matter. However, many teachers rely on traditional teacher-centered methods like dictation and rote notetaking instead of student-centered approaches such as group discussions, class debates, and interactive activities that promote equal participation and engagement for both boys and girls (Nabbuye, 2018). According to School Sector Development Plan (SSDP) in the context of Nepal, many efforts have been given to change teaching approaches, though many classrooms of school education remain textbook and teacher only focused with didactic teaching methods that emphasizes rote learning and uncritical absorption of facts (MOE, 2016). SSDP promotes the student-centered, child-friendly, and interactive pedagogies for students' active learning and development of their range of skills for improving the quality of education. Due to different reasons and lack of understanding about GRP, teachers are less likely to be motivated towards GRP in the teaching and learning process. According to Nabbuye, some teachers feel, "gender-sensitive approaches are time consuming and discriminatory against boys" (p. 9). According to Mlama et al. (2005) some teaching methodologies such as "group work, group discussions, role play, debates, case studies, explorations and practical" (p. 9) will be very effective for encouraging students' active participation especially girls. Some classrooms may benefit from traditional lecture methods, while others might need interactive techniques and active student participation to achieve effective teaching and learning (Murphy et al., 2018). Therefore, teachers should choose appropriate teaching methods that ensure equal participation and involvement of both boys and girls in the mathematics classroom, thereby enhancing the quality of education.

When teacher emphasizes the value of quantitative skills, promotes cooperative learning rather than competitive, and reduce social comparisons of ability then girls tend to have a greater sense of efficacy and valuation of mathematics in the classrooms (Eccles, 1989). Overall, female students seem to perform better in cooperative rather than competitive learning environments (Bussey & Bandura, 1999). The high level of competition associated with high stakes testing and certain STEM courses often discourages female students (Alkhadrawi, 2015). Most of the students have a serious problem of fear of mathematics, fixed mindset blaming, avoiding mathematics, and the victim culture of society. Connected teaching strategies is a pedagogy used in mathematics that "increased women's interests and confidence in mathematics and facilitated their development as mathematical thinkers" (Miller-Reilly, 2008, p. 44). This connected teaching strategy enhances women's mathematical competence and confidence as well as men's also. Additionally, it also works well for those students who have silence and disempowerment in their mathematics learning experiences.

***Practice Situation of GRP***

In Sub Saharan Africa, FAWE was founded in 1992 aiming to improve girls' academic performance. Its mission also includes increasing girls' access to education, improving retention and completion rates, and promoting the delivery of quality education. Consequently, African government has adopted policies that improved girl's enrolment, retention and performance in school. When the SMT model applied, large numbers of girls participated in SMT subjects, improved girls' performance and in addition improved teachers' attitudes towards girls' abilities and participation in SMT (Mlama et al., 2005). Additionally, the GRP model shifted gender dynamics in schools, leading to more gender responsive behavior and attitudes among girls and boys in the classroom. In that situation, girls might participate actively in classroom discussion, group work, questioning and answering with teachers (Njuguna, 2016). She also noted that implementing FAWE GRP training for teachers, tutors, and head teachers led to a transformation in their attitudes and GRP practices and they became more gender responsive. In this environment, students interacted openly or freely with their teachers and among themselves, and provided mutual support for schoolwork and assignments. Girls' confidence levels and self-esteem also increased due to the cause, teachers stopped using harsh, abusive, and threatening language.

Gender stereotype is a challenging concept for teachers and students teaching and learning process. A UNESCO study revealed that gender bias exists in school mathematics, with girls receiving less favorable treatment compared to boys due to teachers' gender stereotyped views on girls' roles and responsibilities within the family and society (Koirala & Acharya, 2005). Similarly, NASA report indicated that boys outperformed girls in all content areas of mathematics, across all geographical regions of Nepal (ERO, 2015b). Teachers held stereotypical beliefs that boys performed better in mathematics and other subjects compared to girls (Mathema & Bista, 2006). This study also revealed that "most families do not offer conditions at home necessary for girls to do well in schools and they must spend significant hours in household chores (more than 6 hours per day in some cases)" (p. 423). According to Ifegbesan (2010) majority of the secondary level teachers surveyed directly or indirectly, they promote gender-stereotypes and were guilty of gender-stereotypes practices in schools. The findings of this study, based on t-test and analysis of variances (ANOVA), revealed a significant difference between male and female teachers in their gender stereotype beliefs, attitudes, and practices. Furthermore, boys of all ages tend to receive more praise from both female and male teachers, despite teachers are adamant that they do not pay more attention to boys rather than girls (Akpakwu & Bua, 2014). They also reported that boys dominate the classroom, and they demand and get more teacher attention in the classroom. These studies concluded that teachers' belief and attitude conveyed gender stereotype in their classroom practice that might impacted boys' and girls' equal participation and attainment in classroom.

Moreover, teachers' attitude and belief impacted whether their pedagogical practice is gender responsive or not. On the basis of GRP practice, Garrahy (2001, 2003) conducted her study to see consistency between teachers' gender beliefs and pedagogical practices. Both of these studies concluded that there were inconsistencies between teachers' verbal expressions about gender and actual classroom practices. Although teachers thought that they approached the classroom from a gender-neutral perspective and they treated girls and boys in equal manner in their teaching. Even though, their classroom practices did not align with these stated beliefs. Their practices revealed some stereotypical attitudes towards male and female students. One of the newest studies initiated a GRP framework that pedagogical approach promotes a transition from gender blindness to gender responsive; allowing lecturers and students to flatter gender responsive professionals (Chapin & Warne, 2020).

Likewise, latest studies also found that still teachers did not aware with gender in their teaching learning process. In order to evaluate the level of teachers' awareness and understanding about GRP methods in teaching, a survey research study was conducted with 83 academic staff members at higher education institutions in Tanzania. The results indicated that the academic staff have partial awareness towards gender sensitive teaching (Kahamba et al., 2017). Additionally, the findings showed that the extent of gender sensitive pedagogical practices was very limited. A similar study conducted to see the usage of GRP in mathematics instruction supported this view, revealing that GRP usage by teachers in mathematics instructions were decreases (Obasi, 2017).

Furthermore, one of the studies conducted in North Wollo Zone, Ethiopia by Abraha, et al. (2019) for the purpose to examine the implementation status of general secondary school science teachers' GRP. The research was designed as a descriptive survey to achieve this. Teachers, department leaders, school principals, and students were the study's respondents, who were surveyed, interviewed, and participated in focus groups. Both qualitative and quantitative analyses of the gathered data were performed on which one sample t-test, mean value, standard deviation were implemented to analyze quantitative results through the questionnaires. Additionally, the information obtained through open-ended questions, an interview, and focus group discussions was examined using words, phrases, statements, and narrative. The findings showed that general science educators were following GRP guidelines. As a result, they determined that their teaching and learning practices were successful regarding classroom setups, language use, classroom interaction, and addressing sexual harassment in their teaching and learning practices. However, teachers were ineffective in developing gender responsive (GR) lesson plans, preparing and utilizing GR instructional materials, and managing gender related aspects of sexual maturation.

Likewise, a study on GRP practices conducted in Bhutan aimed to determine how teachers are aware of and incorporate GRP into their daily teaching and learning processes. On which researcher used non- probability convenient sampling techniques to choose respondent under mixed research design. Data were collected through test, observation, and interviews with teachers and were analyzed with the help of mean, SD, and one sample t-test. The result revealed that teachers were unaware and did not know anything about gender and GRP. Likewise, they paid less attention to language uses, classroom set up, classroom interactions, and textbooks uses (Dorji, 2020). Another study conducted in the same country also revealed that both teachers and students have challenges to understand gender in education and teachers were not gender sensitive in their pedagogical practices (Yuden et al., 2020).

In summary, it was noted that most of the latest reviews showed teachers have limited awareness and hence they have low level of GRP practice in classroom. In such a situation, they paid less attention to applying GRP in their teaching learning process. Hence, gender differences between boys and girls still remains in mathematics.

***Gender Stereotypes in Teaching Materials***

Family is the primary source for children to socialize into their gender identity. At the time of schooling, school and the curriculum become instrumental in socializing children into gender roles. If teachers, curriculum, textbooks, and school environment treated boys and girls differently, then it automatically reinforces the traditional gender roles. The formal curriculum is a strong tool which is implemented through textbooks and learning material (Dawar & Anand, 2017).

We use textbooks as one of the primary instruments of the teaching learning process. Since, for the vast majority of school-aged children, as well as for teachers, it remains the most accessible and affordable educational resource. Textbooks are vital for teachers and students but most of the textbooks reinforce gender stereotypes and gender biases (Dawar & Anand, 2017; Mattu & Hussain, 2003). It was also true in curriculum contents especially mathematics textbooks (Halai, 2010). Gender biased textbooks have been found worldwide but they are more in three regions such as Sub-Saharan Africa, South Asia, and Middle East/North Africa where, female enrollment falls behind, particularly in their poorest states (Blumberg, 2008). Additionally, Blumberg noted that Sweden is the only country where government efforts to eliminate gender bias from textbooks and curricula have clearly succeeded. Moreover, in textbooks, particularly those used in higher grades, rarely included female names and depicted female characters even less frequently in illustrations in mathematics textbooks. Notably, despite some male bias found in English textbooks, there was a comparatively fairer representation of females (Witenstein & Palmer, 2013).

Most of the African teachers thought that most of the textbooks which they used were gender biased. Even though, mathematics curriculum tends to be girl unfriendly and illustrations and activities on books tend to be male dominated

(Moletsane & Reddy, 2011). Gender biased teachers attitude as well as gender biased learning materials may decrease girls' achievement (Blumberg, 2008) in teaching learning process. The gender audit reviewed sample school's textbooks of Nepalese schools and found that most of the textbooks were free from harmful gender bias and avoid gender stereotypes, male and female presented in balanced manner (Terry & Thapa, 2012). Terry and Thapa also reported that Nepalese school's textbooks were made in assimilating gender sensitivity and dispelling negative gender stereotypes.

Every society has its own gender belief system and gender stereotypes; in their formal curriculum, men and women are depicted in the same light. When children join the school setting, the representations of men and women in books influence their conception of gender and, as a result, their own self-image, behavior, goals, and expectations (Dawar & Anand, 2017). In South Africa, school curriculum was found outdated, whereas subjects like handicrafts or humanities are offered for girls on the other hand technical subject like mathematics and sciences are offered for boys (Korenius, 2018). He also mentioned that school textbooks often depicted gender-stereotypical roles, presenting women in passive, traditional roles while portraying men as powerful and independent.

In India, National Policy on Education after 1986 called for a discarding of gender bias in textbooks, but most of the studies still found gender stereotypes and under representation of women in textbooks (Dawar & Anand, 2017). In addition, Dawer and Anand also explained that boys were shown free to travel different in places and collect different experiences where girls were shown as naive and lacking knowledge and there were large numbers of male actors in the texts. Also, textbooks in Tamil Nadu, girls were not given the same opportunities as boys for outdoor games and activities in school that required more physical exertion, teamwork, and competitiveness. Most of the countries like India, Pakistan, Afghanistan represented boys and girls in stereotypical ways in their textbooks; girls were found underrepresented in visuals texts, depiction in occupation, languages in text, jobs and overall representation of men and women (Dawar & Anand, 2017). These textbooks were being exposed to the message that boys are superior, and girls are inferior. In a study like Dewar and Anand's, it was found that more than half of the illustrations in primary mathematics textbooks featured only males, while only 6% depicted females (Benavot & Jere, 2016).

Most of the textbooks used in Sub-Saharan Africa were found to be gender stereotyped. Illustrations used in textbooks used boys and most named characters in textbooks were boys (Mlama et al., 2005). In Japan, the gender gap in primary and secondary schools was eliminated, but some still perceived persistent gender bias in textbooks as an issue (Blumberg, 2008). These large number of studies concluded that "textbooks have not adequately reflected the range of women's roles and occupations in the real world. In general, it seems gender biased images remain strongly present in school textbooks throughout the world" (Blumberg, 2008, p. 347). Similarly, gender bias was also found in school mathematics textbooks (grades 1-12) used in Palestine. Content analysis revealed that gender bias was reflected in names, actions (verbs), images, pronouns, and professions, showing a consistent male bias and male dominance in all these aspects (Karama, 2020). Hence in most of the countries, school textbooks were found gender stereotype in favor of male.

Gender stereotypical textbooks in favor of boy students are pertinent in maximum numbers. Such stereotypical mathematics textbooks impact students' especially girls' motivation, engagement, and participation in learning mathematics.

**Gender Differences in Mathematics Performance and Achievement**

Gender differences have been received as serious problems in mathematics all over the world. Tiedemann and Faber (1994) as cited in Tiedemann (2000) found no gender differences in mathematical performance at the preschool level. Although, at the first grade, gender differences in mathematics performance are found (Ding et al., 2006). Other studies have suggested that gender differences are found in Junior high school (Benbow, 1988). Large research studies have found no gender disparities in mathematics performance at age nine, minimal differences at age thirteen, and larger differences at age seventeenth and hence, larger gender differences are found in higher education (Burns, 1998). These gender differences are observed in abilities, interests, self-confidence, motivation, and overall classroom participation in mathematics.

A vast literature has shown gender differences between boys and girls, with boys generally excelling in mathematics and girls performing better in languages (Asante, 2010; Golsteyn & Schils, 2014; Guimond & Roussel, 2001). Such gender differences mostly remain in higher level mathematics (Asante, 2010). Although most studies have shown that boys tend to be more successful than girls in mathematics (e.g., Fryer Jr & Levitt, 2010; Stoet & Geary, 2013). These results indicated that gender differences started from primary level and extended up to higher level in mathematics. In contrast, a study conducted in the USA found no gender differences in the mathematics test scores and grades of middle and high school students (Hyde et al., 2008). Another study revealed that mindful learning impacts gender differences in mathematics. When mindful learning was not encouraged (absolute instruction), boys performed better than girls, but boys and girls performed equally well when mindful learning was encouraged (Anglin et al., 2008). Whereas contrast results found in national and international studies of Turkey, no mean differences in mathematics achievement based on gender at primary and higher level (Bulut et al., 2010). Whereas contrast results showed by different research studies as no gender differences in mathematics achievement score between boys and girls (e.g., Bulut et al., 2010; Chiesi & Primi, 2015, February; Else-Quest et al., 2010; Lindberg et al., 2010).

In recent years, significant progress has been found in girls' participation in school education. According to UNESCO (2017), by the year 2000, female enrollment in school education had been increasing worldwide across all levels, achieving gender parity in 2014 across all educational levels. Significant advancements were also observed in higher education during this period. In higher education, female's enrollment was almost doubled between the year 2000 to 2014. In the context of Nepal, similar version reported in flash report 2077 that more girls than boys enrolled in all levels of the secondary education in community schools, but significantly more boys than girls enrolled in Institutional schools and hence gender parity has been achieved at all levels in school education (MOE, 2021a). Moreover, in secondary education regional differences were found "more boys than girls complete lower and upper secondary education in South and West Asia, sub-Saharan Africa and the Arab States while the opposite is true in Latin America and the Caribbean" (UNESCO, 2017, p. 18).

Some studies have also observed gender differences in higher performing students. For instance, Ganley (2018)have investigated the greater gender differences among higher performing students rather than lower or average performing students. Among math students, boys tend to perform better than girls. Similarly, researchers found that on name-blind math tests, girls often score higher than boys, but teachers award higher scores to boys when they recognize boy and girl names on the same tests (Chemaly, 2015). Gender differences between boys and girls are also found in specific intelligence factors. A meta-analysis of Hyde (2005) as cited in Golsteyn and Schils (2014) found that "adolescent girls perform better in perceptual speed and verbal tasks, while boys perform better in mental rotation and math tasks" (p. 4). A girl's mathematics performance may also influence through the teacher's gender. The lack of female role model influences the performance of girls in mathematics (Mbuoben, 2018).

The gender Audit by Terry and Thapa (2012) asserted that gender balance in school enrollment has been achieved, with girls showing better rates of advancement, lower dropout rates, and higher survival rates in primary education compared to those of boys. Additionally, there was little evidence of gender differences in grades 5 and 8 results according to district of examination (DoE) statistics from 2008 national level exams. These results indicate that boys perform slightly better in mathematics, while girls show a marginal advantage in English and Nepali. However, the average scores for both girls and boys in Science, Environment, and Social Studies were the same. In a similar manner, the 2006 PISA assessment across OECD countries revealed that girls outperformed boys in reading, whereas boys generally surpassed girls in mathematics. Nonetheless, girls were ahead of boys in all 30 OECD member countries (Tembon & Fort, 2008). Additionally, they found that boys were overrepresented among top performers, while both girls and boys showed similar performance levels among the low performers in mathematics. Similar results have been found in PISA assessment 2015 that in most of the countries boys outperformed girls in mathematics on which differences were varied from country to country (Gurria, 2016). Similarly, PISA result 2018 showed that girls significantly outperformed boys in reading whereas boys outperformed girls by five score points in mathematics (Organization for Economic Cooperation and Development [OECD], 2019). This data indicates that gender differences are still found in mathematics in favor of boys. Therefore, both from a policy perspective and within classroom practice, gender difference in mathematics performance between genders have been noted.

In Nepal, NASA results 2012 of grade III indicated that there were no statistically significant differences in achievement scores of mathematics between boys and girls in any content areas, whether in community or institutional schools (ERO, 2015a). A comparable outcome was reported in NASA's 2015 findings, indicating that there were no statistically significant differences in mathematics achievement between boys (45.29%) and girls (45.30%) at Grade III (ERO, 2016). However, at grade V, NASA results 2012 showed significant differences between boys' and girls' mathematics achievement scores. Compared to the dataset of 1999, the difference between boys and girls had narrowed somehow radically though boys still outperform girls (ERO, 2015a). Similar findings were reported in the 2015 NASA results of Grade V, where a statistically significant difference in mathematics achievement was observed between boys (49%) and girls (48%). Moreover, NASA result 2018 of grade V still showed statistically significant gender differences between boys and girls, but the differences were very narrow in mathematics (ERO, 2019). It has been observed that boys outperformed girls in all content areas of mathematics (ERO, 2016). Moreover, NASA 2012 scored significantly higher (60%) compared to NASA 2015 (44.6%). This shows students achievement was in decreasing way from 2012 to 2015. Similarly, the 2018 NASA results for grade V revealed that boys outperformed girls in mathematics by a margin of 2 scale pointe, indicating a very narrow difference between boys and girls (ERO, 2019). The analysis of these results of grade III and V indicated the positive signal to gender parity at lower basic level in mathematics in Nepal.

The NASA result 2011 of grade VIII observed a statistically significant differences in mathematics achievement scores between boys (45) and girls (41). Although boys outperformed girls across all content areas of mathematics, but the differences were not remarkable. According to ERO (2015b), NASA results 2013 showed same results as 2011, but average score of boys was 38% and girls were 33%, which is lower than NASA result 2011. Hence, student's mathematics achievement in NASA 2013 was found 8% lower than 2011 results in all content areas. Additionally, the 2013 NASA results, when compared with TIMSS data, indicated that Nepalese students were underperforming in mathematics (ERO, 2015b). Likewise, NASA results 2020 of grade VIII, mathematics' average score of girls were worse in compared to boys and the differences were also statistically significant (ERO, 2022). These data indicated that with the increase in years, both boys' and girls' achievement scores decreased at grade VIII. On the other hand, when grade increases students (boys and girls) achievement and performance decreases in mathematics. That's why gender differences at secondary and high level were found greater than previous level in mathematics.

On the contrary, a study conducted in Malta involving 400 grade XI students found that girls performed significantly better than boys in mathematics tests (Bezzina, 2010). Similarly Gurung (2016), conducted the survey study among 5965 primary level students of Pokhara Sub-Metropolitan of Kaski district. The annual examination records of the years (2008-2012) were analyzed through descriptive analysis and t-test. The survey results indicated that girls have consistently outperformed boys at the primary level over a five-year period. Additionally, the study also found no statistically significant correlation between the teacher's gender and the students' academic performance.

McGraw et al. (2006) analyzed mathematics data from 2003 National Assessment of Educational Progress (NAEP) in mathematics and revealed that small but persistent gaps still in favoring boys. Although the average scale scores for both boys and girls have improved, the gender gap in mathematics still persists. In addition, boys scored significantly higher on average than girls at the fourth and eighth grade in 2003 and in 2000, at twelfth grade levels. Moreover, the results also revealed that girls were less likely to study mathematics and were less confident or not believed in their mathematical abilities as compared to the boys (McGraw et al., 2006).

Similarly, Frenzel et al. (2007) reported that although boys and girls received similar grades in mathematics, girls reported significantly less enjoyment and pride compared to boys. Girls expressed more anxiety, hopelessness, and shame, and similarly, they experience significantly greater feelings of anxiety, helplessness, and stress in mathematics classes compared to boys (Frenzel et al., 2007; Schleicher, 2008). Females typically do not outperform males in mathematics and consistently show less interest and enjoyment in the subject. They also tend to have lower self-related beliefs, and experience higher levels of helplessness and stress in mathematics classes (Schleicher, 2008).

Gender differences are also found in students' confidence level in mathematics. One of the studies examined the gender differences in mathematics confidence, interest, and performance and also their relations with 7040 students from grade 3-8. The results indicated that in elementary school, larger gender differences are found in math confidence rather than in interest and achievement (Ganley & Lubienski, 2016). The previous math performance predicts later math confidence and interest. Typically, early gender differences in math interest leads to disparities in math performance and outcomes in later on. However, a study suggested that math interventions for girls should begin early and focus on building math confidence to improve their achievements (Ganley & Lubienski, 2016). Boys may feel more motivated to study mathematics due to the belief that it will be beneficial for their future career opportunities. Hence, gender differences have been found in motivation rather than interest between boys and girls in mathematics (Schleicher, 2008).

Since boys were found to be more confident than girls of their ability to learn mathematics but in terms of enjoyment there were no significant differences found according to gender (Kaiser, 2005; Kaur, 1995). Likewise, Kaur (1995) expressed that boys significantly outperformed girls on mathematics test of junior college students and both believed that males would do better in mathematics, although Kaiser explained that girls surpassed boys in English language comprehension and communication explained. Students' achievement score also depends upon teacher's gender. Likewise, Halai (2010) reported that "students of male teachers had significantly higher achievement scores in mathematics than students of female teachers in the same grade" (p. 51).

Previous research studies have shown that boys outperformed girls in mathematics. There is variation in gender patterns among different countries. In a study, Vassiliou (2010) showed different gender outcomes between Irish PISA in 2003 and to the Local Irish Junior Certificate Mathematics Examination. In PISA, boys have generally outperformed in overall, related to specific content areas, such as Space and Shape, which were not covered in national level test. Additionally, boys tended to excel more in high-level mathematical proficiency, multiple-choice questions, and showed greater self-efficacy and lower anxiety about mathematics compared to girls. These results concluded that better performance in local test was due to differences in test content and test construction.

There was a study conducted in Nepal measuring the mathematical thinking and achievement. The study found no significant difference in mathematical thinking and achievement between males and females. However, it did reveal a significant difference between students from rural and urban areas (Nepal, 2016). In contrast, there was significant gender differences between girls and boys. Whereas girl students have poor performance and achievement in mathematics in comparison to their boys counterparts at secondary level (Simegn & Asfaw, 2018). Moreover, they found that there was significant gender difference in student's mathematics achievement at secondary level. Similarly, Asante (2010) found that in Ghana, there were significant gender differences in mathematics performances in favor of boys. It showed that high school boys outperformed girls in mathematics performance.

Moreover, Mutai (2016) conducted a cross-sectional descriptive survey design and employing correlation methods to explore gender differences in mathematics achievement levels between girls and boys. The subjects of study were 430 students and 18 teachers at secondary schools of Bureti Sub County, Kenya. They conducted surveys with the help of mathematics' questionnaire for both teachers and students and mathematics achievement test for students. The study revealed that boys' schools outperformed girls' schools, with boys showing a greater interest in mathematics. It also found that teacher and school factors had minimal impact on mathematics achievement concerning gender. Similar results have been found by Hughes-Isley (2015) in the United States, showing a statistically significant difference in remedial mathematics achievement between male and female students. The male student at community college performed higher than the females on achievement of Mathematics.

In summary, most of the previous research shows boys outperformed girls in mathematics achievement and performance. But no conclusive findings can be drawn for the students' enjoyment in the learning mathematics.

**Gender Differences in Mathematics Content Selection**

Both boys and girls were motivated to pursue mathematics, due to their personal goals, such as becoming mathematicians, achieving high score in exam, becoming engineer, securing good jobs, or becoming mathematics teachers. There is gender differences found between girls and boys performing some specific units of mathematics. Gender differences have also been found in mathematics according to comprehension, problem solving and contents within content area.

In Hong Kong, girls excelled boys in manipulation problems, while boys performed better than girls in geometry and excelled in comprehension, as well as solving both routine and non-routine problems (Cheung, 1989). The meta-analysis also showed that narrow gender differences were found in favor of boys in complex problem solving (Leder, 2019). Moreover, girls are superior to the less complex computational tasks and boys favor handling more complex problem solving (Hyde et al., 1990). In geometry problem, boys perform better, and girls are better on algebra problems (Gallagher et al., 2002; Hyde et al., 1990). But opposite results have been found on national student data that gender differences in mathematics performance were not found until 12th grades, especially in geometry (Leahey & Guo, 2001). They added that by 12th grade, slight gender difference found in Geometry performance in favor of boys.

According to NASA's 2013 results, students demonstrated stronger performance in lower-level cognitive skills, but showed weaker abilities in higher-level cognitive skills. They were capable of basic calculations but had difficulties with reasoning, problem solving, proving theories or formulas, and constructing shapes and figures (ERO, 2015b). They were good at recalling types of questions and comprehension rather than practical problems. Likewise, according to Amelink (2009), girls favor mathematics courses that involve computation, reading graphs, and algorithmic problem-solving. Even though, boys favor arithmetic tasks that involve word problems, visual spatial skills, problem solving, reasoning, proportionality, measurement, and tasks that don't require an immediate formula (Okan & Arican, 2020). Moreover, girls perform better in mathematics that has direct applications as well. Likewise, they reported that boys performed better than girls across a variety of mathematical content areas, such as number, geometry, data, and chance.

Moreover, gender differences were found in mathematical content preferences, especially girls preferred algebra and calculus related content, while boys preferred geometry (Uwineza et al., 2018). In the same way, boys perform better than girls in probability and geometry area (Bulut et al., 2010). Additionally, Uwineza et al. (2018) conveyed that boys prefer mathematics units requiring reasoning to strengthen their confidence, whereas girls prefer mathematics units that only require the application of formulas. Additionally, boys tend to perform better than girls in more challenging areas of mathematics, such as complex problem-solving. However, there are fewer gender differences in basic numerical abilities between boys and girls (Ganley & Lubienski, 2016). Similarly, boys tend to have slightly stronger spatial reasoning skills, which are essential for solving advanced mathematical problems. Likewise, boys perform better in arithmetical or numerical tasks, whereas girls do better in language oriented mathematical tasks. Boys excelled in numerical or arithmetical tasks whereas girls demonstrated stronger performance in language usage (Le Grand, 2015). The TIMSS 2015 data also revealed that at grade IV level, boys performed better in number items in 21 countries, but girls performed better mean score in only seven countries. Likewise, boys had higher average scores than girls in geometric shapes and figures in 14 countries, while girls mean score was higher than boys in nine countries (Leder, 2019). In addition, she added that at grade VIII, boys achieved higher average score than girls in 17 countries, whereas girls outperformed boys in only four countries. However, the situation was reversed in Algebra content area, where boys did not surpass girls in any country, but girls performed better than boys in 21 countries. Furthermore, in Geometry domain, boys surpassed girls in only two countries, while girls excelled over boys in eight countries. These data revealed that boys performed better in Geometry, whereas girls did better in Algebra domain in mathematics.

According to NASA results 2012 for grade III, students performed worse in Algebra (40%) than in Arithmetic (61%) and Geometry (60%) areas, while comparing to international assessment students' average proficiency of III grader was lower than TIMSS standard (ERO, 2015a). Additionally, NASA results 2012 indicated that students of grade V were below average (53%) in Numeracy (44%) and Algebra (49%), whereas they were above average in Geometry (57%), and Arithmetic (54%). It was also evident that the differences between the content areas were wider in community schools in compared to institutional schools. The data revealed that in both grades (3 and 5), better performance was found in Geometry and Arithmetic in comparison to Algebra and Numeracy.

At grade VIII, mathematics test included five content areas rather than four content areas in grade 3 and 5. According to NASA results 2011 of grade VIII, students' performance was weaker in Geometry (37) and Sets (38), below than national average (43) but they performed better in Arithmetic (49), Algebra (48), and Statistics (48). In addition, in comparison the performance of students of the year 2011 was weaker than the year 2008 (ERO, 2013). Moreover, little bit differences have been found in NASA results 2013 of Grade VIII, students were weaker in Algebra (28%) and Geometry (34%) in mathematics, below than national average (35%), whereas remaining three content areas, students' score were greater than national average (ERO, 2015b). In addition, the 2013 NASA results revealed that students of grade VIII performed well in fundamental operations, such as basic data and numbers manipulation, and few steps calculations, but they were very weaker "in reasoning, problem solving, plotting, proving the theory or formula, and constructing the shapes and figures" (p. 42). In comparison to NASA 2011, in all content areas the achievement level of students in 2013 was lower, the gap was wider in Algebra (ERO, 2015b). The dataset of 2013 showed that instead of improving students' performance, decreased in each content area in compared to NASA results 2011. In addition, comparison of achievement score of NASA 2013 with TIMSS revealed that in all the content areas, Nepalese students were unable to reach the international standard in mathematics.

Since, at the lower basic level, students' performance was better in Geometry in comparison to Algebra, but the upper basic level contrast result found that students showed better performance in Algebra and worse in Geometry. These data showed that whether the grade level increases, the students' performance in Geometry decreases which indicates that leads students to be less motivated to learn mathematics, especially Geometry.

Summarizing the above findings, it can be learnt that boys and girls tend to prefer mathematical content area more closely to their characteristics according to their own gender and can do better in respective fields of mathematics. Gender differences in mathematical content preferences have been found from the above-mentioned research. Boys mostly better preferred in higher ability level mathematical content like as Geometry and problem-solving type mathematical contents whereas girls mostly better preferred in Algebra and computation type mathematical contents.

**Teacher's Beliefs and Attitudes on GRP**

Teacher's beliefs, attitudes as well as their behavior of both them and their students may affect students' interest and attitude towards mathematics subjects. Teacher attitude towards mathematics may impact student's attitude and their performance in mathematics. Anthony and Walshaw (2009) stated:

> Teachers are the single most important resource for developing students' mathematical identities. By attending to the differing needs that derive from home environments, languages, capabilities, and perspectives, teachers allow students to develop a positive attitude towards mathematics. A positive attitude raises comfort levels and gives students greater confidence in their capacity to learn and to make sense of mathematics. (p. 8)

Hence, most of the teaching and learning process depends on teachers' behaviors and attitudes. A teacher's attitude and belief play an important role in shaping the classroom practices (Bolhuis* & Voeten, 2004). Another research study found that positive the teachers' attitude towards mathematics teaching, positive the attitude of students to study mathematics and vice versa (Mensah et al., 2013). The study also revealed a positive correlation between students' attitude and their performance, as well as teachers' attitude and students' performance in Mathematics, these play crucial role in enhancing students' learning. Similar results have been found in another study that student's achievement and attitude towards mathematics were significantly correlated on which male students have slightly strong positive correlation than females in both grade 10 and 12 (Simegn & Asfaw, 2018).

Teachers play a very important role for effective classroom teaching learning activity. Rather than what they teach in classroom, how they teach, behave, belief and interaction with their students play the crucial role in the teaching process (Odiri, 2011). It is a fact that most teachers in Nepal believes that in comparison to boy student, girl students as incompetent, lazy, submissive, and less intelligent (Bista, 2004). More presumptions were made regarding girls' academic performance and their shyness, that they are shy, hesitant to give answers, and have low self-esteem (Nabbuye, 2018). Similarly, society also believes that girls are less mathematically capable than boys and have stereotype that girls just can't do math (Bulut et al., 2010). Similarly, Dano (2015) reported that this male dominated attitude would enhance long lasting effects on the educational choices made by girls in future. This study also indicated that self -concept and self -efficacy of students impact the choices of subject as major. In classroom, if girls feel themselves performing worse than boys, they will see their abilities as inferior in front of boys and generally carry this feeling in future when choosing mathematics subject (Dano, 2015). A teacher's positive or negative attitude or feeling is important for encouraging girls for further study. Students' negative attitude towards mathematics would be a serious problem for shaping learning in mathematics.

Secondary level students' mathematical ability and beliefs vary due to gender. Especially, at grade X, boys are more likely than girls to have a growth mindset and view their mathematics abilities to be stronger than do girls (Perez-Felkner et al., 2017). Girls themselves underestimate their ability in learning mathematics. Not only students, but teachers also underestimate girl's ability in learning mathematics. According to Sarouphim and Chartouny (2017) after interviewing teachers, they perceived mathematics as a male-dominated subject and believed that boys' success was primarily due to high ability and intrinsic motivation, while girls' success was attributed to their effort and teacher assistance. On the other hand, boys' failures were attributed to a lack of effort and intrinsic motivation, while girls' failures were ascribed to the poor ability, whereas boys also perceived "mathematics to be more important than girls do" (Samuelsson & Samuelsson, 2016, p. 29).

The attributional gender bias existed with teachers, parents, and even students themselves. They reported that girls' success in mathematics to effort, while boys' success to ability, whereas girls' failures due to a lack of ability, on the other hand, boys' failures due to lack of effort (Dickhauser & Meyer, 2006; Espinoza et al., 2014; Fennema et al., 1990; Swinton et al., 2011; Tiedemann, 2002). In addition, Fennema et al. examined the teacher's beliefs about mathematical ability. When these researchers asked teachers the name of the two most successful students in their class, teachers identified males as their first choice 79% of the time and females as their second choice 58% of the time. Teachers also believed that their best male students were more competitive, logical, and willing to volunteer answers to mathematics problems more frequently. Additionally, they perceived these boys as having a greater enjoyment of math and being more independent compared to their best female students (Fennema et al., 1990). Additionally, teachers often hold gender stereotype beliefs that boys are more talented and creative in mathematics than girls.

In classroom, girls found discriminating behavior by teachers, which affects their further teaching learning activities. A study conducted by Robinson et al. (2011) utilized nationally representative data from the Early Childhood Longitudinal Study, Kindergarten Class of 1998-99. The research revealed that teachers rated girls lower than boys, despite both having similar mathematics test scores. It also found that teachers' stereotypical beliefs about girls' math abilities negatively affected the girls' mathematics performance. In addition, they reported that, "if teachers did not believe that boys had higher math proficiency than similar girls, then girls would lose about 40-75% less ground in math achievement in each period examined" (p. 5). Sometimes, teachers are guided through their perceptions towards student's abilities and accordingly they assign roles, engage their students, and teach in the classroom (Nabbuye, 2018). Nabbuye additionally stated that teachers create a variety of assumptions about girls' abilities, such as that they are timid, afraid to answer of questions, having low self-esteem, powerless and disempowered. GRP helps teachers to overcome through their bad perceptions and biases in the teaching learning process.

Teachers can convey their messages about their attitudes inadvertently, often without recognizing that their views and attitudes may be biased. There is one of the stereotypes still exists which reflects that boys are stronger in mathematics than girls. Due to such male-oriented culture many females were pushed out of taking STEM subjects and their preferences against STEM fields (Cho, 2018). Such type of stereotype initiates teachers to overestimate mathematical potential for boys and underestimate mathematical potential for girls (Goodell & Parker, 2001). Teacher's gender stereotypes affect girls' performance and their beliefs and motivations towards mathematics. For instance, Carlana (2019) revealed that when girls were assigned by strong gender stereotypes then there increases gender gap in mathematics performance that cause girls to have lower self-confidence and low expectation about her own math ability.

Female teachers become the role models for girls and their thinking, attitude and perceptions towards mathematics become powerful indicators for girls. Moreover, maximum female pre-service teachers didn't feel capable or confident mathematics student in their 12 years' school experiences. Many of the pre-service teachers themselves seemed to suffer from mathematics anxiety and have low confidence in mathematics (Stoehr et al., 2017). For instance, teachers' gender stereotypes influence girls high-school track choice and persuade low performance in math (Carlana, 2019).

That's why students' confidence would impact their carrier choices in future. Both male and female students did not have confidence in their performance while doing and practicing mathematics (Simegn & Asfaw, 2018). Furthermore, Stoehr, et al. added that students who have more confidence in their mathematical ability, they are more likely to take classes related to mathematics that emphasizes to choose carrier in this field. We found most of the girls feel low confidence in mathematical ability. Female teachers' perceptions of their own competence in teaching mathematics have a powerful effect on girls, and these perceptions seem to diminish at higher levels of education (UNESCO, 2017). According to studies, female teachers are more confident than their male colleagues when teaching in primary schools, but by the time they reach in secondary school level, their assurance and confidence has considerably decreased (Jensen et al., 2016). On the other hand, boys have high confidence in their ability, they feel that they do group work in mathematics classroom more often than do girls. In addition, they observe that they exert more influence on the content and are more actively involved in the classroom during lessons compared to girls (Samuelsson & Samuelsson, 2016)

The parents and teachers own mathematical anxieties and their beliefs about mathematics obviously influence their children's math attitudes (Gunderson et al., 2012). Many of the mothers do not feel confident towards their daughters' mathematical ability and they do not expect girls to excel in mathematics (Stoehr et al., 2017). According to Beilock et al. (2010) the research about on mathematics anxiety revealed that both pre-service education students and in-service elementary school teachers consistently report higher levels of mathematics anxiety compared to individuals in other fields. They also explained that high levels of mathematical anxiety can affect the female students' mathematical achievement that develops due to their self-concept. Therefore, adults who experience high levels of mathematical anxiety often have a low self-concept in their mathematics learning.

On the one hand, students' attitude also differs due to gender in mathematics. There were differences in attitudes toward mathematics between boy and girl community college students. It also found that boys had a significantly greater scores in motivation and self-concept compared to girls, while girls scored notably greater in anxiety. Additionally, males scored higher than females in both enjoyment and perceived value of mathematics, although these differences were not statistically significant (Hughes-Isley, 2015). Similar results had been found that both gender group of students were not enjoyed for doing mathematics on which females enjoyment attitude for tackling mathematics were less than males (Simegn & Asfaw, 2018). Simegn and Asfaw also added that both male and female student had positive but medium attitude towards mathematics. Another study revealed some changes on the attitude between boys and girls that there were no significant gender differences in mathematics, even though both of them held positive attitudes towards mathematics (Sarouphim & Chartouny, 2017).

Furthermore, the impact of teachers' gender role stereotypes on their perceptions of students' mathematical abilities was observed. Teachers' perceptions were influenced by gender stereotypes for average and low-achieving students (both boys and girls), but not for high-achieving students (Tiedemann, 2002). Since girl students have higher reported belief about boys' ability that boys are naturally better at mathematics (Beilock et al., 2010). But boys' beliefs were different than of girls, boys have higher level confidence in their mathematical abilities. In addition, in regard to female teachers, girls are more influenced by female teachers and needed more support and encouragement with them.

A survey study that analyze the belief of teachers, parents, boy and girl students, mathematics coaches about gender stereotyping and concluded that boys, fathers, teachers, parents of sons and non-coaching mathematics teachers were gender-stereotyping on the statements mathematics as a 'male domain', rather than girls, mother, parents of daughters, and mathematics coaches (Leedy et al., 2003). In a similar manner, teachers have gender stereotyping belief as 'mathematics as a male domain' in addition they feel boys have high mathematical capability rather than girls and they have higher expectations and positive attitudes towards male students (Li, 1999).

Moreover, Ghosh (2004) conducted a study involving two high school teachers to explore gender differences in mathematics education. The study concluded that both male and female students in math courses were treated differently by their teachers due to their gender. Some of the beliefs identified were: (1) female students with lower mathematical abilities in mathematical abilities tend to exert more effort than their male peers; (2) girls are perceived as more emotional than boys; (3) girls are considered less competitive than boys; and (4) girl students in advanced courses are viewed as less confident than boys. However, these studies also noted that such beliefs about gender differences do not always reflect in teachers' classroom practices and interactions.

Similarly, other studies by Frenzel et al. (2007) found gender differences among girls having considerably more negative emotional patterns towards mathematics than boys. The emotions and beliefs of 1,036 males and 1,017 females of fifth graders were studied. The results showed that although girls and boys received similar grades in mathematics, girls reported significantly less enjoyment and pride, and more anxiety, hopelessness and shame compared to boys. The findings suggested that these emotional patterns of girls were related to their lower beliefs in their mathematical competence and the value they place on the subject, despite their high personal achievement goals. Multiple-group comparisons indicated that the structural relationships between these variables were largely consistent across genders.

Moreover, teacher's attitude and their teaching methods influenced student's attitude towards mathematics. The teacher's positive attitude developed student's confidence that causes positive attitude towards learning mathematics (Mensah et al., 2013). Since a teacher's behavior, attitude, belief, and classroom climate automatically influences s student's achievement. Effective teachers play a crucial role in enhancing students' learning. They support learning mathematics by focusing on students' engagement and creating a positive learning environment (Mensah et al., 2013). Likewise, parents, social environment as well as their motivation and peer group also influence their learning. It concludes that the teachers and students' positive attitude towards mathematics increased students' high achievement in mathematics.

Chionidou-Moskofoglou and Chatzivasiliadou-Lekka (2008) were interviewed with ten primary teachers (5 males, 5 females) about gender and mathematics education. Most of the teachers believed that girls require more explanations rather than boys during learning, as girls feel more hesitation for asking questions when they do not understand something. They became afraid because their peers would insult or make fun of them. Most of the teachers believed that boys generally excel in mathematics and hold higher expectations from boys' mathematical performance compared to girls because most mathematical questions were developed addressing boys rather than girls. This study also reported that teachers believed most of the girls did not perform well in mathematics, but they had higher expectations for both high-performing boys and girls. Moreover, there were stereotypical belief that boys were inherently 'better' 'talented' and 'brighter' at mathematics and do better in mathematics than girls (Chionidou-Moskofoglou & Chatzivasiliadou-Lekka, 2008; Halai, 2010), while girls are considered well-behaved and hardworking, which contributes to their success in mathematics (Halai, 2010). In addition, boys have higher self-esteem about their mathematical ability, although girls feel mathematics boring. But another study found that fourth grade girls liking and enjoying mathematics more than boys (Gugliotta, 2010). Similar versions have been found in another study that boys perceived themselves as more talented than girls, even though they have similar performance on the test, they also planned to pursue higher levels of mathematics more frequently than girls (Watt & Bornholt, 1994).

Glock and Klapproth (2017) conducted a study to examine the implicit and explicit attitudes of 82 elementary and 82 secondary school teachers toward male and female ethnic minority students. They discovered that teachers generally held negative attitudes toward ethnic minority students, regardless of gender. However, elementary school teachers were implicitly more negative toward boys, but more positive toward girls. On the other hand, opposite results have been found for secondary school teachers, they had implicitly more negative attitude towards girls. This result indicates that elementary and secondary school teachers had different attitudes due to genders and shows that teachers had negative feelings towards girls at secondary level. In addition, secondary school teachers showed noticeably enthusiasm for teaching ethnic minority girls compared to boys, while elementary school teachers showed greater enthusiasm for teaching ethnic minority boys than girls. In case of secondary school teachers' implicit attitude, similar results were found as teachers had more negative attitude towards girl's ethnic minority students more than boys, while explicitly teachers favored girl's ethnic minority students (Kleen & Glock, 2018). This study found teachers implicit and explicit attitude towards boys and girls were not dependent on teacher's gender.

Teachers serve as role models, and female teachers often experience higher levels of mathematics anxiety than their male teachers, which can influence on student learning. Moreover, as demonstrated by Beilock et al. (2010), elementary female teachers who are anxious about mathematics may affect the math achievements of the girls in their classrooms. According to Stoehr et al. (2017), many pre-service teachers had encountered feelings of embarrassment, failure, humiliation, shame or difficulty while learning mathematics during their K-12 school education. A study by Levine (2013) reported that when pre-service elementary teachers' confidence was increased for teaching mathematics then their mathematics anxiety was reduced. This study further noted that prior to the course, males exhibited higher confidence than females in mathematics. However, after implementing the course, both male and female participants reported increased confidence, with females showing greater improvements. By the end, there were no significant gender differences in confidence observed between them.

In summary, it can be learnt that teacher's positive attitude and motivation towards mathematics enhanced their students' motivation for learning mathematics. Teachers' gender awareness plays a vital role in teaching and learning process. Due to different types of violence (overloaded contents, overloaded household work, misbehaviors, poverty, etc.) against girls' characteristics left them behind boys. Teachers should provide responsibility to do mathematics according to their individual differences, taking account of their specific learning needs. Teachers should let them think, reason, and respect their answers.

## Gender-Wise Participation and Interaction in Classroom

Gender responsive classroom participation and students' interaction in mathematics classroom play vital role for achieving good performance in mathematics. These two themes participation and interaction inherently acknowledge gender friendly learning and ultimately for obtaining GRP practices in classroom.

### *Gendered Classroom Participation*

Teachers have truly carried their students' work hard at developing trusting classroom communities. Likewise, according to Anthony and Walshaw (2009), teachers ensure that their classrooms maintain a strong emphasis on mathematics and set clear expectations for what their students can achieve. Anthony and Walshaw further stated:

> Teachers have to create a harmonious environment by respecting and valuing mathematics and the cultures that students bring to the classroom. Teachers avoid the kind of caring relationships that encourage dependency. Rather, they need to promote classroom relationships that allow students to think for themselves, ask questions, and take intellectual risks. (p. 7)

In lower secondary education, the gender gap in participation becomes more apparent in STEM. UNESCO stated students' that gender differences have been seen in participation of STEM subjects at the time of subject selection; more boys have taken mathematics subject as major rather than girls at secondary education. UNESCO also explained that the TIMSS 2015 results indicated that, in most countries, the majority of boys were enrolled in advanced mathematics courses compared to girls. Whereas, girls loss their confidence and feel less interest towards mathematics (UNESCO, 2017).

A large number of research studies have examined the classroom participation is based on gender. Boys and girls have got different opportunities to receive gender attention, talk and to display knowledge according to gender. In the context of Nepal, due to the different factors—social, economic, educational, physical, there exists gender disparity between male and female students. Nepalese society is structured male dominated hence our mathematics classroom influenced by male domination cause females to have poor participation in mathematics classroom (Panthi & Belbase, 2017).

The gender gap is especially pronounced in students' attitudes and participation (Hall, 2012). Most of the studies generally accepted that classroom participation based on gender, boys receive more attention from their teachers than do girls (Becker, 1981; Bista, 2004; DeBare, 2005; Hulley, 2001; Renne, 2001). Hall also expressed males generally have much more positive attitudes toward mathematics, greater confidence in their mathematical abilities, and higher levels of participation compared to females. One of the studies done by Sadker and Sadker (1994) found that boys' participation was valued more than girls' participation. Likewise, boys were more often praised, corrected, assisted, and criticized, while girls typically received only the most superficial 'Okay' reaction, one that packs far less impactful responses.

In Norway, when the participation of girls and boys in classroom were examined across four grades (1st, 3rd, 6th, and 9th) it found that boys participated more often in all grade levels of both male and female teachers' classes compared to girls (Gr∅ ver Aukrust, 2008). In the first grade, the difference between boys' and girls' participation was the least, and greatest in the ninth grade. Furthermore, there was no significant difference in boys' participation in classes taught by either male or female teachers, whereas girls participated more often in female teacher's classes than in male teachers' classes (Bista, 2004; Gr∅ ver Aukrust, 2008)

In most of the developing countries, boys mostly outperformed girls in mathematics (Moletsane & Reddy, 2011). In developed countries, it found gender differences in mathematics. In most of the developed countries (United States, Australia and New Zealand), there were significant gender differences in students' attitudes toward mathematics across all grade levels. In these countries, boys' participation in mathematics classes was significantly higher than that of girls, and this trend continued at the university level (Hall, 2012). Similarly, in England, fewer girls than boys participated in post compulsory mathematics, although numbers were going to increase towards mathematics. Teachers have strong expectations, even pressure on students, and a strong culture of encouraging students especially boys for choosing A-level mathematics. On the other hand, they had not involved for specific initiatives to motivate, encourage and to attract girls towards mathematics (Smith & Golding, 2017).

Different factors impact girls' low level of participation in mathematics. In this manner, Mandina et al. (2013) examined the factors limiting female participation by applying descriptive survey research design. The study's results revealed that various factors contribute to the lower participation of females in mathematics, including the perceived difficulty of the subject, lack of self-confidence, anxiety, negative attitudes, stereotypes about girls' math abilities, cultural beliefs that view mathematics as a male domain, and limited awareness of career opportunities in mathematics. Likewise, different barriers such as domestic issues and responsibilities, culture, and stereotyping knowledge and skills emphasize low participation of girls in SMT subjects (Iwu & Azoro, 2017).

In most of the African schools, the number of girls increases between grades I-III than boys but from grade IV the number of girls started to decrease due to different reasons "including sensitivity to negative language used by teachers, classroom issues of over enrolment and fewer resources, lack of respect by teachers and cultural influence" (FAWE, 2015, p. 7). In addition, gender discrimination in favor of boys was found, teachers gave difficult assignment and instructions only to boys than girls. The classrooms were male dominated, boys obtained more opportunities to participate in classroom activities such as in presentations, in preparing materials for classroom instructions and leadership positions. To improve the participation and performance of girls, Mbuoben (2018) recommended that "while school administration and other stakeholders in education work hard on making the pedagogy for secondary school mathematics gender sensitive, there should be heavy emphasis to expose students in secondary schools to female mathematics role models who will motivate their participation in mathematics and consequently improve their performance in the subject" (p. 2238). Similarly, National policies can help to maintain participation of students, especially girls, in mathematics. But a survey administered among 735 teachers in African countries found that about half of the teachers were unfamiliar with the policies and strategies that guide gender equality or promote participation of girls in mathematics (Moletsane & Reddy, 2011).

Summarizing the above findings, it can be learnt that in all types of countries, gender differences in participation in favor of boys emerge when mathematics is optional and are more advanced in higher level in advanced mathematics courses. Boys are highly participating in comparison to girls in mathematics classroom. Teachers should be aware of students' specific learning needs for involving and participating students, especially girls, in mathematics.

***Teacher-Student Interaction in Classroom***

When children enter school, their teachers and peers play vital roles to conform gender roles in the classroom. Students learning depends upon the classroom environment, how they interact with teachers and peers. In our society, the stereotypes that boys are more intelligent, more powerful, and advance especially in mathematics, and therefore teachers may transmit this in their classrooms (Gugliotta, 2010). They knowingly and unknowingly do discriminatory behavior on the basis of gender in mathematics classroom.

It is vital that teachers should treat equally to both boys and girls in mathematics classroom. But most of the teachers knowingly or unknowingly give more value and attention to boys rather than girls in mathematics teaching learning process. That's why boys interacted more often with male teachers, but girls could not do interact (Bista, 2004; Renne, 2001). According to Leder (1987) as cited in Renne (2001, p. 165) "teacher interaction with girls focusing on product questions, whereas teacher interaction with boys addressing on process questions". Teachers' such less amount of attention and dull or passive behavior discourages girls to participate and interact actively in mathematics classroom. Teachers can help to create a harmonious environment for students to bring them into the classroom by respecting and valuing mathematics and their cultures. They need to foster classroom relationships that encourage students to think independently, ask questions, and take intellectual risks, ensuring that all students are assigned tasks that enhance their understanding (Anthony & Walshaw, 2009).

Gender Audit experts in Nepal observed teachers' classrooms and found that boys were asked to answer questions more often than girls, and their work was checked more frequently than that of girls (Terry & Thapa, 2012). They also expressed that teachers punished boys much more likely than girls such corporal punishment by teachers may affect boys negatively. However, the policies have already been established to eliminate corporal punishment in schools, it still continues to be practiced. Likewise, teachers give more classroom attention, support, and give higher encouragement to boys than girls (Mathema, 2007; Sadker & Sadker, 1994).

Most of the mathematics teachers thought that girls' mathematical level is lower than boys. The study published by the National Bureau of Economic Research (NBER) indicates teachers reward male students' higher marks in mathematics than their female peers, even if they have the same ability level (Dano, 2015). Most of the teachers accept both boys and girls should receive equal treatment in mathematics classroom, however most of them expect lower performance from girls than from boys in mathematics (Moletsane & Reddy, 2011). Teacher's discriminatory behavior may lead to a girl's low participation, low achievement, low confidence and frustration towards mathematics subject. Students' motivation and enjoyment towards mathematics also determines through their high or low ability in mathematics.

There were gender differences in learning style and classroom participation on which "teachers interact with males more frequently, ask them better questions, and give them more precise and helpful feedback" (Sadker & Sadker, 2010, p. 1). Similarly, the teachers ask more questions to male students related to mathematical content rather than female students in classroom, even if they don't know they are doing discriminations (Gugliotta, 2010). In this context, teachers have been observed to assess girls' abilities as lower rate than boys' in Mathematics, even when both are performing at similar or comparable levels (Dickhauser & Meyer, 2006).

Likewise, Gugliotta (2010) also expressed that teacher interact with male students much more frequently than female students in mathematics classroom. The boys had more frequent interactions with the teacher and made more unsolicited comments compared to girls (Gr∅ ver Aukrust, 2008). Moreover, differences have also been found between male and female teachers' classes. Additionally, Aukrust revealed that the uninvited comments from girls were made low in the classes of male teachers, but boys contributed such types of comments six times more than girls. Moreover, in classes taught by female teachers, girl students made more unsolicited comments, however it occurred twice from boys. It signifies that most of the teachers are not gender sensitive towards boys and girls specific learning needs and are not focused on individualized instruction while teaching in classroom.

The findings of Joyce (1991) revealed that sex differences in classroom interaction have been found between two countries, Canada and Cuba. In Canada, boys dominated classroom communication in mathematics. Boys were more call out and disciplined rather than girls in mathematics classroom. They were more involved in extended interaction and question-answer process with teachers in the classroom of mathematics. On the other hand, in Cuba, the results were found reversed. Girls have more extended interactions and contact with teachers in mathematics classes whereas boys have more extended interactions and contact with teachers in language and arts classes. Classroom interaction plays a crucial role for the mental and physical development of children. Danish children showed a lower quality interaction with teachers, but they showed higher quality interaction with peers, as compared with U. S., and Germany (Slot & Bleses, 2018).

The studies reported that boys receive more attention from teachers, being asked to answer more questions and complete more tasks compared to girls (Halai, 2010; Tsouroufli, 2002) Similar results have been found by (Stevens, 2015) that boys receive more teacher attention than girls in the school when he observed eight teachers of grade VI to VIII. This study also found that girls tended to receive more academic interaction than behavioral, while boys received more behavioral interactions than girls. In addition, both boys and girls obtain similar amounts of neutral feedback from their teachers.

It has been showed that boys obtain more questions directed to them (Grima & Smith, 1993; Tsouroufli, 2002; Younger et al., 1999) and receiving negative comment either for their behavior and other works (Tsouroufli, 2002). Likewise, teachers interacted more with male students than female students (Duffy et al., 2001; Tsouroufli, 2002). Similarly, teachers' behavior towards boys and girls is found to be different in the classroom. Teachers' attention and interaction were found different due to gender in favor of boys rather than girls in low performing schools in Chile (Bassi et al., 2018). The researchers also found that gender attention gap is linked to lower mathematics scores for girls on Chile's national standardized tests. Teacher's worse interactions with students in the classroom initiates greater gender attention gap. Similarly, there were differences in the number of interactions conducted by teachers with boys and girl students in mathematics classroom. Teachers interacted with boys as twice as than they did with girls (Sarouphim & Chartouny, 2017).

Teachers' views on sex-based abilities can foster a discriminatory environment in the mathematics classroom, discouraging girls from pursuing STEM subjects (Lohbeck et al., 2017; Sayman, 2013). Many teachers may not be recognizing hegemonic controls that silence girls and allow boys to become the center or focal point of the teacher's attention (Duffy et al., 2001). When teachers feel boys are stronger in mathematics rather than girls then they interact differently and have lower expectations towards girls in mathematics classroom (Stoehr et al., 2017). The result can lead that girl developing negative feelings about their mathematical abilities (Beilock et al., 2010; Fennema et al., 1990). In terms of the interaction, teachers often permit boy students to speak and actively initiate contact with them. Similarly, Heaverlo et al. (2013) showed that girls received less instructional and discussion time, asked and answered fewer questions, received less help, had lower self-confidence, and received less praise than boys.

The case study conducted by EAWE (2015) in Africa found that most of the girls were shy and lacked confidence in the classrooms and did not believe in their capabilities. They did not participate in question answers, did not want stand and sit down due to their dressing. In addition, most of the girls did not participate in teaching and learning activities because of the cultural perception that girls were less intelligent than boys especially in mathematics and sciences and that the girls should not take disturb much because ultimately, they would be married anyway.

## Policy and Practices of GRP: National and International Context

In this theme, I have introduced some policies regarding GRP practices, in national and international contexts separately concerning the GRP.

### *National Policy and Practices of GRP*

Creating an inclusive, equal and socially just society is the main aim of Nepal. In policy formation, gender and women empowerment has been getting high priority in Nepal. The issues related to gender have been enacted at an increasing rate since the 1990. Gender mainstreaming policy has also been enacted and in the policy, gender equality and social inclusion has been getting high priority (Government of Nepal [GON], 2021). A gender-related perspective focuses on policies and practices that impact males and females differently. The government has also put gender equity and equality of opportunity policies, strategies, and programs into effect. Since the MOE prioritizes school education through plans such as SSDP 2016/17–2022/23 and SESP 2022/23–2031/32, the goal is to ensure inclusive and equitable access to quality education for all children in Nepal (MOE, 2016; MOEST, 2022). However, the majority of the government's programs are less effective and less successful (SDRC, 2007). UNESCO also supports the government in developing inclusive national education policies that are culturally and linguistically relevant and that respond to the learning needs of indigenous peoples (Yadav, n. d.). According to Yadav, UNESCO Priority Gender Equality Action Plan 2014-2021 seeks to promote gender equality through gender mainstreaming and gender specific programming. Likewise, the Government of Nepal's Gender Equality and Social Inclusion (GESI) Strategy 2021–2023 aims to promote gender equality and social inclusion for all children (GON, 2021). Moreover, the Government of Nepal has also developed the consolidated equity strategy that looks for to ensure equity in access, meaningful participation, and learning outcomes, which was one of the most salient requisites of the SSDP implementation (MOE, 2016).

The constitution along with the enacted laws, rules, and regulations, have included the idea of gender and gender empowerment policy in Nepal. A number of attempts in policy and practice was made to produce favorable results in school education. In Nepalese school education, for ensuring equitable access some good progress has established—the gender parity has been achieved across all levels of school education (MOEST, 2021a;  2022). About the enrollment, in basic level and secondary level, more girls than boys are enrolled in community schools, but reverse in institutional school that showed enrolment rate of girls is improved in community schools (MOEST, 2021a). In addition, the dropout rate of the students in each grade has still remained, but in decreasing way in each year and school completion rates are poorer.

Furthermore, in the fiscal year 2007–2008, the Ministry of Finance also introduced gender responsive budgeting to ensure that funds were allocated to assist gender equality and women's empowerment (Terry & Thapa, 2012). Moreover, prior SSDP and later SESP planned and developed policies, acts, programs, and regulations for free and compulsory basic education and free secondary education (MOE, 2016;

MOEST, 2022). Since, SESP formulated some activities for access to and participation of all children up to secondary education — need based scholarships, free textbooks, midday meals, and provision of health care services. Under SESP, several programs are being implemented, and has made provisions for gender-responsive budgeting to promote gender equity (MOEST, 2022).

The gender issue has been heavily seen in Nepalese schools. In the previous years, the main objective of basic education under the SSRP, according to the ASIP (2011–2012), is to guarantee equitable access to high-quality education through the creation of a child-friendly learning environment in schools and a rights-based approach; it also included Non-Formal Education (NFE), Technical Education and Vocational Training (TEVT) (Terry &Thapa, 2012). Likewise, in present years, SESP consolidated equity Strategy, equity indicators have improved for Nepal school education to reduce existing disparities in school education outcomes. In Nepal, the NESP in the year 2022/23– 2031/32 included the target that all types of disparities in children's enrollment, participation in classroom, and learning achievement regarding to gender, and other factors would be reduced.

In schools, particularly in mathematics, there are minimum proportion of female teachers. It was a requirement in the education system that every primary school have at least one female teacher (Paudal, n.d.; Terry & Thapa, 2012).The Education for All (EFA) included the target that 50% teachers would be women in 2009 (Terry & Thapa, 2012). At present 47.2% female teachers are serving in community basic level and only 20.4% in community secondary level (MOEST, 2022). The data revealed that still the number of female teachers is very low in number at secondary level; among them female mathematics teachers are minimum in numbers at secondary level.

In context of Nepal, there is no sufficient information, and materials are given in the curriculum and textbooks for gender equality and equity. Likewise, there are not any specific lessons and text mentioned about gender equality and its impact in national development (SDRC, 2007). But in present years some progress has been made. SESP are being conducting gender equity related programs such as scholarship providing for all girls in Grades 1 through 5, addressing gender sensitivity issues within the curriculum, including reproductive topics, sanitary pads for girls, inclusive provision of female teacher appointment, etc. (MOEST, 2022). Likewise, topics of equity and inclusiveness have also been included in teacher training. According to the SSDP, to increase student's learning through enhancing teaching and learning materials, the learning environment, curriculum, teaching methods, examinations and assessment are key aspects of educational quality (MOE, 2016). For the quality development, NESP enhanced basic infrastructure development, management of learning materials, learning environment improvement, seating and suitable classrooms arrangement, revised assessment tools and teachers' capacity and qualification building based on prescribed competencies and standards (MOEST, 2022).

For a student's quality education, teachers' professional development is very necessary. Hence the Government of Nepal has planned for the enhancement of teachers' professional development based on the competency standards. Prior to the establishment of the federal structure, 29 Education Training Centers (ETCs), and Lead Resource Centers (LRCs) played essential roles in overseeing both short-term and long-term training programs for teachers were established. Under the federal structure, Resource Centers initially provided professional support to teachers, but they have since been dissolved. With the responsibility for this task now resting with

Local Levels National Education Policy (NEP) 2019 has developed provisions for local levels to take the lead in “conducting various continuous professional development programs for teachers such as customized training, workshops, seminars, observation visits, reflections, teacher networks, collaborative research, mentoring, and coaching” (MOEST, 2022, p. 65). Moreover, during the period of SSDP, conducting TPD training for teachers, who are teaching at basic and secondary level mathematics, science, and English subjects. Whereas, ESA 2020 emphasized the programs to provide need-based teacher training and to imply this training in the classrooms.

Teachers’ training is essential for school level teachers’ professional development. The government of Nepal continuously planned different teacher training programs to develop teachers’ competency skills on different subject. Mathematics teachers highly needed such professional development training to improve students’ performance. In this context, governments focused must be needed on the practice level in actual classroom setting.

***International Policy and Practices of GRP***

Existing national policies determine how well girls succeed in school in terms of performance, retention, and completion. After that, the non-governmental group FAWE in Africa persuaded governments to review and amend laws that restrict girls’ access to education. Girls’ access, retention, performance, and completion would be determined by existing national policy of these countries. In this manner, African nations adopted gender-responsive policies in schools, leading to increased enrolment, retention, performance, and academic success for girls in school education (FAWE, 2008). In 1999, the Tanzanian Ministry of Education and Culture officially adopted the FAWE model, with the goal of implementing it in all 1,890 secondary schools across the country by the end of 2009. Similarly, the Ministries of Education in Malawi and Ethiopia have incorporated FAWE's GRP model into their policy for pre-service training across all TTCs, on both government and private (Njuguna, 2016). Subsequently, the Quality Assurance and Standards Officers in these countries will regularly monitor the implementation of the GRP in schools. If GRP policy adopted by the government, FAWE's developed practices and models could progress gender equity and educational quality in Africa.

Moreover, the Government of Rwanda also prioritized gender equality, women's empowerment, and girl's education (AO & Asemota, 2011). Likewise, girls in Uganda are particularly underrepresented, low enrollment, poor performance and high numbers of dropouts in STEM subjects. The government of Uganda has formulated and implemented the Gender in Education Policy (GEP) whose vision was to promote quality, equitable, and relevant education for all children in Uganda. The implementation of GEP enhanced the equitable access to education, the gender parity on enrollment and completion was achieved at primary level in 2014, and enrollment at secondary and tertiary education for girls were increased (Ministry of Education and Sports, 2016). But the gender gap still remains in retention, literacy, performance, and numeracy. The main cause is teachers are highly gender biased towards students and have negative attitudes, lack of instructional materials, facilities and trained teachers. Therefore, the government developed a plan to offer ongoing professional development aimed at enhancing teaching quality, gender responsiveness, and inclusiveness, particularly in STEM subjects.

Likewise, the research by Chea et al. (2023) revealed that Royal Government of Cambodia's (RGC) had conducted the policy, strategic plan, and programs for strengthening gender equality. Ministry of Education, Youth and Sports's (MoEYS)

Education Strategic plan covering 2018 to 2023 focuses on two priorities “the first aims to ensure inclusive and equitable education and promote lifelong learning opportunities for all. The second priority is to ensure effective leadership and management of education staff at all levels” (P. 5). Different activities have been conducting by MoEYS for improving student’s participation and completion rates in primary level, and to improve students’ access, to increase student’s retention, and providing students 21st century skills while improving secondary school management. Likewise, MoEYS take different policy and programs for tackling gender equity including gender mainstreaming strategic plan, scholarship for weak students, inclusive education policy, one commune, one lower secondary school ambition, and student-friendly school policy. In addition, MoEYS in Cambodia prioritized many policies for teachers for increasing teachers’ number and their quality of teaching. The key policies for teachers’ professional development were “Teacher Policy, Teacher Policy Action Plan (TPAP), Framework for Teacher Continuous Professional Development (CPD), Teacher Career Pathway Framework, and Teacher Professional Standards” (Chea et al., 2023, p. 8). Additionally, the Teaching for Improved Gender Equality and Responsiveness (TIGER) project was implemented in Cambodia which was related to GRP and aimed to improve teachers’ skills and knowledges and school directors’ professional development regarding to gender responsiveness in all levels of the school education. This project improved the gender awareness of teachers and students for the quality education.

In a similar manner, the Government of India has implemented policies, strategies, and programs to promote gender equality, women’s empowerment, and access to education (Sahni, 2018). To advance educational development, the government introduced the recent Indian National Education Policy (NEP) in 2016.

This policy aims to enhance gender inclusion for girls, which is expected to improve gender equality and boost their access to and retention in schools. Sahni (2018) reported that the Government of India implemented this through:

> Ensuring that there is a school available at every kilometer of each inhabited area, by giving free textbooks to all girls up to class 8, by providing girls-only schools at the upper primary level, separate toilets for girls, recruitment of 50 percent female teachers, and gender-sensitive textbooks. (p. 5)

In addition, the Indian Government committed different schemes and policies for access, and quality education for girls such as incentive to girls for secondary education, right to each child free and compulsory education, Sukanya Samriddhi Yojana (SSY), Beti Bachao Beti Padhao, and Bicycle Schemes.

To persuade governments, foreign organizations, and local communities to implement laws and create environments that treat boys and girls equally in the classroom, FAWE has carried out a variety of projects in Africa. FAWE employs a four-pronged approach—advocacy, demonstrative interventions, community engagement, and replication and mainstreaming—to enhance girls' education and promote gender equity and equality in education across Africa (FAWE, 2008). In a similar manner, in Bhutan SESP formulated child friendly school framework to ensure inclusive access, need based planning and budgeting, and specific strategies to cater to the disability children (Yuden et al., 2020).

It is noted that most countries have developed various policies, programs, and plans aimed at promoting gender equality and for gender equality and equity in access to quality education for all children, particularly for girls, who continue to lag behind boys in educational performance. Although girls’ enrollment has increased in all countries, significant gender gaps still remain in retention, performance, and participation, often favoring boys.

**Review of Theoretical Literature**

This section establishes five theories one is inclusive pedagogy in relating to mathematics education, which has been utilized in the formation of tools and to discuss GRP practices based on the perspective of gender equality. Likewise, other four theories include Vygotsky's social constructivist theory, feminist theory, critical theory, and social cognitive theory, all of which have been employed to analyze and discuss the GRP practices from the perspective of gender equality and equity in mathematics education in the context of Nepal.

***Inclusive Pedagogy in Mathematics Education***

Feminist pedagogy and non-discriminatory classroom practices were integrated to establish a frame of references for an inclusive pedagogy in mathematics education (Solar, 1995). In this dissertation, I applied these guidelines for teachers' GRP practices in mathematics education.

Feminist pedagogy is defined as the study of curriculum, teaching, educational environment, and learning from a feminist viewpoint. Large number of literatures on feminist pedagogy revealed three different approaches. The first approach focuses on teaching of a specific discipline, while the second approach emphasizes instructors' personal experiences in women's studies classes, valuing the sharing of these experiences as a feminist method for knowledge building. The third approach centers on a theorization of feminist classroom practices either through comparison with other pedagogies, such as Freire's pedagogy of consciousness-raising, or through the use of a feminist study of the oppression of women or teachers' experiences (Solar, 1995).

Female academics frequently employ the term ‘conscience-raising pedagogy’, also referred to as ‘radical pedagogy’, ‘critical pedagogy’, or ‘liberation pedagogy’ (Solar, 1995). These methodologies are thought to fall within critical theory or liberatory education theory. These approaches emphasize the importance of encouraging active engagement in education among the oppressed by breaking their silence and addressing subjects relevant to their circumstances. These approaches ultimately empowered the learners in their learning processes. The liberation pedagogy, feminist pedagogy, and consciousness-raising pedagogy all maintain the following four dialectical aspects in particular: silence versus speech, passivity versus active participation, powerlessness versus empowerment, and omission versus inclusion (Solar, 1995).

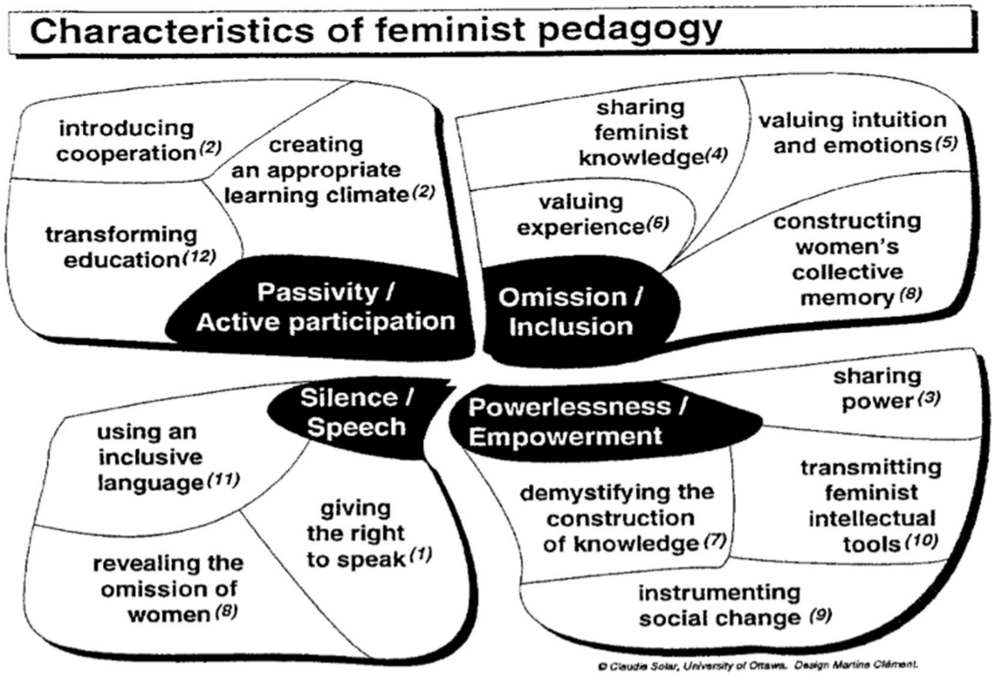
To increase students’ active involvement in the learning process and to give them a sense of empowerment, teachers must create a climate of confidence for female students. The teachers serve as a mentor and aid the students in learning in accordance with the goals they have set for themselves. In this context, gender-inclusive pedagogy aims to foster an inclusive learning atmosphere that respects and appreciates the varied experiences and viewpoints of all students. Specifically in mathematics education, this approach involves acknowledging and addressing the specific challenges encountered by girls and women and employing strategies that promote their active participation and achievement in the subject (Luzano, 2024). Feminist pedagogy drawn from different feminist theories has given rise to the following list of characteristics:

> breaking the silence and giving all women the right to speak, creating an appropriate learning climate for women, that is, a climate where competition is reduced and cooperation encouraged, changing the power distribution in the

> classroom in order to counteract domination and hierarchy, sharing feminist knowledge that ties in with women's lives, valuing intuition and emotions as opposed to rationality and objectivity, taking experience as a source of knowledge, demystifying the construction of knowledge, its political value and the way women relate to it, revealing the omission of women and constructing a women's collective memory, working towards social change and giving women the means to do so, transmitting the necessary intellectual tools to build up a feminist critique, using verbal and written language which respects the experience and diversity of women, and working towards the transformation of education. (Solar, 1995, p. 316)

These features were primarily developed from publications on feminist teaching in the social sciences, literature, and the arts, with only limited sourced from the natural sciences and even fewer from mathematics and the physical sciences. Therefore, these identified characteristics are also applied in the mathematics classroom and were adopted in my study regarding GRP. The 12 characteristics mentioned above are categoriged into four dialectical aspects: passivity vs. active participation, omission vs. inclusion, silence vs. speech, and powerlessness vs. empowerment, as illustrated in Figure 1 as follows.

Figure 1. *Characteristics of Feminist Pedagogy*




(Adapted from Solar, 1995)

Furthermore, Solar (1995) noted that feminist researchers hold varying perspectives on mathematics education: some advocate mathematics education for everyone, while others argue that schools should play a vital role in filtering and selecting the future scientific elite. In this manner, not all are agreed with the 12 characteristics of feminist pedagogy for mathematics education, hence these criteria are redefined for mathematics education. That's why, integrating feminist pedagogy, non-discriminatory classroom practices, and guidelines for an inclusive pedagogy are crucial in mathematics education that have been shown in the following figure 2.

**Figure 2.** *Inclusive Pedagogy in Mathematics Education*

**Inclusive Mathematics Education**

***Silences/ Speech***

**Teaching**

-Using inclusive language
-Forbidding sexist and racist humour
-Using pedagogical settings that makes it easier for student to speak
-Limiting extended conversions with male students

**Learning**

-Speaking about the learning mathematics
-Giving time for women to respond

**Curriculum**

-Explaining the construction of mathematics and its use in society

**Educational environment**

-Valuing women's contributions and concerns
-Setting school goals which include women
-Using inclusive language

***Passivity/ Active participation***

**Teaching**

-Having high expectations for all women.
-Using pedagogical approached that encourage participation.
- Introducing cooperation.
-Asking women high cognitive –level questions.

**Learning**

-Sharing the thinking process.
-Sharing the understanding of mathematics.
-Learning cooperatively.

**Curriculum**

-Having women participate in defining the content.

**Educational environment**

-Allowing women to participate in defining their learning process.
-Having women participate in defining the goals of the school.
-Addressing the issue of gender differences.

***Omission/ Inclusion***

**Teaching**

-Paying attention to all students regardless of sex, race, age etc.
-Monitoring speech in order to includes women
-Using examples which relate to women
-Describing mathematicians and scientists as both males and females
-Valuing intuition and emotions

**Learning**

-Solving problems that deal with women's situations
-Receiving feedback and learning from mistakes

**Curriculum**

-Referring to the contribution of women
-Using situations related to women's lives
-Using non-stereotypical materials
-Including ethno mathematics
-Revealing the omission of women.

**Educational environment**

-Including and valuing women
-Making women visible

***Powerlessness/ Empowerment***

**Teaching**

-Avoiding stereotypes
-Naming differences and explaining them
-Giving women the time and means to learn
-Letting women solve problems by themselves
-Praising women's achievements
-Sharing power

**Learning**

-Demystifying mathematics: more than one solution and more than one process
-Receiving appropriate feedback and instructions
-Learning about women's participation in mathematics and science.

**Curriculum**

-Demystifying mathematical construct
-Mathematics as a process, not a set of rules
-Including the lives of women scientists
-Including women's perspectives

**Educational environment**

-Creating a warm and supportive climate
-Working out beliefs about men and women
-Denouncing stereotypes.

(Adapted from Solar, 1995)

Mathematics is a subject in which discrimination against female students is becoming a serious problem in learning. This framework identifies different Variables, such as teaching, learning, curriculum, and the educational environment, that influence females' learning in the mathematics classroom from a pedagogical perspective. It incorporates the dialectical aspects of feminist pedagogy with inclusive, non-discriminatory classroom practices to establish a framework for equitable pedagogy in mathematics education. This framework would serve as an alternative to overcome discrimination in mathematics education. By implementing GRP, mathematics teachers can help create a more inclusive and equitable learning environment for all students, regardless of gender. Furthermore, this pedagogy is particularly applicable for teachers aiming to establish a gender responsive classroom environment in mathematics education. It is highly relevant to this study for developing a discrimination-free mathematics classroom.

***Vygotsky's Social Constructivist Theory***

Lev Semyonovich Vygotsky (1896-1934), a Soviet psychologist, was the pioneer of the theory of cultural and social development in humans. His theory emphasizes the interaction among people's development and the cultural context in which people live. It proposes that learning is inherently a social process, rooted in the interactions within a given society or culture. Vygotsky firmly believed that community and social environment play a crucial role in shaping meaning. A central component of his theoretical framework is the idea that social interaction is essential for cognitive development. Vygotsky's perspective primarily concentrated on qualitative changes in behavior over time, aiming to elucidate the underlying processes involved in the development of thought, language, and higher-order thinking skills (Polly et al., 2018).

Vygotsky's concepts of socio-cultural learning are based on three core principles: (1) human development and learning begin with social, historical, and cultural interactions, (2) 'the more knowledgeable others (MKO)' / 'psychological tools, particularly language', mediate development of higher mental functions, and (3) learning takes place within the Zone of Proximal Development (ZPD) (Polly et al., 2018). Now, each idea is discussed separately, though they are closely interrelated, non-hierarchical, and interconnected to each other

**Learning Initiates Through Social-Interaction.** Interaction plays a vital role in learning. According to Vygotsky's social learning theory, social interactions play a vital role for developing higher order thinking skills and learning that is embedded in cultural and historical contexts. In this manner, Vygotsky stated that:

> Every function in the child's cultural development appears twice: first, on the social level, and later, on the individual level; first, between people (inter psychological) and then inside the child (intra psychological). This applies equally to voluntary attention, to logical memory, and to the formation of concepts. All the higher functions originate as actual relationships between individuals. (Vygotsky, 1978, p. 57)

This indicates that students learning development first depend upon the social interaction then later their individual force. The learners adopt learning through working with others on a variety of tasks, engaging in shared social experiences, and experiencing their associated effects and then acquire useful strategies and knowledge (Scott & Palincsar, 2013).

**More Knowledgeable Other (MKO)/ Tools and Signs (Semiotics) as a Mediation.** According to Vygotsky, children learning occurs through social interactions with individuals who have greater understanding, higher ability level, and more knowledge than learners in a specific task, process, or concept. They may be tutors, teachers, parents, peers, seniors, siblings and in some cases, juniors having more knowledge in these tasks. According to Vygotsky, social interaction that elaborates collaborative and cooperative dialogue promotes cognitive development.

From this viewpoint, by engaging in various collaborative activities within society, culture, and school within joint efforts and internalize their work's effect together, learners gain new strategies, knowledge, and insights about the entire world and culture.

**Occurrence of Learning Within a Zone of Proximal Development (ZPD).** ZPD is one of the important concepts in the Vygotsky's socio-cultural learning theory which has been defined as "the difference between what a learner can do without help and what he or she can achieve with guidance and encouragement from a skilled partner" (Mcleod, 2019, para. 1). Hence, Vygotsky outlined three distinct zones of learning**:** tasks we can accomplish independently, tasks we can complete with assistance, and tasks that are currently beyond our ability. He emphasized that the true learning occurs in the middle zone —where we are capable of performing tasks with the help, support, or guidance of others. Likewise, this perspective is identified in the definition of ZPD by Vygotsky (1978) as "the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem-solving under adult guidance, or in collaboration with more capable peers" (p. 86).

Vygotsky believed that in order to comprehend the connection between development and learning, it is essential to differentiate between two developmental stages: the current or actual level of development and the potential level of development. Actual level refers to the level at which a child can demonstrate alone or perform independently. It is the upper limit of the task. On the other hand, in potential level of development, the children can perform and demonstrate their abilities only with the assistance of a more competent or skilled individual, through adult guidance, or by working in collaboration with more capable peers. Vygotsky acknowledged that the gap between what children can do on their own independently and what they can accomplish with support represents different stages of development, which may vary among individuals.

The teachers should have understood of ZPD to enhance their teaching and learning processes. They can utilize the ZPD to bridge the gap between what a learner can accomplish independently and what they can achieve with support. As Cherry (2019) noted, these activities include: (a) planning instruction and lessons, (b) using hints, prompts, and direct guidance to enhance learners' abilities, and (c) employing scaffolding techniques, where the teacher offers support to move progressively forward for the child toward a goal.

Vygotsky saw the ZPD as the key area where the most attentive instruction or guidance should take place. This approach helps the child acquire skills that they can eventually use independently to cultivate higher mental functions. Scaffolding is the second key concept of focus. It is directly related to ZPD, as it provides a necessary support for a learner that helps them effectively complete a task within their ZPD (Margolis, 2020). Usually, this process involves a more competent or skilled individual aiding the learning of a less skilled or less competent individual. For instance, this could be a teacher helping a student or a more advanced peer supporting a younger peer. Vygotsky (1978) posits that a learner's thinking and problem-solving skills can be divided into three categories: tasks they can complete independently, tasks they can handle with help or assistance, and tasks they cannot accomplish even with assistance. The tasks that remain unmanageable despite help fall outside the ZPD.

Vygotsky (1978) argued that the key to effective learning is rooted in the quality of social interactions among individuals at different levels. What the learners obtain assist or support through mediators, his/ her layer of understanding or knowledge depends. He also regarded tools as the mediators among them on which language is the important tools. Sociocultural theory places a great deal of emphasis on the language uses to assist learners in entering and progressing with the help of their ZPD. In relation my study, language means gender responsive language, teachers have to implement such type of language with students in classroom activity.

Scaffolding is another fundamental concept of the ZPD theory**.** When children are within their ZPD, they receive activities, instructions, tools, and resources—collectively referred to as scaffolding (Margolis, 2020). Over time, this scaffolding can be gradually removed, allowing the student to complete the task on their own independently. That's why it is the temporary support that parents, teachers, some knowledgeable person or peers give a child to do a task. According to Vygotsky, a knowledgeable participant can set up supportive circumstances in a social interaction through speech, enabling the student (novice) to participate and enhance their current skills and knowledge to a high level of competence (Christmas et al., 2013). In education, scaffolding refers to an instructional approach where the teacher initially models the desired learning strategy or task and then progressively handling responsibility to the students.

The ZPD Theory carries significant consequences for how mathematics is taught and learned in educational settings. In solving mathematical problems, assisted instruction is necessary for learners. Vygotsky recommends the use of assisted instruction. Vygotsky (1978) suggests that problem-solving should be supervised by a skilled adult or capable peer. This practice is applicable for learners who have a low level of mathematical performance and ability. Collaboration is another important aspect that Vygotsky considers in mathematics teaching learning. To facilitate effective collaboration, teachers should recognize students with strong mathematical capacities in the class. Those with less capacity in mathematics should be assisted and be supported by these more capable peers (Christmas et al., 2013). That's why learners are able to accomplish more mathematical tasks independently with collaboration, direction or some kind of help through others.

The primary aim of teaching mathematics within the ZPD framework is to motivate and encourage students to actively participate in their learning, become self-directed, and develop into lifelong learners. According to the ZPD theory, learning mathematics involves the teacher and the student co-constructing knowledge, which is then transformed into the learner's own personal knowledge (Christmas et al., 2013). This interaction between teacher and learner becomes collaboration and co-learning. When teaching mathematics within the ZPD, teachers' interactions with students are crucial in encouraging them to be engaged and self-reliant learners.

Vygotsky sociocultural theory remarked that interaction and collaboration play a crucial role in learning mathematics. If teachers interacted equally with boys and girls inside and outside the mathematics classroom, then students would actively engage and develop their learning. The collaborative and cooperative environment fosters motivation of both boys and girls, especially girls, in learning mathematics. On the other hand, if the teacher creates a more interactive classroom environment between peers' groups of boys and girls, then their interactions can further enhance students' learning. Classroom interaction is one of the components of GRP in my study. That’s why a sufficient amount of interaction conducted in the mathematics classroom and gender responsive language used would enhance gender equality and equity in mathematics classroom. It also increases students' performance and participation. I employed this theory to analyze and interpret the interactions among students and teachers, as well as among students within the same or different gender groups. In addition, I utilized this theory in discussing of pedagogical practices regarding to GRP in the classroom. Therefore, this theory supported my study during the phases of data collection, analysis, and interpretation.

***The Feminist Theory***

Feminists argue that gender inequality is not simply a personal issue but is deeply embedded within the structure of societies. It is ingrained in the organization of marriage and families, the workplace and economy, politics, religion, the arts, and even the language we use (Zarza, 2018). Making men and women equal, is the necessity for social solutions rather than an individual. In relation to the gendered social order, feminist perspectives can be broadly categorized into three main types: gender reform feminisms, gender resistant feminisms, and gender revolution feminisms (Letherby, 2003). The feminisms of the 1960s and 1970s initiated the second wave of feminism, including liberal feminism, development feminism, and Marxist and socialist feminisms, all of which are rooted in gender reform feminism. For this research, I stood on liberal feminism within the framework of gender reform feminisms.

Liberal feminist theory demands that men and women be treated equally and works to build up them the same rights and responsibilities (Thompson, 2003). It is the theory that laid the groundwork for achieving gender equality. Male and female are equal in all aspects of life, more specially, female is as capable as male of the reasoned behavior required in the modern workplace (Brewis & Linstead, 2004). The principle of this theory is that every person ought to be treated equally. That's why quality of rights and opportunities should be expanded to girls in all areas of their life (Dalal, 2015). This theory is crucial in elucidating and ensuring the implementation of non-discriminatory laws for women, as well as securing their legal rights (Awad & Eldon, n. d.). Liberal feminist theory has served as the foundation for efforts aimed at achieving gender equality. In modern organizations, women are trapped through the 'glass ceiling' that refers to an invisible, implicit, but impenetrable attitudinal barrier that prevents them to reach the top level of the organizational positions. Women found it to be difficult to break through this ceiling due to their dual role in both wider society and individual organizations (Brewis & Linstead, 2004). Brewis and Linstead argued that many occupations are segmented by gender at entry point rather than progression level, to the extent they have no options in taking up this profession. On the other hand, female is less geographically mobile rather than male due to childrearing role that breaks their career. This theory assumes that "inequity is a consequence of ignorance or prejudice and thus something that gradually can be modified through enlightened educational programs and corrective policies such as affirmative action" (Thompson, 2003, p. 14). With respect to education, liberal feminists work broadly under three themes: 'equal opportunities', 'socialization and sex stereotype', and sex discrimination' (Aker, 1994; as cited in Dalal, 2015).

Liberal feminism asserts that distinctions between male and female are not rooted in biology, that primarily pertains reproductive difference. Therefore, women should have equal rights to men, including access to the same educational and employment opportunities (Enyew & Mihrete, 2018). If male and female are fundamentally the same, they should not be treated differently by the law. Women should be granted the same rights as men and have equal access to educational and work opportunities (Lorber, 1997). Liberal feminists are concerned to eliminate gender discrimination through legal change, education, and media. It wanted to eliminate sex role stereotypes and to present varied and positive image of women. This theory asserts that every individual female should be as free as male for determining their social, educational, and political roles; as well as for determining any law, tradition, and activities that inhibits equal opportunities and rights (Dalal, 2015). Dalal also added that in education, the intent of this theory is to remove all barriers that prevent girls reaching their destination; though these barriers remain in school, society, individual psyche, or discriminatory labor practices.

Most of the developing countries like Nepal, containing gender liberal societies, gender disparity is still found in STEM careers. These countries are still suffering from gender discrimination against girls in the nation and automatically transformed in schools. In these countries, sex is becoming the main organizing principle to determine the ability of boys and girls in mathematics. Sex can still affect girl's participation and applying pedagogy in mathematics because of gendered male dominated society. If an equal opportunity is given to both boys and girls, become aware about specific learning needs of both boys and girls in mathematics and many gender barriers can be removed from school and classrooms, gender differences in pedagogy applied in mathematics would be removed. If all the stakeholders of Nepalese classroom would become gender aware then they can be applied GRP in mathematics classrooms efficiently. According to the principles of liberal feminist theory, gender equality plays a pivotal role in enhancing the mathematics learning of both boys and girls. Hence, this theory is employed to interpret and discuss the aspects of gender equality among male and female teachers' teaching process and among boys and girls learning process in mathematics classroom.

In the field of mathematics education related to GRP, this theory emphasizes gender equality and advocates for equal treatment of both boys and girls in all aspects of their workplace including educational experience. Liberal feminist theory is the most relevant and applicable, because it encourages teachers to make efforts to ensure equal opportunities and treatment for both boy and girl students in the mathematics classroom. It also helps to eliminate sex stereotypes and sex discrimination in their teaching process that helps to maintain gender responsive classroom. This theory makes teachers aware towards GRP, which fosters the classroom environment that is just and unbiased on the basis of gender.

***Social Cognitive Theory***

Originally developed as social learning theory in the 1960s by Albert Bandura, social cognitive theory emerged in 1986 as an expanded framework. It proposes that learning occurs within a social context through the continuous and reciprocal interaction among an individual, their environment, and their behavior. This theory proposed that learning is influenced through modeling from others, and that this is not a stimulus-response relationship, but more of a symbolic representation. Social cognitive theory suggests that gender-typed behaviors are encouraged through modeling, experiencing the outcomes of such behaviors, and direct instruction on gender roles. Through these processes, children are thought to develop expectations about outcomes, beliefs in their own abilities, and self-regulations that influence and direct their gender-typed behaviors. A distinctive aspect of this theory is its emphasis on social influence, highlighting the role of both external and internal social reinforcement in the learning process. It examines how individuals learn and sustain behaviors through social interactions, while also taking into account the social context in which these behaviors occur. In a 1991 article, Bandura wrote that an individual's self-efficacy beliefs determined their level of motivation, which determined how much effort that person would exert and how long he or she would persevere in the face of obstacles. The stronger the sense of self-efficacy, the more persistent and motivated the individual was. Likewise, the students who have a high level of self-efficacy would be successful in carrying out any tasks (Bandura, 1977).

Bandura revealed that students' self-efficacy is based on their personal performance accomplishments. If students have a work well done, enhancing their skills level, and becoming more successful in their accomplishments, then that increases students' self-efficacy (Pajares, 1997). Additionally, Bandura discovered that students gain information by observing the successes and failures of others, rather than by comparing their own performance. Consequently, observing others' successes tends to enhance students' self-efficacy, while witnessing others' failures can diminish it (Bandura, 1977, 1986). As a result, the more students select and observe successful models, the greater their self-efficacy becomes. According to Bussey and Bandura (1999) the gap in the perceived ability and self-efficacy grows as boys and girls age, with girls beginning to lose confidence in their math abilities and show a reduced interest in advanced mathematics relative to boys as they move into high school. People with a high sense of personal efficacy investigate a variety of professional possibilities, show more interest in them, invest more in preparing for various careers, and show increased perseverance in their chosen fields of endeavor. Students are also persuaded by encouragements and suggestions from others like teachers, peers, and counselors, that may positively affect their self-efficacy (Bandura, 7, 1986). A student's self-efficacy beliefs can be affected by their attitudes and gender, which in turn influence their academic performance (Bandura, 1977).

Rather than actual capabilities, stereotype linking causes gender-related efficacy obstacles. Women who lack confidence in their quantitative capabilities, perceive a scarcity of successful female role models in traditionally male-dominated fields, and view themselves as highly feminine (Bussey & Bandura, 1999). Female's beliefs about their career choices and their own capabilities are determined by undermining social practices within family, mass media, peers, education systems, and cultural practices at large. Parents, peers, and teachers were the main sources of beliefs about a subject as well as about the sense of self-efficacy in that subject, including mathematics. Gender has an impact on perceived mathematical effectiveness through high school math preparation, math success, and masculine gender-role orientation. Bussey and Bandura (1999) highlight evidence that negative reactions from parents and peers towards children's behavior that challenges gender stereotypes support the notion that gender development is significantly influenced by external sanctions. In school, some students may try to do new activities or tasks that exceed their capabilities, thus resulting in stress, failure, and withdrawal. Conversely, other students may underestimate their self-efficacy and consequently avoid such activities and tasks. Thus, students needed appropriate guidance and decisions at the beginning of a task start (Bandura, 1986).

It is suggested that children's socialization history gives specific insights into masculinity and femininity from birth, through elements such as clothing, nursery decor, and the toys and activities they are given. Moreover, gender stereotypes are extensively modeled within families and the wider culture. When adults and peers' mock children for behavior that doesn't fit traditional gender roles, it strongly encourages and motivates them to conform to gender-stereotyped behaviors (Bussey & Bandura, 1999).

School also plays a crucial role for gender differentiation. According to Bussey and Bandura (1999), teachers encourage more pronounced gender distinctions for boys than for girls through their social consequences. They assert that girls are often praised for being tidy and compliant while facing criticism for academic failures, whereas boys are more likely to be praised for academic achievements and success and criticized for misbehavior. This gender-based discrimination through social sanctions can enhance boys perceived self-efficacy while diminishing that of girls (Eccles, 1987). Teachers should discourage social comparative assessment of students' abilities and promote collaborative, cooperative or individualized learning rather than competitive learning (Eccles, 1989).

Boys and girls initially have similar perceptions of their mathematical abilities, but by the time they enter high school, girls start to lose confidence in their math skills and ability and increasingly differ from boys. Most of the research studies found that gender discriminations in self-efficacy begins to emerge at middle or junior-high school, girls at that time have lower self-efficacy belief than boys (e. g., DeBacker & Nelson, 1999; Pajares, 1997; Smist et al., 1997). Moreover, middle school girls often have lower confidence compared to boys regarding their ability to excel in mathematics (DeBacker & Nelson, 1999; Smist et al., 1997). Girls enroll significantly fewer numbers in higher-level mathematics, show less interest in these subjects, and perceive them as less relevant to their lives compared to their male counterparts (Bussey & Bandura, 1999). Likewise, research has shown gender differences in mathematics self-efficacy, with boys demonstrating higher self-efficacy compared to girls in terms of their attitudes toward mathematics (Betz & Hackett, 1983). In accordance with social cognitive theory, Bussy and Bandura also claimed that, despite performing equally well in math as boys, girls underestimate their own mathematical efficacy. Girl's lack of confidence in their own mathematical capabilities and are viewed as being less valuable in their lives when it comes to math skills. Likewise, lower level of self- efficacy is linked to lower academic performance.

This theory focuses on students' self-efficacy and demands high self-efficacy beliefs for both boys and girls, especially for girls enhancing motivation and persistence in mathematics. Gender specific barriers are persistent to enhance self-efficacy in learning mathematics such as gender stereotypes, lack of role models, mathematics subject selection and study continuation, and classroom dynamics. This theory makes teachers aware to understand students' beliefs about their mathematics abilities, accordingly they develop self-efficacy of both boy and girl students based on their specific individual learning needs. When teachers motivate and encourage girls by enhancing their self-efficacy towards mathematics, girls will overcome the misconception of mathematics and equally be motivated to choose and continue studying mathematics. Hence, this theory is prominent for improving gender responsive pedagogical approaches in mathematics.

***Critical Theory***

Critical theory is primarily linked with the Frankfurt School (around 1920), which adopts a Marxist theoretical approach aimed at criticizing and challenging various forms of domination (Stinson & Bullock, 2012). Critical theory in education is about liberating, enlightening, emancipating, and empowering. This theory is especially concerned with "issues of inequality and oppression, and beyond theorizing oppression, critical theorists struggle toward social change and the creation of a fairer and more just world" (Dell'Angelo et al., 2014, p. 1). The focus of this theory is on power and social power for inequality among mankind (Peca, 2000). The aim of critical theory is to engage in the dialectical process that enhances awareness of reality and drives change. It examines the interaction between self-consciousness and self-reflection on one side, and external social realities on the other (Turner, 1999). This theory focuses on individual perception and on group interaction. Critical theory involves examining power dynamics, social structures, and cultural norms that shape, and influence perceptions, experiences, and inequalities related to gender (Kincheloe & McLaren, 2011).

Critical theories of gender examine how gender is socially constructed and how power structures and hierarchies based on gender lead to oppression and marginalization (Jansen, 2002; Kincheloe & McLaren, 2011). Moreover, this theory initiates how power operates in society and how it shapes gender identities, roles, and relations. In the realm of critical theory, the analysis focuses on the conflicting power dynamics (Stinson & Bullock, 2012) among different groups and individuals within a society, examining who benefits and who faces disadvantages in particular circumstances. Critical theorists contend that privileged groups often seek to maintain the existing social order to safeguard their advantages. The dynamics of such efforts often become a central focus of critical research, especially concerning privilege related to race, socioeconomic class, gender, and sexuality (Kincheloe & McLaren, 2011). Critical theory, when applied to the study of gender, involves a theoretical approach that seeks to understand and critique power dynamics, social norms, and cultural practices that contribute to the construction and perpetuation of gender inequalities and injustices (Stinson & Bullock, 2012).

Moreover, this theory explores how norms, expectations, and stereotypes about masculinity, femininity, and non-binary genders are created, maintained, and challenged (Nicholson, 1994). Critical theory in gender studies often aims not only to analyze and critique existing gender norms and inequalities but also to inform strategies for social change. This may include advocating for policy reforms, promoting education and awareness, and supporting grassroots activism. Likewise, applying critical theory to gender involves engaging with these theoretical frameworks and concepts to offer insights into the complexities of gender dynamics in society. It encourages a reflective and transformative approach that challenges existing power structures and promotes gender justice and equality (Kincheloe & McLaren, 2011).

Critical theories in education must know two key aspects: first is educational systems are at least complicit in oppression; and second is that there must be a deliberate strategy for achieving emancipation through education. Teacher is one of the influencing factors to change classroom accordingly. This can depend upon the nature of curriculum and the pedagogies teachers enact in classroom. Critical mathematics, rooted in critical theory, recognizes that both students and teachers exist within a society shaped by dominant hegemonic power structures. It develops mathematics curricula that are centered around students' cultural identities, ensuring that learning mathematics inherently engages with social and political issues. The goal is to provide access to the mainstream mathematics taught in schools to those who have historically marginalized or excluded (Stinson & Bullock, 2012). Critical pedagogy promotes educational theories and practices that encourage both educators and learners to grasp how ideology, power, and culture are interconnected (Stinson et al., 2012). In this sense, Dell'Angelo et al. (2014) expressed based on teacher:

> Teacher must explore their roles and ideologies to avoid perpetuating negative constructions of their students, and they must also struggle against overly proscribed and often misleading curricular content that envisions poor and minority students as deficient while overtly or covertly teaching the lesson that in contemporary society everything is fair and just as it should be. (p. 10)

In critical pedagogy, teachers apply Freire's model by collaboratively sharing knowledge with their students, valuing the students' existing understanding of the world, and involving them in decisions about the curriculum and classroom rules. On the other hand, curriculum should be developed collaboratively to produce emancipatory knowledge that underpins the foundation for social justice, equality, and empowerment (Dell'Angelo et al., 2014). It offers opportunity and understanding of the different perspectives of disadvantaged members of society. Active participation, interest, reflection, and critical understanding of those taught and those teaching are necessary while developing critical mathematics pedagogy (Stinson et al., 2012).

Freirean model can influence the development of a mathematics curriculum in several ways. Freire emphasized the importance of contextualizing education within learners lived experiences. In the context of mathematics, this means connecting mathematical concepts and problem-solving to real-world situations that students can relate to, thereby making the subject more relevant and engaging (Coben, 1997). He argued that this model involves fostering discussions among students and between students and teachers to explore different approaches to problems, understanding mathematical concepts, and challenging conventional ideas. Freire advocated for developing students' critical thinking skills by urging them to challenge assumptions, critically evaluate information, and create their own solutions to problems. This would involve promoting inquiry-based learning where students explore mathematical concepts independently and collaboratively, developing their problem-solving abilities, giving students opportunities to make decisions about how they approach and solve mathematical problems, fostering a sense of ownership over their learning (Coben, 1997; Stinson et al., 2012).

Additionally, critical pedagogy, as advocated by Freire, emphasizes social justice and equity in education. In the context of mathematics curriculum development, this may involve addressing issues of access to quality mathematics education, challenging stereotypes and biases in mathematical learning, and ensuring that the curriculum reflects diverse perspectives and experiences.

Overall, Freire's model encourages educators to view mathematics not just as a set of abstract concepts, but as a tool for critical inquiry, problem-solving, and understanding the world, while also promoting social consciousness and empowerment among learners. Integrating these principles into curriculum development can help create a mathematics education that is meaningful, inclusive, and transformative.

**Implication of the Reviewed Theories in the Research**

This subsection of the study deals with the five theories such as inclusive pedagogy in mathematics education, social constructivist theory, feminist theory, social cognitive theory, and critical theory under review have been appealed to develop tools and to analyze the results of the study. Inclusive pedagogy in mathematics, as a theory, combines the dialectical aspects of feminist pedagogy and non-discriminatory classroom practice. It also provides guidelines for this pedagogy in mathematics education. The theoretical framework of this theory is used to administer questionnaires, within the context of GRP for teachers and students relating to mathematics. In addition, I employed this theory to discuss the findings that were obtained through the interactions, classroom activities, language used, teaching materials, and feedback and assessment regarding GRP employed in mathematics classrooms.

According to the notion of social constructivist theory, the role of 'social interaction' is crucial in the teaching and learning process. Interaction is a key component of this study. This theory is employed to interpret and discuss the findings regarding interactions between teachers and students (both male and female), as well as among students themselves, in the context of GRP practices in secondary level mathematics classrooms.

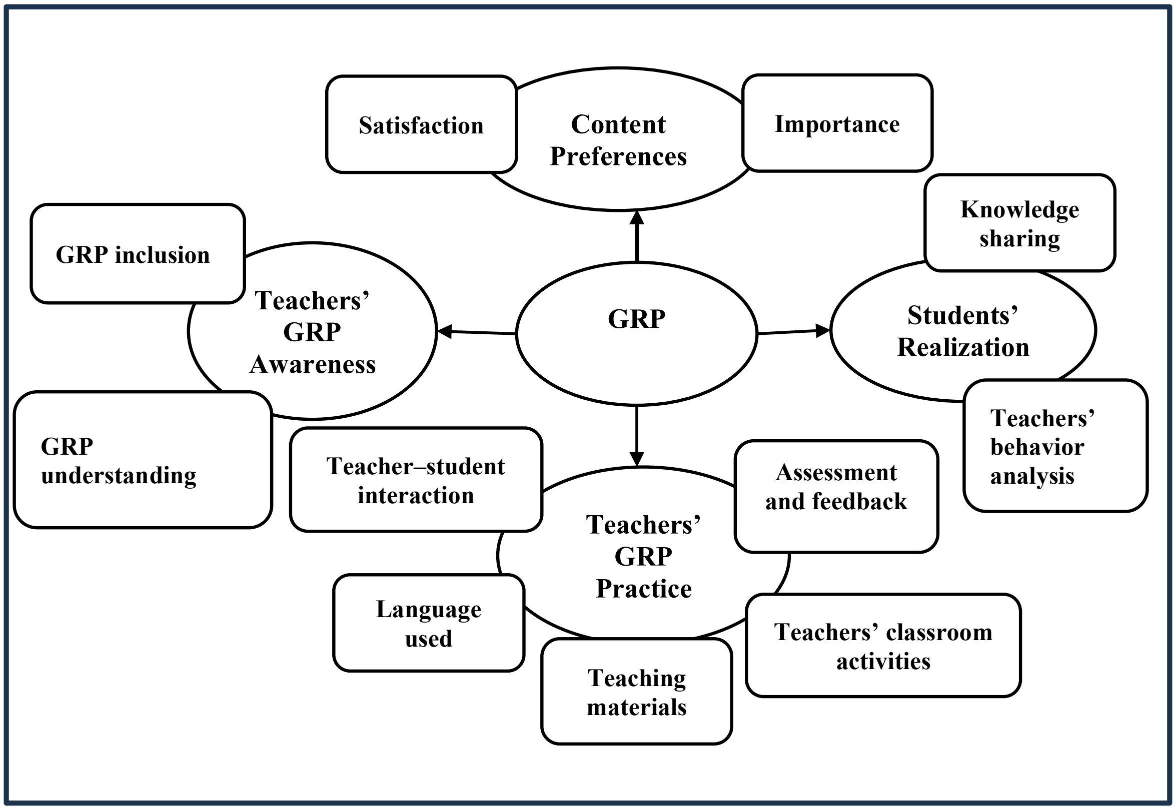
Liberal feminist theory demands that students (both male and female) are equal and should have treated equally and provided the same rights and responsibilities. The main notion of this theory is equality. Girls are as capable as boys but 'glass ceiling' attitudinal barriers prevent them for reaching the top level of any occupation and professionalism. This notion is used to explain and discuss the findings regarding gender equality point of view in all aspects such as content preferences, GRP practices, and students' realization towards GRP practices in teaching and learning mathematics. In a parallel vein, the main principal of critical theory is that knowledge is power, so we must use our understanding of power dynamics to challenge oppressive systems and promote social justice, in opposition to gender inequality. This notion is used to discuss the results derived from teachers' GRP practices and students' realization towards GRP in mathematics classrooms. In addition, this theory joined while discussing mathematical content preferences and teachers' classroom activities.

Another theory reviewed in this study was the social cognitive theory, the center of the theory is that gender-typed behaviors are guided and promoted by self-efficacy beliefs and individuals' self-efficacy beliefs determine their motivation level in any task. Thus, self-efficacy is important for students' learning. This theory is employed to explain and discuss the findings derived regarding gender-stereotyped behavior of teachers and students obtained in GRP practices in the classroom.

**Conceptual Framework of the Study**

To address the research questions, the study's conceptual framework was formulated based on different conceptual, empirical, and theoretical literature related to GRP. The variables content preferences, teachers' awareness and practice on GRP, and students' realization related to GRP were considered the main variables of this study. Teachers' awareness measured based on two components one is the teacher's understanding or feeling about GRP and another is the teacher's inclusion of GRP methods in their teaching and learning process which was considered in the study by Kahamba et al. (2017). In other words, teachers' awareness towards GRP were measured based on their understanding towards GRP and methods they have known about GRP. Likewise, teacher-student interaction, language used, teachers' classroom activities, teaching materials, and assessment and feedback were the components of teacher's GRP practices and were considered based on the reviews (Forum for African Women Educationalist, 2015; Mlama et al., 2005; Njuguna, 2016; Solar, 1995). The key variables explored in this study are depicted in Figure 3 as follows.

**Figure 3**. *Conceptual Framework of the Study*




This framework is the heart of my entire study. I have used the variables included in this framework in tools formation in the methodological part of this study. I have developed a survey questionnaire for teachers to measure their GRP awareness based on the variables—GRP inclusion and Understanding GRP and to measure teachers' GRP practices on the basis of five variables—language used, teacher-student interaction, teaching materials, teachers' classroom activities, and assessment and feedback. Moreover, on the basis of this framework, I have developed a survey questionnaire for students based on students' realization of teachers' behavior towards GRP in mathematics classrooms on the basis of two variables: knowledge sharing and teachers' behavior analysis. In addition, I have developed a survey questionnaire for students to measure their mathematical content preferences based on two variables —

satisfaction and importance from eight content areas of mathematics through Grade IX mathematics textbook. Similarly, I have used this framework to develop interview guidelines for teachers and students and to prepare observation guidelines for observing teachers' GRP practices and students' classroom activities in mathematics classrooms at the time of the teaching process.

Likewise, I engaged in surveys, and face-to-face interviews, and conducted classroom observations with mathematics teachers and students to examine GRP practices. The collected data were interpreted and linked to various theories such as feminist theory and critical theories regarding gender equality and equity cases, Vygotsky social constructivist theory (ZPD) regarding pedagogical aspect as interaction and collaboration, the social cognitive theory regarding self-efficacy, culminating in the formulation of conclusion.

**Implications of the Research for the Study**

The GRP was introduced by FAWE in 1990 in Africa to empower girls and to motivate them to participate especially in STEM subjects. Teachers are unquestionably a crucial component in implementing GRP within the teaching and learning process. The literature confirmed the importance of a GRP from the teachers to eliminate gender bias, maintain gender responsiveness in the classroom, improve girls' participation, confidence, and encouragement in mathematics, and to change teachers' beliefs and attitudes towards girls. When gender-responsive teaching practices are integrated into the interactions among the teacher, students, and their peers in the mathematics classroom, they foster a supportive and healthy learning environment, particularly for girls, which results in positive developmental outcomes.

A number of research were found regarding gender wise achievement, gender differences, participation, teacher's attitude and perception. After a gap of long duration, the topic of GRP was further examined by a few numbers of researchers (Abraha et al., 2019; FAWE, 2015; Kahamba et al., 2017; Mlama et al., 2005; Njuguna, 2016). Most of the researchers studied about GRP were from South African countries. Whereas a limited number of recent research (e.g., Dorji, 2020; Yuden et al., 2020) related to GRP were also done in Bhutan. Among them, only one of the studies was conducted at a higher level, and except majority of these studies were concentrated on school level education. However, most of these studies were devoted to examining GRP practices only through the teachers' perspective. Still, from all over the world, very few research was conducted to label teachers' awareness and classroom practices and about students' realization of teachers' GRP practices.

Nepal, as a developing country, continues to experience gender disparities in mathematics, with boy students consistently outperforming their girl counterparts (Bista, 2004; ERO, 2015a; 2015b; 2019; Mathema & Bista, 2006). Research has shown that teachers often exhibit gender discriminatory behaviors in mathematics classrooms, frequently favoring boys over girls in terms of attention and perceived ability (Bista, 2004). These findings highlight the importance of examining teachers' awareness and practices regarding GRP, as well as students' realization of teachers' behavior regarding GRP in mathematics at the secondary level. While some studies on GRP have been conducted in Sub Saharan African countries, there is a noticeable lack of research focused on Nepalese context, particularly within the subject of mathematics, which is the research gap in my study. This gap in the literature underscores the need for the present study, which aims to address these limitations and contribute to the awareness and practices of GRP in mathematics education in Nepal.

Furthermore, there is a noticeable lack of mixed methods research (Quan. + qual.) that employs a combination of tools such as questionnaires, interviews, and classroom observations on the topic of GRP, particularly within mathematics education. This research sought to address that gap by exploring the GRP practices of secondary school mathematics teachers and examining how students perceive their teachers' gender responsive behaviors, utilizing various data sources.

The findings of this research can inform the development and implementation of targeted workshops and training programs for teachers, prompting and encouraging the adoption of GRP among both teachers and students. Ultimately, this would support the creation of gender responsive classroom environments in teaching and learning of mathematics. Under these circumstances, this study holds particular significance for developing the foundation for GRP in Nepal, particularly in the field of mathematics education.

# Chapter III

## Research Methodology

This study aims to explore teachers' awareness towards GRP and how they implement GRP practices in mathematics classrooms. In addition, the purpose is to explore students' realization towards teachers' behavior regarding GRP practice in mathematics classrooms. The primary aim of this chapter is to identify, describe, and provide a rationale for the research design and methodology applied in this study. It specifically outlines the research design and its philosophical foundations, accordingly and then justifies the chosen design and paradigm. It also delineates population, sample, and sampling methods. Later, it discusses about the tools used and the procedures of data collection, as well as discusses about data analysis procedures employed to obtain answers to the research questions. Lastly, I detail the ethical considerations undertaken when working and collaborating with the teacher and student participants in the field.

### Research Paradigm: Pragmatism

A paradigm is a comprehensive belief system or worldview that directs research within a field (Willis et al., 2007). It represents a philosophical stance about the nature of reality or the world. Furthermore, the paradigm is a set of beliefs and practices (Morgan, 2007; Teddlie & Tashakkori, 2009) that influences researchers to select research questions they explore and the methods they employ to investigate them (Teddlie & Tashakkori, 2009). From the philosophical perspective, the paradigm includes researchers' positions on ontological, epistemological, methodological, axiological and rhetorical in the study that guides the research process (Creswell, 2015).

This study was typically based on mixed method research. Mixed methods research encompasses various paradigmatic perspectives, including pragmatism, transformative emancipation, dialectics, and critical realism (Shannon-Baker, 2016). Among them, pragmatism is the optimal paradigm or philosophical orientation associated with mixed research design (Creswell & Plano Clark, 2018; Teddlie & Tashakkori, 2009). That's why, I adopted pragmatism as the philosophical lens in this study. Those who adhere to the pragmatist viewpoint argue that both quantitative and qualitative techniques, methods, concepts, approaches, and procedures, that best meet the needs and purposes of the mixed methods study (Creswell, 2009; Johnson & Christensen, 2014).

Pragmatism as a worldview that is based on actions, situations, and consequences rather than on prior conditions (Creswell, 2007, 2012). According to this paradigm, the main focus of the study is to "on the consequences of the research, on the primary importance of the research question asked rather than methods, and on the use of multiple methods of data collection to inform the problems" (Creswell & Plano Clark, 2018, p. 45). The truth of this paradigm is 'what works' regarding the research questions (Teddlie & Tashakkori, 2009) and is pluralistic and oriented towards real world practice (Creswell & Plano Clark, 2018). The basic ideas of pragmatism allowed the mixed method researchers that there is no boundary of any one system of philosophy or reality and have real freedom to choose any multiple methods, designs, techniques, and procedures that meet their need for "why" and "how" to conduct research based on intended purposes of the research (Creswell, 2007). In this paradigm, the researchers focus on the research problem rather than methods and uses all approaches related to problems. Pragmatism encouraged the researcher to use mixed methods, as employing various methods provides a richer and more comprehensive set of information to address the research questions than relying on a single method or tool.

Pragmatism is philosophical thought which is outcome-oriented and serves as an alternative to positivism and metaphysical (critical, post positivism and participatory approaches) thinking (Shannon-Baker, 2016). Shannon-Baker adds, pragmatist researcher engages the subject of inquiry from all possible angles while using all available tools, for fully answering the research questions. According to Shannon-Baker, researchers must be able to maintain subjectivity and objectivity in data collection and analysis. Pragmatism also supports the use of mixed research methods by enabling researchers to utilize multiple methods to obtain the effective answers to their research questions.

The conviction underlying my research study is that the singular and multiple realities (Creswell & Plano Clark, 2018) coexist underlying the implementation of GRP in mathematics classroom at secondary level in community schools. This study also accepted the existence of external reality and diverse viewpoints based on the social realities (Teddlie & Tashakkori, 2009). The perspective on the quantitative part can be the same and the perspectives on qualitative part can be differerent based on location, time, grade, individual participant's viewpoint of content preferences, awareness, and practice, rendering reality relative. Hence, I consider the truths regarding belief about teachers' GRP practices and students' realization are both singular and multiple.

The epistemology of pragmatism paradigm is that practicality because in which researcher collects data by 'what works' to address research questions (Creswell & Plano Clark, 2018). In this study, knowledge is generated in both objective and subjective points of view (Teddlie & Tashakkori, 2009). The knowledge concerning content preferences, teachers' awareness and GRP practices, and students' realization were identified by survey instruments that provides objective view of participants' beliefs (i.e., both knower and known are independent). Also, the classroom observation and participants' interviews were conducted to identify belief systems (i.e., both known and knower are inseparable) of teachers' GRP practices and to explore students' realization through face-to-face interaction with respondents by myself. Hence knowledge is flexible and context-dependent, that provides subjective view of both teacher and student respondents.

Pragmatists combine both inductive and deductive thinking (Creswell & Plano Clark, 2018) in mixed research design in which the researcher mixes both qualitative and quantitative data to obtain the best answer to the research questions. My research operates on the assumption that the survey data regarding GRP practices through questionnaires was deductively guided by the already developed theory. Likewise, results from the surveys were analyzed deductively. Moreover, the qualitative data (observation and interview) were obtained inductively with the help of participants' life-stories, experiences, historical background, and dialogue in this study. Moreover, the results from classroom observation and interviews were analyzed inductively.

The pragmatic researchers included both unbiased and biased perspectives (Creswell & Plano Clark, 2018). According to Teddlie and Tashakkori (2009), values play a vital role in interpreting results for pragmatist researchers. In this study, the data collection and analysis phase included both unbiased lenses (survey questionnaires) and biased lenses (interview and classroom observation). Moreover, the quantitative data related to content preferences, GRP practices, and students' realization obtained through survey questionnaires were generalized to the entire population because the results obtained were not biased. Likewise, the qualitative knowledge obtained through classroom observations and interviews was not generalized to the entire population, that is dependent upon the researchers' perspectives.

**Research Design of the Study**

The mixed methods approach employed in this study aimed to gather, analyze, and integrate both quantitative and qualitative data to examine mathematics teacher's awareness and practices related to GRP, student's perceptions of teacher behavior on the basic of GRP, and students' preferences in mathematical content areas. On which, both types of data were collected, analyzed, interpreted, and validated using systematic principles (Johnson & Christensen, 2014) in a single study. Likewise, this research methodology addresses both types of data to comprehensively address research questions from multiple perspectives in a systemic way (Creswell & Plano Clark, 2011; Creswell & Plano Clark, 2018). Mixed method has its own right to collect and to analyze data from multiple sources in a single study.

Since quantitative and qualitative methods have their own strengths and weaknesses. Mixed methods can leverage the strengths of each approach while simultaneously compensating at the same time for the weaknesses of each method (Creswell & Plano Clark, 2011; Creswell & Plano Clark, 2018). The strengths of combining both the quantitative and qualitative methods can enhance comprehension of research problems or issues beyond what each method can achieve independently, thereby surpassing their individual limitations (Creswell & Creswell, 2018). Moreover, this method incorporates both quantitative and qualitative approaches to formulate research questions, select research methods, collect data, analyze the data, integrate the findings, and draw conclusions (Teddlie & Tashakkori, 2009). Such research encompasses more than merely employing quantitative and qualitative strands; it emphasizes the integration of these two strands in a meaningful and purposeful way to explore and answer the research questions of the study (Creswell, 2012; Creswell & Plano Clark, 2011). This method helps the researchers to obtain answers the research questions with sufficient depth and breadth (Johnson & Christensen, 2014).

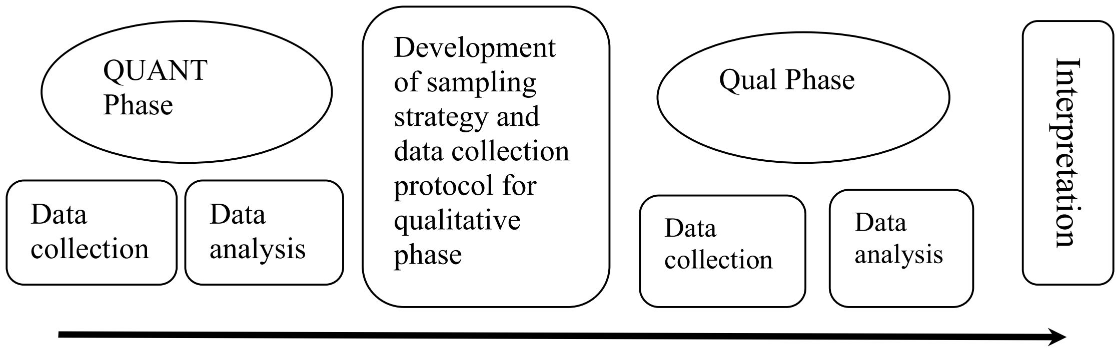
Within the scope and nature of this study, I adopted the explanatory sequential mixed methods design (Creswell, 2009; Creswell, 2012; Creswell, 2014; Creswell, 2015; Creswell & Creswell, 2018; Creswell & Plano Clark, 2018) to collect both quantitative and qualitative data sequentially. This design involved a two-phase approach; hence the study was conducted in two distinct stages. Initially, quantitative numerical data was collected and analyzed, which informed the subsequent qualitative phase of the study. In the second phase, qualitative data was gathered and analyzed to provide a comprehensive explanation of the results of quantitative phase (Creswell & Creswell, 2018; Creswell & Plano Clark, 2018).

In this study, the quantitative data provided a general overview of the research problem, while the qualitative data and its subsequent analysis provided a more detailed, in-depth, and deeper understanding of the research problem regarding GRP practices in mathematics (Creswell & Plano Clark, 2018). Moreover, Creswell (2008) stated that an explanatory study "captures the best of both quantitative and qualitative data—to obtain quantitative results from a population in the first phase, and then refine or elaborate these findings through an in-depth qualitative exploration in the second phase" (p. 560). The data collection and analysis usually occur sequentially on which, the results of the quantitative phase guide the development of the qualitative phase (Doyle et al., 2016). Hence, by using quantitative data, GRP practice issues can be operationalized with the help of well-defined survey instruments, using large representative samples, and making comparisons; on the other hand, qualitative data can be provided breadth and depth on the issue GRP practices in this study. Moreover, qualitative data was used to build on, support, and explore the quantitative findings to provide deeper understanding of the phenomena GRP practices and mathematical content preferences (Creswell, 2014). I employed this design, since this study intended the general overview regarding GRP and also its depth understanding in mathematics classroom.

In this study, both the quantitative and qualitative components focused on developing a description of the mathematics teachers' beliefs and perceptions in regards GRP practices and student's realization of teachers' behavior about GRP at secondary level. The quantitative data provided the statistical foundation and the general overview of teachers' GRP practices, which then guided a more in-depth examination of these practices in the classroom through qualitative methods.

The explanatory sequential mixed research design typically places a higher priority on the quantitative portion of data (Creswell & Plano Clark, 2018; Doyle et al., 2016). Although both quantitative and qualitative data, as well as their analysis, are given approximately equal emphasis throughout the research process, the overall intent of this design is to use qualitative data to provide a more detailed explanation of the initial quantitative results (Creswell & Creswell, 2018). Therefore, the results of both phases were unknown at the outset of the study. The qualitative portion offered a deeper understanding of research problems, whereas both strands were equally important in addressing the research questions in this study. Both the quantitative and qualitative data were collected and analyzed separately, then merged together during the interpretation phase only (Creswell & Plano Clark, 2011; Creswell & Plano Clark, 2018). This dissertation was conceptualized and carried out based on explanatory sequential mixed methods design outlined by Creswell and Plano Clark (2018), which is illustrated in a visual diagram in Figure 4.

**Figure 4.** *Design of the Study*




Thus, this study collected quantitative data in the first phase through survey instruments of both mathematics teachers and their students and then analyzed the data. The survey data enabled generalizations from samples about the entire population of mathematics teachers and students regarding GRP practices. The quantitative data obtained through teachers and students' survey questionnaire provided a general overview of the research problem about teachers' GRP practices, students' content preferences, and students' realization of teachers' behavior regarding GRP. The method of interviews and observations were preferred to address misconceptions of the quantitative results and to gain a deeper understanding of the GRP practices. Hence, the specific results of quantitative data guided for the selection of respondents for interview, and development of interview and observation guidelines for qualitative portion in the second phase. Thus, the qualitative data further explained the results obtained through quantitative data (Creswell, 2012; Klassen et al., 2012) and, in addition, to form a more comprehensive understanding of the results of quantitative data from the initial survey (Creswell, 2014). In this study, interviews and observations were employed to capture personal in-depth information about GRP from participants for the strengths of the study (Creswell, 2014; Rubin & Rubin, 2011).

The primary objective of the quantitative phase was to gather numeric survey data to state mathematics teachers' awareness, examine GRP practices, investigate students' content preference, and their realization towards teachers' behavior regarding GRP practices. Similarly, the purpose of the qualitative phase was to further elaborate on and explore the findings from the quantitative data, understand the complex phenomenon in depth, and developing a deeper understanding of mathematics teachers' GRP practices and students' realizations.

***Quantitative Research***

Quantitative research is an approach on which numbered data can be analyzed using statistical procedures. In this study, numbered data were collected through survey of math teachers and students. The quantitative approach facilitated the gathering of numerical data from a large number of participants, which enhances the likelihood of generalization of research findings to the wider population. The aim of quantitative approach of this study was to provide a general overview of the research problem as a whole.

The quantitative part of this research was collected through survey research design, which is the most used method in social science research to collect quantitative data. In this design, researchers administer survey questionnaire to a representative sample of the study. Further, researchers collected quantitative, numbered data using questionnaires then analyzed the data statistically to answer the research questions or hypotheses (Creswell, 2012). The gathered information or findings obtained from the survey are intended to be generalized back to the population, within the bounds of random error (Kotrlik & Higgins, 2001).This design enables researchers to generalize the research findings from a sample to the entire population.

In this study, I employed a cross-sectional survey design in the first phase, which is a popular design on which the researcher collects data at one point in time (Creswell, 2012). This design measures current attitudes or practices. According to Creswell, this design "provides information in a short amount of time, such as the time required for administering the survey and collecting the information" (p. 377). Furthermore, it had realized that teachers' classroom practices of GRP and students' realization on teachers' GRP practice was carried out one at a time. The teachers' GRP practice on mathematics classroom was measured only one time with the help of teachers' survey questionnaire. Furthermore, student's content preferences and their realization about teachers' GRP practice was measured with the help of students' survey questionnaire concurrently but independently. However, the survey study is based on wide and inclusive coverage, is a representative of the entire population, and it provides a general overview of the research problem in this study.

***Qualitative Research***

Qualitative research basically depends on gathering of qualitative data. It provides primarily a narrative report with thick and rich description rather than statistical data (Johnson & Christensen, 2014). Creswell (2008) also reported that qualitative research is typically educational research in which "the researcher relies on the views of participants; asks broad, general questions; collects data consisting largely of words (or text) from participants; describes and analyzes these words for themes; and conducts the inquiry in a subjective, biased manner" (p. 46). The aim of qualitative research is to offer interpretations that emphasize achieving meaning and understanding, as well as developing concepts and theories. It provides insights into the nature of students, hence is very useful in learning mathematics. These methods were employed to observe phenomena as they naturally unfold and in all their complexity (Leedy & Ormrod, 2016). In this sequential explanatory mixed methods study, the aim of qualitative research is to explain, explore or expand the quantitative results obtained through survey questionnaires and help achieve a deeper understanding of teachers' GRP practices and students' realization towards teachers' GRP use in mathematics classroom and students' content preferences about mathematics. For the qualitative phase, I utilized qualitative descriptive design for allowing the qualitative data.

In summary, a sequential mixed-methods approach was employed to offer a more comprehensive thorough understanding of the issues concerning to teachers' awareness and practices related to GRP, as well as students' realizations towards GRP, compared to the use of a single method in this study. Hence, both quantitative and qualitative data were obtained through multiple tools. This study used a sequential mixed methods approach to gather different types of data, both quantitative (surveys) and qualitative (interview, observation), from the same participants (students and teachers), to address the same research question at various times. The data were then separately analyzed, quantitative data in first phase and qualitative data in second phase and the results of these various types of data were compared at the interpretation phase.

**Sampling Procedure of the Study**

In this study based on the research questions and methods, I decided to conduct research in a single province out of the seven provinces in Nepal. I selected the Bagmati province employing simple random sampling technique. Hence, all the community secondary schools of Bagmati province as the study site of this study.

### *Population*

To address the research questions, the researcher needs to gather data from all cases. The entire collection of cases from which the sample is drawn refers to as the population (Taherdoost, 2016). This is typically related to the number of people residing within a particular area, region, or country. Therefore, I decided to select secondary level mathematics teachers and their students from Bagmati Province of Nepal for data collection. That’s why the population of this study was secondary level teachers who were teaching mathematics at Grade IX and X and their students who were studying at Grade X in this Province.

### *Sampling Method for Quantitative Data*

This is the explanatory sequential mixed methods study, that's why in the first phase sample size for quantitative data were determined. For instance, the sampling technique was carried out for quantitative survey data collection of both teacher and student respondents. It was necessary to determine a sample size that would represent the entire population, and the result is generalized to the wider population of the study. Although the researchers had often limited time and resources to analyze the entire population, it is crucial to identify a representative sample to reflect the entire population. It was realized that a large number of samples “enhance the representativeness of the sample and, in turn, this allows greater confidence about making generalizations based on findings from the sample” (Denscombe, 2014, p. 41). Multi-stage sampling is widely used in widespread geographical regions. Hence, in this study, due to those reviews, time, cost, and geographical difficulties, it was decided to select community secondary schools’ mathematics teachers and students by employing multi-stage sampling technique. According to Ackoff, as cited in

Taherdoost (2016) multi-stage sampling is a method that involves narrowing down a broad sample to a narrow sample, using a step-by-step process.

For the mathematics teachers' sample from the Bagmati province, in the first stage, I employed stratified random sampling for district selection. Thirteen districts of this province were divided into four strata, which are based on geographical characteristics as geographical regions: Hilly (6), Mountain (3), Valley (3), and Terai (1). Then, four districts, one district from each geographical region; Dolakha from Mountain, Sindhuli from Hilly, Chitwan from Terai, and Kathmandu from Valley were randomly selected.

In the second stage, the sample size of schools in these four districts were determined by applying Slovin's formula. According to Flash Report 2076, there were 461 secondary schools including Dolakha (83), Sindhuli (111), Chitwan (103), and Kathmandu (164) (MOE, 2020). Hence, N = 461 community secondary schools as the population of the selected four districts. Then, I employed Slovin's formula (Simegn & Asfaw, 2018; Tejada & Punzalan, 2012) at 0.05 margin of error, where n = 215 as the sample of school. I added a 10% non-response rate (22), then altogether n = 215 + 22 = 237 as the total sample size of the community secondary school. Moreover, sample schools of each district were determined according to the proportion of the population of each district. The sample determination of teacher participants of each sampled district is shown in (Appendix G) having Dolakha (43), Sindhuli (57), Chitwan (53), and Kathmandu (84). For the selection of sample schools, the sampling frame of all schools of each four districts were prepared on which the schools' names were arranged alphabetically and assigned a number and then a lottery was prepared to select each individual school based on their assigned number within slips of paper (Appendix M). Determined number of sampled schools were randomly selected through a simple random sampling procedure using the lottery method (Bryman, 2012).

In the third stage, sampled mathematics teachers were taken 237, one teacher from each sampled school, assuming that at least one mathematics teacher teaches mathematics at Grades IX and X in each school. For instance, if there were more than one mathematics teachers in each of these sampled schools, only one mathematics teacher was selected randomly, employing a simple random sampling technique. The sampling procedure of teacher respondents is presented in Table 1 below.

**Table 1.** *Sampling Procedures of Mathematics Teachers*

| Region | Mountain | Hilly | Terai | Valley | Total |
|---|---|---|---|---|---|
| No. of Districts | 3 | 6 | 1 | 3 | 13 |
| Sample Districts | Dolakha | Sindhuli | Chitwan | Kathmandu | 4 |
| No. of Secondary School | 83 | 111 | 103 | 164 | N = 461 |
| Sample Size (School) | 43 | 57 | 53 | 84 | n = 237 |
| Sample Size (Teacher) | 43 | 57 | 53 | 84 | n= 237 |
| 10% Non-Response Rate | | | | | 22 |

Therefore, the sample for the study consisted of 237 mathematics teachers teaching Grades IX and X in community secondary schools across Bagmati Province, Nepal. Out of this total, 211 teachers completed and returned the survey questionnaire. Hence, the return response rates of 89%, around 70% and higher response rate are generally considered acceptable (Johnson & Christensen, 2014, 2019). Whereas, among 211 returned questionnaires, six of the teachers' questionnaires were incomplete, I had not included these questionnaires for data analysis purposes. Hence, the teachers' quantitative survey data ended up with 205 mathematics teachers' questionnaires.

The student respondents for the survey portion of the study were also determined by employing multi-stage sampling. I determined a sample of student respondents for the survey of the quantitative portion, from the same four districts of four geographical regions of Bagmati Province. All the student respondents were studying at Grade X in community schools. Students were equally important in this study. I considered the time and costs for the sample selection of students. The students' sample were taken out from the secondary school of those 237 teachers who were selected for the teachers' sample of the study.

In this study, I have decided to take above 400 student sample, that would be sufficient for the study. In average each school contained above 30 students at Grade X. For instance, I selected student sample from 28 secondary schools. The student samples were proportionally distributed from each of the four districts, including 10 schools from Kathmandu, 7 schools each from Sindhuli and Chitwan, and 4 schools from Dolakha districts randomly employing simple random sampling technique. It was found that out of 28 schools, 25 schools enrolled below 100 students, and three schools enrolled above 100 students. Since, those three schools were only from the Kathmandu district. I utilized criterion sampling for determining the sample size of student participants from each sampled schools, based on 100 below and 100 above number of students at Grade X. Since, criterion sampling occurs when the researcher identifies and selects participants based on some predetermined criteria of importance (Creswell, 2014). In criterion sampling, the researcher establishes specific criteria and then selects samples that meet those criteria (Miles & Huberman, 1994; Nichols, 2022). Based on the criteria, I selected 15 students from each of the 25 selected schools having less than 100 students and 32 students from each remaining three selected schools having above 100 students at Grade X for the study. Hence, there were altogether 471 student participants for the survey —60 from Dolakha, 105 from Sindhuli, 105 from Chitwan, and 201 from Kathmandu.

The student respondents were chosen using the simple random sampling technique from each sampled school. This sampling method is widely used in educational research (Bryman, 2012). This sample size (471) of students may be acceptable for the study, following Denscombe (2014) advice for the sample size of student participants that social research surveys and sampling are often employed in small-scale research involving between 30 and 250 cases. Then, the number of student respondents returning the survey was 459, among 471 students. The response returns rate of student respondents of the survey was 97%, which was acceptable response, since 70% and higher responses were generally considered acceptable (Johnson & Christensen, 2014, 2019). Among returned 459 surveys of students, seven of the collected questionnaires were incomplete, these incomplete questionnaires were not included for the analysis purpose of the study. So, the students' survey data ended up with 452 students' questionnaires.

***Sampling Method for Qualitative Data***

For the second phase of this study, the teachers and students were the respondents in the qualitative part, who completed the survey questionnaire in the first stage of the study. These participants were determined after analyzing the survey data and based on the results of survey data. Both teachers and students were selected employing purposive sampling technique. The primary goal of purposive sampling is to target specific characteristics within a population that are of interest and relevant which will best enable the researcher in effectively addressing the research questions. On which, I intentionally selected the specific group of teachers and students, who were taught and learnt mathematics in secondary level community schools.

In this study, all the teacher and student participants were taken from the Kathmandu district. Since, the quantitative results revealed that lowest GRP practices were found on teachers of this district, and some variability found on this district. Likewise, for the teacher participants, among 205 mathematics teachers, I selected six teachers (four males, two female), who were the source of qualitative data to examine teachers' GRP practice in mathematics classrooms. However, one male mathematics teacher was not convinced to audio record his interview for research purposes, hence I had not included his interview in this study. Consequently, the study ended with five mathematics teachers (three males and two females). Five of them were included for semi-structured interviews, though all six mathematics teachers' classroom observations were included for qualitative data analysis purposes. To ensure a diverse range of teacher participants, various criteria were applied during the selection process —(a) one teacher from schools having above 100 students, two teachers from schools having below 30 students, remaining three from schools having above 30 and below 100 students at Grade X, (b) two were female teachers and four were male teachers for good gender balance for gender wise comparison, (c) half of them have less than 15 years of teaching experiences, and the other half of them have above 15 years of teaching experiences, (d) a willingness to continue in the study (see Appendix I for details).

Among 452 students, I selected twelve students (six boys, six girls), who were selected purposively from the classes of the above six sample teacher participants, for an interview containing two (one boy and one girl) from each teacher's classroom. To capture the diversity of the student participants, a variety of criteria were used for their selection: (a) a willingness to continue in the study, (b) half of them were boys and half of them were girls for a good gender balance, for gender wise comparison,

(c) five of them were high achievers, five were medium, and two were low achievers based on their performance in the classroom, and (d) different caste and multi-cultural group (see Appendix H for details). For the observation, I had chosen the mathematics classroom of the above six mathematics teachers selected for interview.

## Tools for Data Collection

The main purpose of the study was primarily to identify teachers' awareness and examine teachers' GRP practices and the realization of students towards teachers' behavior towards GRP at the secondary level. To obtain the answers to the stated research questions, both quantitative and qualitative data were collected. I collected multiple forms of data employing "multiple methods" (Cohen et al., 2018). The methods, I employed to collect the quantitative and qualitative data were teachers' and students' survey questionnaires, semi-structured interviews, and classroom observation. The first type of data that is quantitative data was collected with the help of survey questionnaires in the first phase and the second type of data that is qualitative data were collected through interviews and classroom observation guidelines in the second stage. The interview and observation guidelines for the qualitative phase were developed based on the findings from the survey data collected in the first stage, to explain the results of quantitative data more deeply.

### *Questionnaires*

Conducting a survey was the most effective method for collecting quantitative data in this study. Questionnaires served as the most applicable tool for collecting information about teachers' awareness and practice of GRP in the mathematics classroom and students' realization towards teachers' GRP practice in mathematics teaching learning process. Questionnaires are required by respondents "to reveal information about feelings, to express values and to weigh up alternatives in a way that calls for a judgement about things rather than the mere reporting of facts" (Denscombe, 2014, p. 157). Questionnaires are used to investigate participants' attitudes, opinions, preferences, and feelings.

Two separate sets of questionnaires for the teacher and student participants were prepared. The survey questionnaires for teacher participants were developed (see Appendix A for details) and consists of three different parts: students' content preferences, teachers' awareness of GRP, and teachers' practices related to GRP. The items in the first part, which pertain to students' content preferences were derived from a questionnaire developed for students based on the Grade IX mathematics textbook, allowing for triangulation with students' content preferences. The items in the second part of the questionnaire were created based on the main concepts and related concepts of GRP, informed by the research conducted by Kahamba et al. (2017), to measure teachers' awareness towards GRP.

The questionnaire items designed to assess teachers' GRP practices were prepared based on five different variables: classroom interaction, teaching materials, teachers' classroom activities, language used, and assessment and feedback, as outlined in the conceptual framework of this study. The statements were carefully crafted to address the research questions. Additionally, some of the statements related to teachers' GRP practices were adapted from various literatures (e.g., Solar, 2000; Abraha et al., 2017; Mlama et al., 2005) and modified to make the suitable for mathematics teachers in the context of Nepal.

The survey questionnaire for student participants was developed (see Appendix B in details) and consists of two parts: students' content preferences and students' realization towards teachers' behavior regarding GRP practices. The items related to content preferences in the students' survey questionnaire were prepared from eight mathematical content areas and contents within each content areas, including Set, Mensuration, Algebra, Arithmetic, Statistics, Probability, and Geometry, as outlined in the Grade IX mathematics textbook. The questionnaires of content preferences were rated using a 5-point Satisfaction and Importance Likert scale. Similarly, the questionnaires assessing students' realization towards teachers' behavior regarding GRP practices were developed based on two variables: knowledge sharing and teachers' behavior analysis. The items in this questionnaire related to students' realization were created with reference to various literatures related to gender-based concepts in mathematics classroom and were based on questionnaire prepared for teacher participants regarding GRP practices.

Teachers' GRP practices and students' realization were assessed using a 5-point Likert scale, with responses ranging from Strongly Agree (5), Agree (4), Neutral (3), Disagree (2), to Strongly Disagree (1). Reverse values were given for the negative directional statements ranging from Strongly Disagree (5) to Strongly Agree (1). Both positively and negatively directional items were arranged throughout the survey to minimize the likelihood of extreme or overly compliant responses from participants. The questionnaires were developed by altering several questionnaires related to GRP, used in previous research, and new questionnaire were self-developed especially to obtain answer of the research questions.

***Interview Guidelines***

Interviews were conducted with mathematics teachers and students to gather data on the teachers' practices of GRP and students content preferences and self-realization about teachers' GRP use in mathematics, how teachers practice GRP in classroom and how students perceive this teachers' GRP practice as gender responsive or not to explain the result of quantitative data**.** Interviews were considered the most effective method for gaining insight into participants' experiences and perspectives, allowing them to express their thoughts in their own words. Interviews were generally conducted to support, verify and cross-checks of questionnaire findings (Cohen et al., 2018). Interviews enable the researchers to collect rich data from the respondents.

Interviews used in qualitative research studies are less structured and might be open ended than those used in quantitative research studies. Also, such interviews might be semi-structured in nature and focus on a small number of questions central to the study (Leedy & Ormrod, 2016). In this study, semi-structured open-ended interview guidelines were developed for mathematics teachers and students. Interview guidelines were prepared to obtain additional information rather than a survey questionnaire, through teachers and students about their GRP practices in the classroom. Interview guidelines were developed based on the results of survey data, taking the extreme or outlier cases, debatable cases, common cases, and significant or insignificant results relating to variables. For this, new interview guidelines were prepared rather than using an existing one for both teachers and students separately. The interview guidelines focused on the same categories as the teacher and student surveys presented in the conceptual stands. While interview guidelines allowed all sampled teachers to be asked the same initial questions, based on their responses follow-up questions were varied. Teachers' interview guidelines were developed based on their GRP practices in mathematics classrooms on the basis of different categories regarding teaching methods employing in the classroom, classroom interaction, teaching materials, language used, teachers' activity in the classroom, and assessment and feedback in their classroom (see Appendix C for details).

Likewise, I also developed interview guidelines for students taking into consideration outlier cases, common cases, and debatable cases of results of students' survey data. I developed interview guidelines for students based on content preferences, knowledge sharing and teachers' behaviors analysis related to GRP (see Appendix E for details).

***Observation Guidelines***

Observation guidelines were developed for qualitative data based on quantitative results. In educational research, just like interviews, and observation can serve as a primary source of data. It is conducted in the natural setting with the phenomenon of interest occurs, providing firsthand information and direct insight into the subject being studied. I utilized this approach for collecting data by observing the classroom activities of teachers and students as well as site artefacts.

During the observation of classroom activities, I administered the method of 'overt nonparticipant observation' (Cooper et al., 2004), which required notifying the relevant teachers regarding my participation in their classroom for research purposes. Nevertheless, I abstained from taking part in the actual teaching learning activities in the classroom where teacher and student participants were involved. I did not interact with each other, just observed the classroom activities of mathematics teachers with the help of prepared observation guidelines (see Appendix D for details). I developed classroom observation guidelines based on a methodology that teachers conduct in the classroom, the interaction between teacher-student and student-student, students' actions in the classroom, whether the language used by teacher in the classroom is gender responsive or not, and based on classroom set up.

***Piloting the Questionnaires***

It is always necessary to pilot any self-constructing questionnaires before administering them to the main sample population (Bryman, 2012). To identify any misleading or irrelevant items, to evaluate the consistency of the survey items, and to finalize the survey questionnaire, a pilot study of survey questionnaires was conducted before conducting the main study. The secondary level mathematics teachers and their students, who were studying at grade X were selected for the pilot study, who were not included in the main text in 2019 October and November. The main purpose of the pilot study was to identify any wording, formatting, languages, and access difficulties for respondents in completing the survey form. The pilot study also explored the consistency of the items for the main study.

Before implementing this study, I had selected 25 teachers including both male and female from two districts Lalitpur and Sindhupalanchowk, who were teaching at Grades IX and X. Similarly, four schools (two schools from each district) were selected employing convenient sampling, for taken around 10% respondents. Then, 10 students from each three schools and nine students from the remaining one school were selected randomly employing a simple random sampling technique, who were studying at grade X. Hence, altogether 39 students including both boys and girls from four schools were chosen for the pilot study. The teachers and students, who involved in the pilot study were not included in the main formal study.

***Reliability and Validity of Survey Tools***

The researchers have the main works to maintain the research tools be more reliable and valid. Without consistency and accuracy of tools, the research would become irrelevant and useless. That's why researchers should always pay close attention to maintaining the reliability and validity of the tools. Reliability is the consistency or stability of measurement over a variety of conditions, likewise, validity is concerned with the meaningfulness of research components (Drost, 2011). A questionnaire is valid if it measures what it sets out to measure, whereas a questionnaire is reliable if it can be measured consistently across different situations (Field, 2009) and obtain the same result.

The most commonly used technique to estimate reliability is the correlation coefficient also called the reliability coefficient (Drost, 2011). There are three prominent factors involved in measuring reliability: stability over time, internal reliability, and inter-observer consistency (Bryman, 2012). Among them, internal reliability measures consistency within the instrument, which is the focus of my study. Hence, I applied the method of internal consistency in my study. As stated by Drost, the most widely used method for assessing internal consistency in behavioral science is coefficient alpha, popularly called Cronbach's alpha which "gauges internal consistency, the stability, and validity of many measures" (Bryman, 2012, p. 181). Cronbach alpha is useful for estimating reliability for item-specific variance in a unidimensional test (Field, 2009). That's why, I measured data reliability by providing Cronbach alpha values of self-constructed questionnaires with the help of SPSS software.

The self-constructed questionnaires for teachers and students regarding GRP were validated using Cronbach's alpha values to assess the internal consistency of the survey items for the specific sample groups. All constructs related to GRP were expected the Cronbach's alpha value above 0.70. The value between 0.70 to 0.80 is an acceptable value for Cronbach alpha and the value lies on 0.80 to 0.90 gives good reliability (Field, 2009). The resulting Cronbach's alpha values of both questionnaires are depicted in Table 2 as follows.

**Table 2.** *Cronbach's Alpha Values of the Items of Each Construct*

| Constructs | Cronbach's Alpha Values of Teachers | Cronbach's Alpha Values of Students |
|---|---|---|
| Satisfaction within content area | 0.701 | 0.778 |
| Importance of content area | 0.869 | 0.858 |
| Teachers' GRP practices | 0.826 | --- |
| Students' Realization towards GRP | ---- | 0.851 |

The reliability value of teachers' views on students' satisfaction within content area scales was 0.701 which had acceptable reliability. Moreover, teachers' views on the importance of content area scales had a good reliability with 0.869 and their GRP practices scale had also good reliability with a Cronbach alpha is 0 .826. Likewise, the internal reliability for the student's three scales resulted in the following Cronbach alpha: 0.778 for satisfaction with the content area, 0.858 for the importance of the content area, and 0.851 for their realization towards teachers' behavior on GRP practices. According to Field (2009), all values of Cronbach alpha indicated that Cronbach alpha value was acceptable for satisfaction within the content area scale and good for the remaining two importance within content area and agreement scales conducted for students. Due to the fact that all constructs except the satisfaction scale of both teachers and students showed a good internal consistency of both teacher and student on the importance scale and agreement scales, where Cronbach alpha values were above 0.80, implies that all items in each construct were strongly correlated (Nunnally & Bernstein, 1994). Field (2009) expressed that the value of Cronbach alpha can be influenced by the number of items on a scale, hence it should be interpreted with caution. Field posited that as the number of items decreases, the alpha value will decrease. There were only eight items in the content area, that is why all items of both teachers' and students' questionnaires were included in the main study of the dissertation.

Drost (2011) suggested that the questionnaire was assessed by expert observers before its application in the pilot study. Accordingly, in this study, I maintained and evaluated content and face validity with the help of subject experts. I consulted and met with my research supervisor, mathematics professors, mathematics teachers, gender workers, experts in this area, and my colleagues before conducting the pilot study. They were also asked to provide comments, suggestions, and questions regarding each survey item. According to the comments and recommendations given, those questionnaires that had any problems were modified and reconstructed according to the purpose of the study. Then, I made sure these both items were understandable for participants, all items measuring the same construct in a similar way (Creswell, 2009). I also ensured that each survey item had face validity in the fact that each item of both questionnaires was regarding gender responsiveness in the field of mathematics. In this way, the validity of self-constructing questionnaires was maintained for the study.

***Trustworthiness***

To enhance the trustworthiness and validity of qualitative research, Guba (1981) suggested four key criteria: credibility (similar to internal validity), transferability (comparable to generalizability), dependability (equivalent to reliability), and confirmability (related to objectivity). According to Guba, credibility would be established through the method of thick description, triangulation, prolonged engagement in the field, member check and negative or deviant case analysis.

To ensure credibility, I used triangulation (Denzin, 1989) by using multiple data sources through teacher and student interviews and classroom observation to confirm findings related to GRP practices. In addition, I ensured credibility by implementing the practice of member checking (Lincoln & Guba, 1985) by providing opportunities to the selected participants (including teachers and students) to review their interview transcripts, originally taken in the Nepali language. Likewise, credibility was also ensured with the help of a 'thick description' (Denzin, 1989) of the interview data, connecting with different theories associated with the content of the study, and 'disconfirming evidence' (Miles & Huberman, 1994) collaborating with the respondents. Ultimately, credibility was ensured by promoting honesty, as participation in the interview process in this study was entirely voluntary. The interviewer explicitly stated that respondents had to answer honestly and were free to skip questions or stop participating at any point (Shenton, 2004).

Likewise, transferability was established through the development and use of an interview guideline that allowed the interviewee to build rapport and a close relationship with the interviewer and, as a result, facilitated extensive and detailed sharing of experiences (Rubin & Rubin, 2011). The research supervisor examined the research study's procedure and final result to assess dependability and evaluated for accuracy whether the findings were supported by the data (Lincoln & Guba, 1985).

**Data Collection Procedures**

Explanatory sequential mixed research design is a two phase approach (Creswell & Plano Clark, 2018), and hence data were collected in two distinct phase: quantitative data collection in the first phase and qualitative data collection in the second phase. As such, I organized the data collection process into four steps of explanatory sequential mixed research design:

Step 1: Design and implement the quantitative strands

Step 2: Use Strategies to connect from the quantitative results

Step 3: Design and implement the qualitative strands

Step 4: Interpret the connected results (Creswell & Plano Clark, 2011; Creswell & Plano Clark, 2018)

I followed these four steps to collect data to obtain answers of the related research questions. In this study, I had discussed data collection procedures of each phase separately.

***Quantitative Data Collection***

Prior to any data collection, the researcher should have visited and contacted the intended school and the school's principal. In the plan to conduct the research, I visited each of the sampled schools and began by contacting and meeting with the school's principal. I handed over the permission letter given by the Graduate School of Education and explained the purpose of my research. After receiving permission from the school principals, I met with the mathematics teachers and explained the purpose, the research process, and the rationale of the study in mathematics instructions. Most of the principals and teachers were helpful, kind, and supportive but some of them denied participating in this study.

I distributed a survey questionnaire for sampled mathematics teachers and provided one week's time to fill up the questionnaire for each teacher. One week later, I returned to the sampled school and collected these questionnaires after they had filled up. Moreover, some of them had taken a little more time to fill out the form, I have also included these questionnaires in this study. Due to the spread area, it took four months to collect the survey questionnaires. Among 237 mathematics teachers' survey questionnaires, 211 questionnaires were returned of which 205 completed surveys were involved in this study.

After obtaining the approval and consent from principals and teachers, I also met the sampled students with the help of mathematics teachers. I met them and explained the purpose, the research process, and the rationale of the study and took permission to proceed with the study. As one of the questionnaires about students was about their realization towards their mathematics teachers' behavior regarding GRP. Prior to the study, it was decided that mathematics teachers of each classroom might not distribute the questionnaire to their students. This could create an uncomfortable environment for students to fill up real data by rating their teachers. Hence, sampled students filled up the questionnaire in their leisure time, I helped them to clear their confusion on questionnaires. They took about 30 minutes' time to complete the survey and I collected all questionnaires at the end. I took confidentiality into strict consideration in the classroom, ensuring that none of the questionnaires and results were shared with their classmate participants. Out of 471 student survey questionnaires distributed, 459 were returned, and 452 completed survey questionnaires were included in this study.

***Qualitative Data Collection***

After collecting the survey data of both teacher and student respondents, survey data were analyzed before entering into the next qualitative phase. Since, the qualitative phase is linked to and relies on the findings from the quantitative phase. Hence, for entering into the qualitative phase, specific quantitative results were identified that call for additional explanation of quantitative results (Creswell & Plano Clark, 2018). These results helped to choose qualitative sampling respondents and to develop the qualitative research questions (interview and observation guidelines) and data collection protocol. In this study, I utilized the quantitative survey data from both teachers and students to designate six mathematics teachers and twelve students for the qualitative phase. I then conducted semi-structured interviews and observed each teacher's classroom using observation guidelines. Moreover, five mathematics teachers (2 females, 3 males) and twelve students (6 boys, 6 girls) participated in the interviews, whereas six mathematics teachers' classrooms were observed. Data were gathered from multiple sources to enhance the richness and depth of each case description.

Classroom observations of the teacher participants were scheduled after taking permissions from them. Each of the six mathematics teachers' classroom was visited and observed twice, resulting in a total of 12 classroom observations. The duration of each observation was taken for 45 minutes or one class period based on the school's time allocation. The observations were conducted during the school day concentrating on observing mathematics teachers' GRP practices and students' activities in mathematics classroom. The classroom observations were conducted during the months November 2021 to January 2022. As a nonparticipant observer, I took both descriptive and reflective field notes in the natural classroom setting while teachers were teaching mathematics at Grade X, followed the observation guidelines (See Appendix D). Each observation was thoroughly documented in field note in detail from start to finish, providing a detailed account of the classroom environment, including interactions, participation, activities, and overall setting within the observed classrooms. I documented on my diary the teachers' GRP practices and students' activity based on teacher-student interaction, students' activity, teachers' used methodology, sitting arrangements, and also noted lesson content studied at that day.

After observing each teacher's classroom, I contacted each teacher and student participants and explained the research study purposes, significance, interview processes, and scheduled individual interviews prior to the interviews. The interviews were conducted face-to-face mode at each school, with both teachers and their students one at a time interviewed individually. Schools were chosen as the interview locations because it was the most convenient and natural setting for the participants to participate. Interviews were fixed before and after the school class time and during break time and taken interview with the help of interview guidelines. In addition, designed additional supportive questions at the time of interview procedures. Each interview of both teachers and students were audio recorded in my personal smart phone after taking permission. I implimented the practice of follow-up interview if needed then I ended up the follow-up interviews.

**Data Analysis Procedures**

In this study, I employed an explanatory sequential mixed methods design, where quantitative and qualitative data were analyzed separately and in sequence, then merged them during the results and discussion phase. The data analysis of sequential mixed research approach followed the process on which quantitative data analysis occurs first and followed qualitative data analysis strategies (Teddlie & Tashakkori, 2009). This type of mixed analysis is a formal technique, on which the analysis from these two phases is related to one another in the same study simultaneously. In the first phase, quantitative data were analyzed, and the results guided the development of the subsequent qualitative phase.

***Quantitative Data Analysis***

The questionnaires obtained from the surveys of both teacher and student respondents were entered and coded into the Statistical Package of Social Sciences (SPSS) version

23.0. program. At first data from the surveys were checked, cleaned, and separated for any missing information or any exception before examination. The data were then coded is SPSS, with negative items were coded reversely. I generated both descriptive and inferential statistics from the survey responses of teachers and students. Descriptive statistics —including skewness, kurtosis, frequencies, percentage, means, and standard deviations —were calculated to analyze the demographic characteristics, students' content preferences, teachers' awareness and practices of GRP, and students' perceptions of teachers' behavior, based on data collected through survey questionnaires.

Demographic variables, including gender of both teachers and students, were analyzed using an independent samples t-test to determine if there were statistically significant differences in GRP practices. The data were examined for accuracy. Additionally, demographic variables concerning district-wise comparisons of teachers' GRP practices were analyzed using one-way ANOVA, followed by Post Hoc tests, to identify any statistically significant differences in GRP practices. In this study, statistical significance was determined at a p-value of 0.05, with a 95% confidence interval applied to all analyses. A p-value of 0.05 means there was a 5% chance of committing a Type I error, which I accepted for this study. Effect sizes for the mean differences in the independent samples t-test were reported using Hedges' g, with values categorized as small (0.20), moderate (0.50), or large (0.80+). In this study, I used the Hedges' g instead of the Cohen's d effect size because it is preferred for unequal sample size and for small sample size (< 20) (Field, 2009). The descriptive analysis allowed the researcher to understand general overview of the quantitative data and way forward for qualitative study.

***Qualitative Data Analysis***

In an explanatory sequential mixed methods design, the qualitative phase is guided by the results from the quantitative phase. The qualitative data for this study were collected through semi-structured interviews and classroom observation notes. The analysis of qualitative data would be an ongoing process throughout the study. To begin, I listened the audio recorded interview of teacher and student respondents repeatedly and then transcribed in Nepali language. Though, in this study, interview of both teacher and student respondents were conducted in Nepali language and also responded in Nepali language. Teachers and students received their transcripts and checked for accuracy. Then the transcribed data were translated into English language. Then, I embraced these translated text documents in ATLAS.ti (9.0.21 version) project. In the qualitative interpretation phase, I implemented insights from various sources (e.g., Adu, 2019; Attride-Stirling, 2001; Braun & Clarke, 2006; Saldaña, 2021; Yin, 2016) to guide for the general qualitative data analysis procedure.

Likewise, to analyze the qualitative data using ATLAS.ti, basically while adding documents, coding, categorizing, grouping, and developing themes, I took concepts from different sources (e.g., Friese, 2017, 2019; Soratto et al., 2020). In this study, the qualitative analysis was conducted in three phases such as pre-analysis, material exploration, and interpretation (Soratto et al., 2020). In the first phase, known as pre analysis phase, I developed the PhD project after installation in titled “Gender Responsive Pedagogy in Mathematics: A Practice in Nepal” in my personal computer. Following this, I incorporated the translated text documents, called “empirical data” (Soratto et al., 2020), into the project. In second phase, known as material exploration phase, after importing all documents into ATLAS.ti project, I thoroughly read the text data multiple times, selected the data segments, and created quotations based on the research questions of this study. In the initial coding phase, I employed the "Apply Codes", "Codes in Vivo", and sometimes "Quick Coding" features based on the situation. In this stage, I assigned code to each quotation, a total of 193 initial codes (see Appendix J for details) were drawn from all documents that were called basic themes of my study.

Once coding was completed, the codes were reviewed in detail then recoding, merging the codes to customize the number of codes, splitting, renaming, and to reflect the higher abstract level of code. I also consolidated the initial codes based on their meanings, the initially created 193 codes were reducing to 137. In the final stage of data interpretation, further refinement of codes in multiple times, there were 70 fine codes (refer to Appendix K) for grouping that were called organizing theme of my study.

The codes were grouped and regrouped based on the research questions to form global themes. A higher order of code was formed to assign global themes to each group for interpreting data with the help of thematic networks (Attride-Stirling, 2001). Details of basic themes, organizing theme, and global theme were given in Appendix L for detail. Finally, I created a code report that included code groups, codes, and selected quotations. I also generated networks of codes with each theme in ATLAS.ti for qualitative analysis. I analyzed both data obtained from observation and interview by triangulation method and cross-match with previous data obtained through a survey of teachers. Since the results obtained through quantitative and qualitative data were merged only during the interpretation and discussion phase.

**Ethical Considerations**

For the ethical concerns, I received the permission and authorization from the Graduate School of Education, Tribhuvan University for my study. Then, I obtained permission from sample school's head teacher to administer survey questionnaire, to conduct interview and for classroom observation of both mathematics teachers and students. Since, the primary participants for this study were secondary level mathematics teachers and their students, I asked each teacher and students to study the letters and confirm their participation on survey, classroom observation, and interview (see Appendix F). I distributed consent form to each participant and they filled out, signed, and returned on time. Each teacher and student participant were assured that their information would remain confidential and their responses would be anonymous. They were also informed that their participation in the study was entirely voluntary and did not affect their any autonomy (monetary reward) or non-maleficence (physical risks).

Confidentiality, anonymity, and non- identifiability was maintained during the time of interview, classroom observation, data transcribing and in the process of research. It was also explained that the teacher and student participation was for research purpose not for their evaluation purposes. The participants were also informed that they would be withdrawn their participation from the study if needed without providing any reason at any time with ethical principle of autonomy and beneficence. Furthermore, each interview participant was asked whether they would agree for audio recordings of their interview before the interview, they responded positively. Considerations of ethical issues were necessary for the purpose of ensuring the privacy of the participants. The names of the schools, teacher and student participants were not included at any point during the study. I gave pseudonyms in place of the participant's real name when referred to in my study in order to maintain anonymity. Likewise, any other distinguishing characteristics of the participants are also kept confidential and used to protect the student and teachers' identity. The interviews and classroom observations were kept confidential. I gave opportunities to the respondents to listen the recorded interviews, and allow them withdraw and delete any unwanted things of them. I used inclusive and unbiased language or words against gender, race or other groups with teachers, students, and others throughout the study. Moreover, the participants had the option for refusing their data shared outside of the research setting.

**Chapter Summary**

The primary aim of this sequential explanatory mixed methods design was to examine and explore mathematics teacher' GRP practices and students' realization towards teachers' behavior regarding GRP practices. This method uses two strands: quantitative strand in the first phase and qualitative strand in the second phase. The survey, semi-structured interviews, and classroom observations were the three tools utilized to carry out this study. The quantitative data was collected using self-administered survey questionnaires of both mathematics teachers (237) and students (471) at secondary level schools of Bagmati Province. The survey data provided both descriptive and inferential insights to give an overall view of the study. Qualitative data were gathered through classroom observations and semi-structured interviews conducted with five secondary mathematics teachers and twelve students.

In addition, this chapter also includes the specifics of how agreement was obtained from all participants, authorization to perform the study was secured, and how the population and sample were selected. Results of this explanatory sequential mixed methods research study are presented in the subsequent chapter, Chapter IV the quantitative result and Chapter V the qualitative result.

# Chapter IV

## GRP Practices: Analysis and Interpretation of Quantitative Data

### Introduction

This chapter presents the findings from the quantitative phase of the research. It presents the analyzed data collected from survey questionnaires of both the teacher and student respondents. The first purpose of this explanatory sequential mixed research design was to investigate students' content preferences at secondary level community schools. The second purpose was to identify mathematics teachers' awareness and examine their practices of GRP in mathematics classrooms. It also aims to examine students' realization towards teachers' behavior about GRP practices. For these purposes, secondary level mathematics teachers and their students were involved.

The data analysis in this study is organized according to the research questions. Quantitative data collected from teacher and student survey questionnaires were entered into Statistical Package for the Social Sciences (SPSS) version 23.0 to ensure precise and accurate analysis. After entering all data in SPSS, students' content preferences related data were derived from both students and teacher respondents and presented as the first component of the quantitative data. Data were analyzed using both descriptive and inferential statistical tools. In content preferences two things, one was students' difficulty level in mathematical content areas based on satisfaction scale and next important contents for students' future life based on important scale were analyzed, since the content preferences was one of the components for GRP practices in mathematics. After that, status of mathematics teachers' awareness about GRP were analyzed using descriptive statistics such as frequency and percentage. In this study, either male teachers or female teachers, who had more understanding towards

GRP were also established. The main component of this study was teacher's GRP practices in mathematics classroom. Therefore, after analyzing mathematics teachers' awareness of, their GRP practices were subsequently analyzed using both descriptive and inferential statistics. On which, teachers' GRP practices depend upon five components such as teacher-student interaction, language used, teaching materials, teachers' classroom activities, and assessment and feedback. The data for each component were analyzed individually and seperately and then as a whole using descriptive statistics. Likewise, students' realization towards teachers' behavior regarding GRP practices were analyzed using descriptive statistics derived through survey responses. In addition, inferential statistics were employed to analyze both gender-based and district-wise comparisons of both teacher and student respondents. All descriptive and inferential statistical analyses were performed using SPSS software.

The following four research questions were addressed to secure responsible information from teacher and student respondents for this study.

- Do the preferences of mathematical contents included in the curriculum differ by gender? Why?
- What is the status of teachers' awareness towards GRP in mathematics?
- How do teachers practice GRP in mathematics classroom?
- To what extent do students realize teachers' behavior towards GRP in mathematics classroom?

The research question related to awareness is addressed in this chapter using a fully quantitative approach. In contrast, the remaining three research questions were addressed by integrating both both quantitative and qualitative data, since they required an explanatory sequential mixed methods approach.

**Demographic Information of Teachers and Students of Quantitative Phase**

The participants in this study were secondary level mathematics teachers and students from community secondary schools in Bagmati Province of Nepal. For the survey of this study, out of 237 mathematics teacher, 211 teachers returned back their survey form and out of 471 students, 459 students returned the survey form. Of the 211-survey returned back by teachers, six teacher participants were excluded from the overall analysis because they submitted a response that skipped over half of the items of the survey form. In addition, of the 459-survey returned back by students, seven of the student participants submitted a response that did not answer majority of the items; hence seven participants were excluded from the overall analysis in this study. Hence, 205 mathematics teachers' and 452 students' surveys were included for data analysis of this study.

***Demography of Teacher***

Demographic data of teacher participants were collected aside from the variable gender, district, qualification, teaching experiences, and job category. Of the 205 teacher participants, 181 were male (88.3%), and 24 were female (11.7%). The number of female teachers at the secondary level community school was low in number, as the majority of mathematics teachers were male. In Nepal, currently only 20.4% of teachers at the secondary level in community schools are female, and among them, the number of female mathematics teachers is particularly low (MOEST, 2022). In regards to districts, majority of the respondents were from Kathmandu with 72 (35.1%) participants, the smallest group of participants were from Dolakha with 36 (17.6%), 48 participants were from Chitwan (23.4%), and 49 participants were from Sindhuli (23.9%). Moreover, regarding the qualification of the teacher respondents, 171 (83.4%) of the teachers reported that they had graduated masters' degree, 33

(16.1%) of the teachers reported that they completed bachelors' degree, and only one (0.5%) of the teacher participants reported he/she had got M. Phil Graduation.

In regard to mathematics teaching experience, there were 33 (16.1%) teachers who had less than five years of teaching experiences, 54 (26.3%) teachers who had 5-9 years, 51 (24.9%) of the teachers who had 10-14 years, and 67 (32.7%) of the teachers who had above 14 years of teaching experiences. The majority of mathematics teacher respondents in the study fell in the range above 14 years of teaching experiences in mathematics, with 67 participants participating. The smallest group of teachers had less than 5 years of teaching experiences, 33 (16.1%) mathematics teachers participating in this range. These data indicated that majority of mathematics teachers had high experiences in teaching, but newly fresh teachers were low in number. In addition, in terms of employment status, the majority of mathematics teacher respondents —134 (65.4%)—held permanent job, while the remaining 71 (34.6%) were employed on a temporary basis at the secondary level community schools. This indicates that a significant proportion of mathematics teachers enjoy their job stability through permanent positions, whereas over one-third are in temporary positions. Table 3 presents a data summary of teacher participants of this study.

**Table 3.** *Demographic Data From Teacher Participants*

| Characteristics | | Frequency | Percentage |
|---|---|---|---|
| Gender | Male | 181 | 88.3 |
| | Female | 24 | 11.7 |
| District | Chitwan | 48 | 23.4 |
| | Dolakha | 36 | 17.6 |
| | Kathmandu | 72 | 35.1 |
| | Sindhuli | 49 | 23.9 |
| Qualifications | Bachelors | 33 | 16.1 |
| | Masters | 171 | 83.4 |
| | M.Phil | 1 | 0.5 |
| | Less than 5 | 33 | 16.1 |

| | | | |
|---|---|---|---|
| Teaching Experiences | 5-9 years | 54 | 26.3 |
| | 10-14 years | 51 | 24.9 |
| | above 14 years | 67 | 32.7 |
| Job category | Permanent | 134 | 65.4 |
| | Temporary | 71 | 34.6 |

***Demography of Students***

Out of the 452 student respondents, the majority were girls, with 235 (52%), while the remaining 217 (48%) were boys. This reflects a higher enrollment rate of girls than boys in community secondary schools. In terms of district-wise representation, the largest number of students—194 (42.9%)— were from community secondary schools in Kathmandu district. This was followed by 100 (22.1%) students from schools of Sindhuli district, 98 (21.7%) students from the schools of Chitwan district, and 60 (13.3%) students from Dolakha district of Bagmati Province. According to the Flash Report 2076, this distribution aligns with the number of community secondary schools in each district, with the highest student representation from Kathmandu and the lowest from Dolakha. The list of students is presented in Table 4 below.

**Table 4.** *Demographic Data From Students Participants*

| | | Frequency | Percentage |
|---|---|---|---|
| Gender | Male | 217 | 48.0 |
| | Female | 235 | 52.0 |
| District | Chitwan | 98 | 21.7 |
| | Dolakha | 60 | 13.3 |
| | Kathmandu | 194 | 42.9 |
| | Sindhuli | 100 | 22.1 |

The data reveals that slightly higher girl enrollment rate in community secondary schools, which is a positive indicator of gender parity in education. The higher number of respondents from Kathmandu reflects the greater concentration of secondary schools in the capital compared to other districts. Due to remote areas, the low student representation from Dolakha district corresponds with the smaller number of schools in that district.

**Mathematical Content Preferences**

The first quantitative research question of the study was “What is the content preferences of boys’ and girls’ students in Mathematics at secondary level?” This research question was answered by obtaining the students’ responses on the survey tools. Questionnaires were developed based on all eight mathematical content areas based on secondary level mathematics textbook. Two variables were used to measure students’ mathematical content preferences —Satisfaction and Importance. Five-point Satisfaction Likert scale was developed and administered to examine student’s satisfied mathematical content areas on the basis of difficulty. Whereas, five-point Important Likert scale was developed and administered to identify students’ important mathematical contents for their future life.

The first level questionnaire items included a 5-point Satisfaction Likert scale with the response options: Extremely Satisfied (5), Very Satisfied (4), Moderately Satisfied (3), Not Very Satisfied (2), and Dissatisfied (1). The higher score, greater than scale mean 3, reflecting students are very satisfied on this content area and felt not very difficult. The responses of the students’ survey items were quantified and entered in SPSS software. Then descriptive and inferential analysis procedure was computed with the help of SPSS software. The descriptive and inferential statistics of students’ satisfaction on different mathematical content areas are depicted in Table 5 as follows.

**Table 5.** *Descriptive and Inferential Statistics About Students' Satisfaction on Mathematical Content Areas*

| | Boys | | | Girls | | | |
|---|---|---|---|---|---|---|---|
| Content Area | N | M | SD | N | M | SD | P-value |
| Set | 217 | 3.66 | 1.011 | 235 | 3.71 | .817 | .050 |
| Arithmetic | 217 | 3.18 | .977 | 235 | 3.15 | .823 | .010 |
| Mensuration | 217 | 2.95 | 1.006 | 235 | 3.01 | .967 | .780 |
| Algebra | 217 | 3.18 | 1.005 | 235 | 3.11 | 1.015 | .744 |
| Geometry | 217 | 2.69 | .987 | 235 | 2.74 | .947 | .263 |
| Trigonometry | 217 | 2.79 | 1.084 | 235 | 2.73 | 1.030 | .618 |
| Statistics | 217 | 3.54 | 1.122 | 235 | 3.73 | .966 | .002 |
| Probability | 217 | 3.46 | 1.067 | 235 | 3.44 | 1.050 | .821 |
| Overall | 217 | 3.18 | .662 | 235 | 3.20 | .553 | .090 |

*Note*. M = Mean; SD = Standard Deviation

The results of Table 5 show that in general both boys and girls have almost the similar level of satisfactions with the difficulty on whole mathematics with (boys overall mean = 3.18, SD = .662; girls overall mean = 3.20, SD = .553). The results revealed that both boy's and girl's overall mean value were greater than scale mean 3 that means both boys and girls were satisfied on mathematical contents included in the mathematics curriculum at secondary level. The mean differences between boys' and girls' satisfaction score were minimum in size, slightly in favor of girls. However, overall result ($P = .090 > .05$) assured that the mean differences between boys and girls was not statistically significant. This result reported that the satisfaction level of both boys and girls was similar with the difficulty of overall contents in mathematics.

One can see on the Table 5 that based on the means, satisfied mathematical content areas for both boys and girls were Set, Arithmetic, Algebra, Statistics, and Probability, by obtaining calculated mean value greater than scale mean 3. On the other hand, both boys and girls were dissatisfied on the two-content areas such as

Geometry and Trigonometry, by obtaining calculated mean value less than scale mean 3. However, an inverse result was observed in Mensuration area, where boys (M = 2.95, SD = 1.006) reported dissatisfaction with the difficulty of the content, while girls (M = 3.01, SD = 0.967) indicated greater satisfaction. Although, the size of mean differences in Mensuration area was minimal between boys and girls. These results assured that both boys and girls generally preferred most mathematical content areas. However, Geometry and Trigonometry were among the least preferred areas for both gendes, with Mensuration also emerging as a less preferred area specifically among boys. This finding may reflect girls preferred Mensuration content area in which problems were solved by using formulas of solid objects. Likewise, these findings may reflect perceived difficulty, lack of interest, or instructional challenges in these specific areas of mathematics.

Boys were more satisfied on the Set area with (M = 3.66, SD = 1.011), on the other hand girls were more satisfied on the Statistics area with (M = 3.73, SD = .966) in comparison to other content areas. That means boys mostly preferred Set area and girls mostly preferred Statistics. But boys' less satisfied content area was Geometry (M = 2.69, SD = .987) and girls' less satisfied content area was Trigonometry (M = 2.73, SD = 1.030) in comparison to other content areas. Interesting results was found in content area Set, since boys' highly satisfied mathematical content area was Set but in comparison with girls, large number of girls (M = 3.71, SD = .817) were more satisfied than boys (M = 3.66, SD = 1.04) in area Set. Moreover, boys were more satisfied than girls in Arithmetic and Algebra content area. In Geometry, both boys and girls were not satisfied but the calculated mean of girls were little bit greater (M = 2.74, SD = .947) than boys (M = 2.69, SD = .987), but was in favor of girls.

Moreover, from the Table 5, one can see that there were most of the content areas, showed no statistically significant mean differences existed between boys and girls. In fact, there were no statistically significant differences exist in Mensuration, Geometry, Algebra, Trigonometry, and probability area between boys' and girls' satisfaction with content difficulty in mathematics. In these five mathematical content areas, both boy and girl students have similar types of satisfaction on the basis of content difficulty, they preferred such type of contents for their current study. Whereas, the mean differences were statistically significant in remaining three content areas of mathematics as Set, Arithmetic, and Statistics between boys' and girls' satisfaction with content difficulty. However, in the areas Set and Statistics, slightly minimal gender differences in favoring girls, but in Arithmetic area slightly favoring boys.

The above results indicated that there were no significant differences between boys and girls on the satisfaction level of mathematical content areas as a whole. Both boys' and girls' low level of satisfaction was found on two of the content areas—Geometry and Trigonometry, whereas they were highly satisfied on the contents Statistics and Set. Since there were no statistically significant differences of both boys and girls' satisfaction on five mathematical content areas —Mensuration, Geometry, Algebra, Trigonometry, and Probability, but statistically significant gender differences found on three content areas —Set, Statistics, and Arithmetic. The results revealed that both boys and girls preferred and satisfied on most of the content areas indicated by the mathematics curriculum, but they did not prefer contents related to geometric figures and trigonometrical content.

Besides students' satisfaction for content preferences, this study also measured students' perceptions based on mathematical content important for their future life.

The second level questionnaire items included 5-point Important Likert scale with the response options: Very Important (5), Important (4), Moderate Important (3), Less Important (2), and Unimportant (1). The higher mean score, greater than scale mean 3 reflect that such contents would be more important for students' future life. The descriptive and inferential value are depicted in Table 6 as follows.

**Table 6.** *Comparison Between Boys and Girls About Contents Important for Students' Future Life*

| | Boys | | | Girls | | | |
|---|---|---|---|---|---|---|---|
| Content Area | N | M | SD | N | M | SD | P- value |
| Set | 217 | 3.28 | .935 | 235 | 3.38 | .829 | .151 |
| Arithmetic | 217 | 4.21 | .769 | 235 | 4.38 | .615 | .000 |
| Mensuration | 217 | 3.60 | .800 | 235 | 3.65 | .771 | .191 |
| Algebra | 217 | 3.17 | 1.005 | 235 | 3.35 | .879 | .034 |
| Geometry | 217 | 3.18 | 1.031 | 235 | 3.31 | .846 | .000 |
| Trigonometry | 217 | 3.37 | 1.111 | 235 | 3.36 | 1.039 | .375 |
| Statistics | 217 | 3.22 | 0.981 | 235 | 3.19 | .896 | .083 |
| Probability | 217 | 3.34 | 1.014 | 235 | 3.47 | .947 | .397 |
| Overall | 217 | 3.45 | 0.634 | 235 | 3.54 | .531 | .007 |

*Note*. M = Mean; SD = Standard Deviation

Table 6 shows that as a whole, both boys and girls felt that mathematics content would be important for their later life with calculated mean (Boys M = 3.45, SD = .634; Girls M = 3.54, SD = .531) as compared to scale mean 3. They found important and preferred secondary level mathematical contents for their future life. Whereas, mean difference was statistically significant with ($P = .007 < .05$) between boys and girls, in favor of girls. This result indicated that maximum number of girls thought all mathematical content of secondary level would be important for their later life in comparison to boys. The results revealed that students thought and belief in regard to mathematics subject is going to be in progress. They have positive thought with mathematics that would enhance their learning performance.

The overall trends of the results were first examined. One can see from the Table 6 that both boy and girl students perceived all contents mathematics would be important for students' future life, since each content area's calculated mean value is greater than average mean value 3. Among the content areas, all contents of Arithmetic area received the highest level of importance by both boys ($M = 4.21$, $SD = .769$) and girls ($M = 4.38$, $SD = .615$) for their future life. That means both boys and girls mostly favored contents of Arithmetic area for their future life. Whereas, the mean difference was statistically significant with ($P = 0.00 < 0.05$), in favor of girls. The result revealed that in comparison to boys, girls highly perceived contents related to Arithmetic area would be more important for their future life. Since boys were more satisfied in Arithmetic area, but more girls felt this area would be more important for their future life. Second high-level positions by means were received by Mensuration area by both boys ($M = 3.60$, $SD = .800$) and girls ($M = 3.64$, $SD = .771$), both boys and girls felt that contents of Mensuration area would be also important for their future life, but less than Arithmetic. Mean difference between boys and girls in Mensuration area was not statistically significant with ($P = .191 > 0.05$). Since the mean differences was minimal and in favor of girls, but not statistically significant. This revealed that gender does not appear to play a major role and they have similar level of feelings about importance of Mensuration area in future life.

Among all content areas of secondary mathematics, the mean differences predominantly favored girls in the majority of areas, including Set, Arithmetic, Mensuration, Algebra, Geometry, and Probability. Among the content areas, statistically significant mean differences between boys and girls were found only in Arithmetic ($P = 0.00 < 0.05$), Algebra ($P = 0.034 < 0.05$), and Geometry ($P = 0.000 < 0.05$). Maximum girls thought these contents would be most important for later life in comparison to boys. In these mathematical content areas, the girl respondents were more positive about contents importance for future life. Moreover, in remaining two content areas as Statistics and Trigonometry, on which mean differences about the contents important for future life was in favor of boys, but statistically not significant with Statistics ($P = .083 > 0.05$) and Trigonometry ($P = .375 > 0.05$). That means both boys and girls favored these content areas for their future life in similar manner, no differences have been found between them.

The above results indicated that students (both boys and girls) felt all of the contents of mathematics would be important for future life. Girls felt that whole mathematical contents were more important for later life in comparison to boys, whereas the difference was statistically significant. They felt the contents which were related to their day-to-day life (Arithmetic and Mensuration) would be important for their future life, but they were less satisfied in these content areas. The data revealed that girls generally exhibited more favorable attitudes towards the importance of various mathematical content areas for their future lives, with higher mean scores observed in Set, Arithmetic, Mensuration, Algebra, Geometry, and Probability. Among these, statistically significant gender differences were identified in Arithmetic, Algebra, and Geometry, indicating that girls significantly valued these areas more than boys in terms of future relevance. However, the two content areas — Statistics and Trigonometry, the mean scores slightly favored boys. However, the differences were not statistically significant, suggesting that both boys and girls generally regarded these topics as similarly important for their future life. Individual contents within each content areas were also analyzed descriptically and inferentially. The students' responses on each content within each content areas are depicted in Table 7 as follows.

**Table 7.** *Comparison Between Boys and Girls About Contents Importance for Students' Future Life*

| Area | Contents | Boys | | | Girls | | | P-value |
|---|---|---|---|---|---|---|---|---|
| | | N | M | SD | N | M | SD | |
| Set | Relation of group in Venn diagram | 217 | 3.30 | 1.067 | 235 | 3.43 | .951 | .222 |
| | Cardinality of sets and solution of words problems | 217 | 3.26 | 1.117 | 235 | 3.33 | .987 | .078 |
| Arithmetic | Profit and loss related problems | 217 | 4.31 | .872 | 235 | 4.48 | .747 | .003 |
| | Commission, discount, tax, dividend related problems | 217 | 4.24 | .918 | 235 | 4.43 | .788 | .041 |
| | Household related arithmetic | 217 | 4.08 | 1.001 | 235 | 4.23 | .870 | .036 |
| Mensuration | Area and volume related to cube, cuboid, prism | 217 | 3.51 | 1.171 | 235 | 3.57 | .968 | .174 |
| | Find area of real field or objects | 217 | 3.58 | .964 | 235 | 3.72 | .923 | .170 |
| | Project work related to real life situation | 217 | 3.71 | 1.123 | 235 | 3.64 | 1.105 | .723 |
| Algebra | Factorization / solving equation | 217 | 3.18 | 1.220 | 235 | 3.49 | 1.134 | .305 |
| | Exponential equation | 217 | 3.05 | 1.218 | 235 | 3.24 | 1.104 | .414 |
| | Ratio and proportion | 217 | 3.29 | 1.136 | 235 | 3.33 | .933 | .006 |
| Geometry | Geometric construction | 217 | 3.31 | 1.187 | 235 | 3.37 | 1.027 | .024 |
| | Experimental equations | 217 | 3.15 | 1.220 | 235 | 3.26 | 1.033 | .007 |
| | Theoretical proof | 217 | 3.09 | 1.284 | 235 | 3.26 | 1.128 | .017 |
| Trigonometry | Trigonometric relation on triangle | 217 | 3.36 | 1.232 | 235 | 3.40 | 1.099 | .042 |
| | Solving trigonometric problems | 217 | 3.39 | 1.216 | 235 | 3.32 | 1.179 | .617 |
| Statistics | Central tendency | 217 | 3.19 | 1.177 | 235 | 3.15 | 1.109 | .276 |
| | Graphical representation | 217 | 3.24 | 1.171 | 235 | 3.23 | 1.065 | .036 |
| Probability | Estimation of empirical probability | 217 | 3.37 | 1.144 | 235 | 3.38 | 1.057 | .262 |
| | Probability of an event | 217 | 3.30 | 1.170 | 235 | 3.56 | 1.074 | .102 |

*Note*. M = Mean; SD = Standard Deviation

Firstly, when examined overall trends in the results according to the mean values, all contents within each content areas the mean value is more than 3. Furthermore, in the Set area, all of the content showed no statistically significant differences in mean scores between boys and girls. The mathematical content area Set is clearly girls marked since in each content within Set; mean differences is in favor of girls. Which means girls highly received each Set related contents in mathematics important for their future life in comparison to boys. Even though, both boy and girl students calculated mean greater than scale mean 3, both felt each content of Set would be important in their later life. Among eight mathematical content areas, both boys and girl students perceived Arithmetic content area would be very important for their future life. Whereas, the results showed the statistically significant gender differences favoring girls in all three types of contents such as profit and loss related, commission, discount, tax, dividend related, and household related problems within Arithmetic. In the Mensuration area, the analysis showed no statistically significant gender differences across all contents within it. However, on the basis of mean scores, girls scored higher than boys in two contents out of three types of contents: calculating the area and volume related to cubes, cuboid, and prisms, and finding the area of real fields or objects. In contrast, boys had a higher mean score than girls in one type content —project work related to real-life situations —in secondary level mathematics. That indicates these contents related to mensuration there is no differences between boys' and girls' preferences for their future life.

Out of three types of contents regarding to Algebra, one type of content such as ratio and proportion was statistically significant ($P = .006 < 0.05$), in favor of girls. But one can see that remaining two types of contents such as factorization/solving equation and exponential equation have not statistically significant gender differences and also in favor of girls. In Geometry, which is marked positively for girls in all contents within Geometry area, the differences between boys and girls showed statistically significant. The results reveals that a larger number of girls considered each Geometry related contents to be important for their future lives compared to boys. However, despite recognizing the relevance of Geometry for their future, both girls and boys expressed relatively low levels of satisfaction with the subject. However, large number of girls highly preferred Geometry related contents for students' future life in comparison to boys.

Likewise, in Trigonometry area, out of two contents one content as trigonometric relation on triangle, the mean difference was statistically significant ($P = 0.046 < 0.05$), slightly in favor of girls. Whereas in another content as solving trigonometric problems, the mean difference was not statistically significant ($P = 0.617 > 0.05$), but mean in favor of boys. In Statistics area, in both types of contents mean difference was found in favor of boys, but in one content as central tendency, the mean difference was not statistically significant. Whereas in another content as graphical representation, the mean difference was statistically significant. Although, both boys and girls received each Probability related contents were important for students' future life, but one can found in both contents mean differences favoring girls, but not statistically significant.

Hence, the preferences of mathematics contents among boys and girls shows there is significant gender differences in all contents related to Arithmetic, ratio and proportion related to Algebra, all contents related to Geometry, trigonometric relation on triangle related to Trigonometry, graphical representation related to Statistics. Interesting result found that among these differences, all contents' differences were found in favors of girls except graphical representation which was in favor of boys. Therefore, a greater number of girls believed that most mathematics contents within each eight mathematical content area would be important for their future life in compared to boys.

### ***Comparison Between Teaches' and Students' Perceptions on Students' Difficulties in Mathematical Content Areas***

This section investigates the teachers' and students' perspectives about students' satisfaction across eight mathematical content areas at secondary level. The Table 8 presents the mean scores and standard deviations reflecting both teachers' and students' perspectives on students' satisfaction across various mathematical content areas. A higher mean score indicates greater satisfaction, which generally corresponds lower perceived difficulty, and vice versa. The overall results, teachers rated students' satisfaction slightly higher (M = 3.46, SD = .501) than students rated themselves (M = 3.19, SD = .605), suggesting that teachers tend to perceive students as more satisfied with the content than the students actually report themselves. This suggests a perceptual gap between teachers and students, with teachers potentially underestimating the difficulties that students experience in certain mathematical content areas. Eventhough, overall mean values of both teachers and students were above average scale 3, suggesting that both of them tend to perceive students as satisfied on mathematics subject at secondary level. The teachers' and students' perceptions about students' satisfaction on each content areas' difficulty is depicted in Table 8 as follows:

**Table 8.** *Teachers' and Students' Perspective on the Satisfaction Level of students in Mathematical Content Areas*

| | Students | | | Teachers | | |
|---|---|---|---|---|---|---|
| Content Area | N | M | SD | N | M | SD |
| Set | 452 | 3.69 | .915 | 205 | 3.73 | .787 |
| Arithmetic | 452 | 3.17 | .899 | 205 | 3.39 | .695 |
| Mensuration | 452 | 2.98 | .985 | 205 | 3.35 | .940 |
| Algebra | 452 | 3.14 | 1.010 | 205 | 3.56 | .812 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Geometry | 452 | 2.71 | .965 | 205 | 2.62 | .880 |
| Trigonometry | 452 | 2.76 | 1.055 | 205 | 3.25 | .897 |
| Statistics | 452 | 3.64 | 1.047 | 205 | 4.10 | .798 |
| Probability | 452 | 3.45 | 1.057 | 205 | 3.71 | .897 |
| Overall | 452 | 3.19 | .607 | 205 | 3.46 | .501 |

*Note.* M = Mean; SD = Standard Deviation

In terms of the eight content areas, students reported high level of satisfaction with Set area (M = 3.69, SD = .915), whereas, teachers received second highest mean value in this area with (M = 3.73, SD = .787). Moreover, teachers reported high level of satisfaction with Statistics area (M = 4.10, SD = .798), however, students rated second highest mean value (M = 3.64, SD = 1.047) for this area. This result indicated that students highly satisfied with the content area Set, but teachers observed that their students highly satisfied with the Statistics content area of mathematics. However, both teachers and students observed that students mostly enjoyed with the content areas covering calculation using formula such as Set and Statistics. This result revealed that these areas are generally perceived as less difficult and more accessible for students. Both of them prefered the content areas Set and Statistics for students in comparison to other mathematical content areas.

Conversely, the area Geometry received the lowest satisfaction acores from both students (M = 2.71, SD = .965) and teachers (M = 2.62, SD = .880), highlighting it as a commonly challenging area for students. In fact, it is noted that teachers' observation of difficult content area for their students and students' observation of difficult content area was same that is Geometry. Mathematics teachers and students received that students were not satisfied with the difficulty level of Geometry and felt Geometry is difficult content area at secondary level. Notable discripancies were observed in three areas such as Algebra, Trigonometry, and Mensuration, where teachers consistently rated students' satisfaction higher than students themselves. Since, in Trigonometry, students reported a mean satisfaction ($M = 2.76$, $SD = 1.055$), while teachers reported ($M = 3.25$, $SD = .897$), suggesting that teachers may underestimate the students' level of difficulty face on this content area. An especially significant gap was found in Statistics area, where teachers perceived students to be highly satisfied ($M = 4.10$), whereas students' ratings were relatively lower ($M = 3.64$). This overestimation may indicate a need for better communication and feedback mechanisms between teachers and students regarding learning difficulties.

According to these perceptions, discriminating results have been found in two content area as Trigonometry and Mensuration; students observed these areas as more difficult mathematical content areas, but teachers observed their students did not feel difficult and are satisfied on these content areas. Accordingly, teachers thought they were conducting appropriate teaching strategies based on students' pace, but students were unable to achieve success. Based on the table, it is noted that only at Geometry, students mean value higher, whereas remaining seven content areas, teachers' mean value higher than students. The result indicates that in maximum content areas, teachers thought students understand their teaching and satisfied but students were not satisfied as thinking by teacher.

The comparative analysis highlights perceptual gaps between teachers and students regarding the difficulty of various mathematical content areas. While these differences may be influenced by a range of pedagogical and cognitive factors, they need the more gender responsive teaching approaches called GRP. Students' satisfaction in mathematics can be affected by gendered perceptions of ability, girls may feel less confident in mathematically intensive subjects due to cultural and classroom biases. In this study, the identified discripancies, particularly in areas where teachers overestimated student satisfaction, may partly reflect a lack of seisitivity to how gender dynamics play out in the classroom. Hence, by integrating GRP into their teaching, teachers can better recognize and respond to subtle or hidden differences among students.

***Comparison Between Teachers' and Students' Perceptions on Mathematical Contents Important for Students' Future Life***

The Table 9 presents the perceptions of students and teachers regarding the importanceof various mathematical content areas for students' future lives. The data revealed both the convergence and divergence in views between teachers and students, with teachers generally assigning higher importance to most content areas than students. Their beliefs about the content importance for students' future life is depicted in the following Table 9 as follows:

**Table 9.** *Students and Teachers Thought on the Importance of Content Area for Students' Future Life*

| | Students | | | Teachers | | |
|---|---|---|---|---|---|---|
| Content Area | N | M | SD | N | M | SD |
| Set | 452 | 3.33 | .882 | 205 | 3.81 | .759 |
| Arithmetic | 452 | 4.30 | .697 | 205 | 4.53 | .552 |
| Mensuration | 452 | 3.62 | .784 | 205 | 3.39 | .770 |
| Algebra | 452 | 3.27 | .945 | 205 | 3.37 | .799 |
| Geometry | 452 | 3.24 | .940 | 205 | 3.47 | .940 |
| Trigonometry | 452 | 3.37 | 1.073 | 205 | 3.90 | .751 |
| Statistics | 452 | 3.20 | .936 | 205 | 3.63 | .820 |
| Probability | 452 | 3.41 | .981 | 205 | 4.02 | .654 |

*Note.* M = Mean; SD = Standard Deviation

The overall trend of the results is firstly examined. The calculated mean value of both teachers and students about the content area important for future life was greater than scale mean 3. Both of them thought all mathematical content areas are important for students' future life. Among the eight-content areas, Arithmetic area received the highest mean values from both groups, (M = 4.30, SD = .697) by the students and (M = 4.53, SD = .551) by the teachers, indicating strong agreement on its essential role in everyday life and future applications. This reflects a shared understanding of the practical value of Arithmetic skills in personal and other real-life scenarios.

In contrast, for content areas like Set, Geometry, Algebra, Probability, and Statistics, the ratings were more moderate, with teachers consistently viewing these content areas as more important for students' future lives than the students themselves did. Since, teachers rated importance of Probability at (M = 4.02), while students gave it a lower rateing of (M = 3.41). similarly, for Trigonometry, teachers rated it significantly higher (M = 3.90) compared to students (M = 3.37), suggesting that students may not fully perceive the long-term value or application of these content areas in their later-life or their future career contexts. Interestingly, Mensuration is one of the few areas where students (M = 3.62) rated its importance slightly higher than their teachers (M = 3.39), possibly due to its seen application in physical environments. This highlights that students may relate its contents directly in their real life.

Students rated the content area Statistics as least importance for later life with mean value (M = 3.20. SD = .936), whereas teachers rated Algebra area as the least important content area for students' future life with mean value (M = 3.37, SD = .799). The results revealed a divergence in perceptions between teachers and students regarding the least important mathematical content areas for students' future studies. Teachers perceived Algebra as less important compared to other content areas, whereas students considered Statistics to be the least important for their further study. These findings indicate that both students and teachers may lack a comprehensive understanding of the real-world applications and future relevance of certain mathematical domains. While, it is noted that there was consensus between teachers and students on the importance of Arithmetic, which was consistently rated as the most important content areas for students' future lives, their views differed when identifying the least important content areas. This indicates a need for enhanced awareness among both teachers and students about the practical and academic relevance of all mathematical content areas across various contexts.

In addition, Table 9 reveals that teachers rated all the seven mathematical contents areas —except Mensuration —as more important for students' future lives compared to students' ratings, as indicated by higher mean scores of teachers across these areas. Conversely, Mensuration was the only content area where students assigned a higher importance than teachers. This suggests that students may perceive the practical applications of Mensuration more directly in their daily lives, while teachers view other content areas as more broadly applicable in academic, professional contexts, and higher-level mathematics. Overall, teachers' expectations regarding the importance of mathematical content for students' future life were generally higher than those of students' expectations. Despite these differences, both groups are agreed that all mathematical content areas hold some level of importance for students' future success.

The gap in perception emphasizes the need for instructional strategies that not only teach mathematical contents and its concepts, but also contextualize their relevance, making them meaningful, and visible with the help of different mathematical tools in students' lives. Implementing GRP, embedding real-life examples, showing career-oriented applications, and interdisciplinary connections can help students better appreciate the long-term importance of different mathematical domains. Moreover, in Table 10, the teacher and student perspectives on the contents within each content area are depicted as follows:

**Table 10.** *Students' and Teachers' Perspectives on the Importance of Individual Content Items for Students' Future Life*

| Area | Contents | Students | | | Teachers | | |
|---|---|---|---|---|---|---|---|
| | | N | M | SD | N | M | SD |
| Set | Relation of group in Venn diagram | 452 | 3.37 | 1.009 | 205 | 3.85 | .845 |
| | Cardinality of sets and solution of words problems | 452 | 3.29 | 1.051 | 205 | 3.78 | .809 |
| Arithmetic | Profit and loss related problems | 452 | 4.40 | .813 | 205 | 4.53 | .661 |
| | Commission, discount, tax, dividend related problems | 452 | 4.34 | .857 | 205 | 4.53 | .622 |
| | Household related arithmetic | 452 | 4.16 | .937 | 205 | 4.54 | .668 |
| Mensuration | Area and volume related to cube, cuboid, prism | 452 | 3.54 | 1.070 | 205 | 3.89 | .791 |
| | Find area of real field or objects | 452 | 3.65 | .945 | 205 | 4.06 | .793 |
| | Project work related to real life situation | 452 | 3.68 | 1.113 | 205 | 4.10 | .910 |
| Algebra | Factorization / solving equation | 452 | 3.34 | 1.185 | 205 | 3.29 | .909 |
| | Exponential equation | 452 | 3.15 | 1.163 | 205 | 3.23 | .920 |
| | Ratio and proportion | 452 | 3.31 | 1.034 | 205 | 3.64 | .872 |
| Geometry | Geometric construction | 452 | 3.34 | 1.106 | 205 | 3.48 | .927 |
| | Experimental equations | 452 | 3.21 | 1.127 | 205 | 3.45 | .926 |
| | Theoretical proof | 452 | 3.18 | 1.207 | 205 | 3.17 | .986 |
| Trigonometry | Trigonometric relation on triangle | 452 | 3.38 | 1.164 | 205 | 3.49 | 1.01 |
| | Solving trigonometric problems | 452 | 3.35 | 1.196 | 205 | 3.44 | .987 |
| Statistics | Central tendency | 452 | 3.17 | 1.141 | 205 | 3.97 | .882 |
| | Graphical representation | 452 | 3.24 | 1.116 | 205 | 3.82 | .901 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Probability | Estimation of empirical probability | 452 | 3.38 | 1.098 | 205 | 3.59 | .907 |
| | Probability of an event | 452 | 3.44 | 1.127 | 205 | 3.67 | .850 |
| Overall | | 452 | 3.49 | .5839 | 205 | 3.776 | .457 |

*Note.* M = Mean; SD = Standard Deviation

One can be seen in Table 10, teacher's mean value was higher than students' mean value in all contents within area Set, Arithmetic, and Mensuration. Teachers were more likely to be felt that all mathematical contents of area Set, Arithmetic, and Mensuration were important for their students' future life. In Algebra area of secondary mathematics, mixed responses have been found from students and teachers. Students rated the contents factorization/ solving equation very important with the mean value (M = 3.34, SD = 1.185), whereas teachers mean value (M = 3.29, SD = .909). On the other hand, remaining two contents exponential and ratio and proportion under Algebra, teachers rated the highest mean value than students. In Geometry area, geometric construction and experimental equation demonstrated the highest mean value by teachers than students, but in theoretical proof demonstrated the highest mean value by students than teachers. The results revealed that teachers realized the contents geometric construction and experimental equation are more important for student's future life than students' ratings, whereas students reported as theoretical proof may be important for students in their future life. However, teachers demonstrated higher mean value in all contents related to Trigonometry, Statistics, and Probability areas in comparison to students. Teachers highly realized that the contents regarding to Trigonometry, Statistics, and Probability would be most important for students' later life.

It is evident that the overall mean score of teachers is higher than that of students. It can be concluded that teachers strongly recognized the all-mathematical contents within every content area would be important for students' future lives.

Compared to students, teachers demonstrated greater confidenc in the relevance and significance of secondary level mathematics contents.

**Teachers' Awareness Toward Gender Responsive Pedagogy (GRP)**

The teachers' GRP practices depend upon their belief, understanding, and knowledge level about GRP. This study underscored the general understanding of secondary level Mathematics teachers on GRP by asking them to choose any one highly related concept of GRP among seven related concepts. The research findings in Table 11 indicate that a majority of mathematics teachers were able to choose the correct definition of GRP. However, the results also show that less than 50% of both male and female mathematics teachers demonstrated overall awareness towards GRP. From the table, one can see that only 35.1% of all mathematics teachers (33.7% males and 45.8% females) who were able to choose the correct meaning of GRP. This result indicates that teacher respondents partially understood the actual meaning of GRP, which reveals teaching and learning process that pay attention to specific learning needs of boys and girls, which is provided by Mlama et al. (2005) that is adopted by this study. Since this accurate meaning of GRP was chosen by maximum number of teachers among seven options.

Moreover, about 23.4% (22.7% males and 29.2% females) of all mathematics teachers chose the meaning of GRP as gender inclusive teaching and about 15.1% (16.0% male and 8.3% female) of all mathematics teachers chose the meaning of GRP as gender sensitive in classrooms. These two statements were closely related to the accurate meaning of GRP, second and third large number of teachers chose these meaning. It was also found that, only 0.6% (only one) of male teachers understand GRP as incorporating culture in the teaching/learning process. Interesting result was also found that about 8.8% (9.4% males and 4.2% females) of all mathematics teachers who were teaching at secondary level who didn't know what is GRP all about. Those 8.8% teachers were unable to choose accurate meaning or similar meaning of GRP; they seemed gender blind all about. Moreover, the findings revealed that the general awareness towards gender is high towards secondary level mathematics teacher but the findings did not show teachers are familiar with the accurate meaning of GRP. Large number of teachers were unable to choose accurate meaning of GRP. The result is depicted in Table 11 as follows.

**Table 11.** *Teachers' Awareness Towards GRP*

| Statements | Male | | Female | | Total | |
|---|---|---|---|---|---|---|
| | N | % | N | % | N | % |
| Consider differences among categories of students | 18 | 9.9 | 2 | 8.3 | 20 | 9.8 |
| Teaching that gives opportunities and preferences to women | 14 | 7.7 | 1 | 4.2 | 15 | 7.3 |
| Teaching and learning process that pay attention to specific learning needs of boys and girls | 61 | 33.7 | 11 | 45.8 | 72 | 35.1 |
| Gender sensitive in classrooms | 29 | 16.0 | 2 | 8.3 | 31 | 15.1 |
| Incorporating culture in teaching/learning process | 1 | .6 | 0 | 0 | 1 | .5 |
| Gender inclusive teaching | 41 | 22.7 | 7 | 29.2 | 48 | 23.4 |
| Don't know about gender responsive pedagogy | 17 | 9.4 | 1 | 4.2 | 18 | 8.8 |
| Total | 181 | 100.0 | 24 | 100.0 | 205 | 100.0 |

### Gender Responsive Pedagogy (GRP) Practices of Teachers

For GRP practices, data were collected using questionnaire that distributed to secondary level mathematics teacher who were teaching in community secondary school at Grade IX and X at Bagmati Province of Nepal (N=205). The questionnaires assessing teachers' GRP practices included 76 items using a Likert scale, with response options ranging from Strongly Disagree (1) to Strongly Agree (5). For negatively worded items, the scoring was reversed, so that Strongly Agree was scored as 1 and Strongly Disagree as 5, across all five components. The developed items included into the following five dimensions: Teacher- Student Interaction (29-items), Language Used (7-items), Teaching Materials (9-items), Teachers' Classroom Activities (21-items), and Assessment and Feedback (10-items) (See Appendix A).

Descriptive statistics were computed on the basis of item levels and component levels including means, standard deviation, minimum, and maximum to examine teachers' GRP practices in the mathematics classroom.

***Teacher-Student Interaction***

The item level descriptive statistics for the component teacher-student interaction of mathematics teachers in their teaching learning process had shown in Table 12 below. The five-point agreement type Likert scale related to teacher and student interaction for gender responsiveness are included as Strongly Agree (5) to Strongly Disagree (1) for positive guided items and for negative guided items, the inverse score has given as Strongly Disagree (5) to Strongly Agree (1). That's why the score greater than Likert average value 3, indicated that teachers have good GRP practice on teacher-student interaction in the mathematics classroom. Analysis was conducted on twenty-nine items in teacher-student interaction domain. The descriptive statistics related to teacher-student interaction is depicted in Table 12 as follows.

**Table 12.** *Descriptive Statistics for Teacher- Student Interaction*

| S.N | Statements | N | Min | Max | M | SD | Skew | Kurt |
|---|---|---|---|---|---|---|---|---|
| 1. | I encourage boys more than girls to improve performance in mathematics since the course mathematics suits boys more than girls. | 205 | 1 | 5 | 4.32 | .956 | -1.830 | 3.329 |
| 2. | Girls in my classroom remain passive respondents, compared with boys. | 205 | 1 | 5 | 3.65 | 1.202 | -.766 | -.526 |
| 3. | I devote more time to encouraging girls than boys in mathematics classroom. | 205 | 1 | 5 | 2.64 | 1.406 | .311 | -1.289 |
| 4. | I give special attention to students especially girls with their special needs (menstruation, disabled, social circumstances etc.). | 205 | 1 | 5 | 3.80 | 1.039 | -.952 | .479 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 5. I allow boys more chance than girls to answer questions in my classroom. | 205 | 1 | 5 | 3.95 | 1.049 | -1.128 | .846 |
| 6. I allow consultation with girl students in case of a need for further clarification and support in solving mathematical problems. | 205 | 1 | 5 | 3.76 | 1.069 | -1.259 | .889 |
| 7. My classroom practices encourage both girls and boys to respect other gender. | 205 | 1 | 5 | 4.25 | .931 | -1.594 | 2.524 |
| 8. I demystify mathematics through more than one solution and more than one process to motivate girls in mathematics. | 205 | 2 | 5 | 4.08 | .910 | -.945 | .265 |
| 9. Girls are more interactive than boys in my mathematics classroom. | 205 | 1 | 5 | 3.28 | 1.154 | -.262 | -.834 |
| 10. Boys draw teachers' attention by calling out more or behaving more conspicuously than girls. | 205 | 1 | 5 | 3.07 | 1.219 | -.279 | -1.015 |
| 11. Boys get more opportunities than girls to solve mathematical problems on the blackboard/whiteboard in my classroom. | 205 | 1 | 5 | 3.57 | 1.151 | -.915 | .024 |
| 12. Girls are likely to be praised more for the outward appearance of their work. (Examples: neatness, obedience toward teachers' directions, beauty etc.) in my classroom. | 205 | 1 | 5 | 3.06 | 1.180 | -.160 | -1.100 |
| 13. Boys are more likely to be praised for the intellectual quality of their work. | 205 | 1 | 5 | 2.86 | 1.214 | .092 | -1.180 |
| 14. Boys dominate more opportunities for interaction with teachers than do girls in all forms of response. | 205 | 1 | 5 | 3.09 | 1.277 | -.166 | -1.206 |
| 15. I only encourage boys to choose mathematics for further study. | 205 | 1 | 5 | 3.74 | 1.259 | -.826 | -.499 |
| 16. I regularly communicate to class through gender neutral class representation. | 205 | 1 | 5 | 4.11 | .851 | -1.172 | 1.682 |
| 17. I ensure that both boys and girls speak out and participate actively during the lesson. | 205 | 1 | 5 | 4.27 | .825 | -1.341 | 1.986 |
| 18. I tell the answers to girls directly and more frequently, but I guide boys more so that they could solve mathematical problems on their own. | 205 | 1 | 5 | 3.70 | 1.289 | -.997 | -.171 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 19. I also ask girls high cognitive-level questions paying attention to all students regardless of sex, race, age, etc. | 205 | 1 | 5 | 4.38 | .722 | -1.508 | 3.606 |
| 20. I address boys and girls equally often and with equally stimulating demands. | 205 | 2 | 5 | 4.44 | .659 | -1.088 | 1.344 |
| 21. When a girl performs better in mathematics than a boy in my class, it creates problem for me. | 205 | 1 | 5 | 3.97 | 1.212 | -1.094 | .097 |
| 22. I allow sufficient time for students to answer or ask questions, especially girls who may be shy or afraid to speak out in classroom activity. | 205 | 1 | 5 | 3.94 | .929 | -1.168 | 1.455 |
| 23. Boys have more frequent and academically challenging interaction with me than girls. | 205 | 1 | 5 | 2.90 | 1.246 | .042 | -1.249 |
| 24. Boys answer by calling out without being called on by teachers more than girls do during a lesson. | 205 | 1 | 5 | 2.83 | 1.219 | .118 | -1.266 |
| 25. Girls appear more ashamed than boys when responding with wrong answers in questions. | 205 | 1 | 5 | 2.40 | 1.141 | .477 | -.918 |
| 26. Girls take a little more time to think about answers and respond than boys when questions are asked in classroom. | 205 | 1 | 5 | 2.84 | 1.216 | .164 | -1.165 |
| 27. More girls ask questions to me first than boys do during a lesson. | 205 | 1 | 5 | 3.10 | 1.167 | -.061 | -1.165 |
| 28. I valuing girl's intuition and emotions as opposed to rationality and objectivity. | 205 | 1 | 5 | 2.74 | 1.293 | .204 | -1.123 |
| 29. I ask questions to boys first in the classroom than later on I only ask to girls. | 205 | 1 | 5 | 3.78 | 1.196 | -.948 | -.043 |

*Note.* M = Mean; SD = Standard Deviation; Min = Minimum; Max = Maximum; Skew = Skewness; Kurt = Kurtosis

Table 12 presents the descriptive statistics of mathematics teachers' GRP practices during classroom interactions with students. Analysis was conducted based on 29 items related to teacher- student interaction. The Table 12 shows that the majority of the items have mean score value greater than the average scale value 3. On which among 29 statements, 22 statements have mean value greater than 3, whereas only seven statements have mean value less than test value 3. Greater mean value indicates that majority of mathematics teachers have better gender responsive classroom interaction practice in mathematics classroom. The means of the greatest agreement of the statement “I address boys and girls equally often and with equally stimulating demands” this domain reflected the teacher’s perspectives (M = 4.44, SD = .046), support the equal involvement of both boys and girls on mathematics classroom. This result indicates teachers have better gender responsive in classroom interaction. Teachers also self- reported that their next greatest gender responsive interaction practice was on the item “I also ask girls high cognitive-level questions paying attention to all students regardless of sex, race, age, etc” (M = 4.38, SD = .050). This result reported that teachers also give high valued to girls and asked high cognitive level questions too like as boys. The means for the greatest disagreement on the statement “I encourage boys more than girls to improve performance in mathematics since the course mathematics suits boys more than girls” is (M = 4.32, SD = .067), indicates that teachers were not only encourage boys but equally give value to girls for improving performance in mathematics thinking mathematics subject is equally valuable for girls.

One can see on Table 12 that the seven items have mean value less than average value 3. The teachers on average reported the lowest GRP practices under teacher-student interaction domain was “Girls appear more ashamed than boys when responding with wrong answers in questions” (M = 2.40, SD = .477), suggested that mathematics teachers observed large number of girls ashamed while answering the questions than boys in mathematics classroom. The results indicate that comparatively girls showed shyness habit in questioning and answering activity in classroom that creates girls’ low involvement in interaction with teachers and peers. The second lowest GRP practice under interaction domain was the item “I devote more time to encouraging girls than boys in mathematics classroom", the result indicated that teachers had not given more time for girls' encouragement for mathematics learning process rather than boys.

***Language Used***

The item-level descriptive statistics for the component language used by mathematics teachers in teaching learning process had shown in table 13 below. The five-point Likert type scale labels for teachers' perspective on the language used for gender responsiveness. That's why the score greater than Likert average value 3 indicated that teachers have good GRP practice on the Language used in mathematics classroom. Descriptive analysis was conducted on the seven items in Language used domain.

**Table 13.** *Descriptive Statistics of Language Used Domain*

| S.N | Statements | N | Min | Max | M | SD | Skew | Kurt |
|---|---|---|---|---|---|---|---|---|
| 1. | I use written and spoken language, which is gender neutral in my classroom. | 205 | 1 | 5 | 4.08 | .839 | -1.264 | 2.306 |
| 2. | I use both verbal and non-verbal language in the classroom that can discourage and demotivate girls from performing well in mathematics. | 205 | 1 | 5 | 3.79 | 1.213 | -1.023 | .019 |
| 3. | My harsh language in classroom can cause students especially girls to become fearful from mathematics. | 205 | 1 | 5 | 3.75 | 1.209 | -.955 | -.032 |
| 4. | I express that girls cannot perform similar to boys in mathematics, or that boys should not allow themselves to be outperformed by girls academically. | 205 | 1 | 5 | 4.01 | 1.066 | -1.195 | .810 |
| 5. | I ensure equal use of the pronouns "he" for boys and "she" for girls in mathematics classroom. | 205 | 1 | 5 | 3.47 | 1.178 | -.559 | -.738 |
| 6. | I use verbal and written language that respects the experience and diversity of girls that increase their classroom participation in mathematics. | 205 | 1 | 5 | 3.99 | .863 | -1.136 | 1.450 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 7. I always use encouraging, inclusive, and gender responsive language in mathematics classroom that treats boys and girls as equal partners and provides a conducive learning environment for them. | 205 | 1 | 5 | 4.20 | .860 | -1.426 | 2.323 |

*Note.* M = Mean; SD = Standard Deviation; Min = Minimum; Max = Maximum; Skew = Skewness; Kurt = Kurtosis

Table 13 represents that all the items have mean value greater than scale mean 3, which indicates that majority of mathematics teachers felt that they have good GRP practices in the language use in mathematics classroom. The mean value for the greatest agreement regarding this domain reflected the teachers' perspectives (M = 4.20, SD = .860) that in item 7, supports the use of encouraging, inclusive, and gender responsive language in mathematics classroom. The result revealed that teachers treat girls and boys as equal partners, create a supportive learning environment, and use gender-friendly languages in classroom. The results reveal that teachers have no disparity while using language, they used gender responsive and inclusive language that creates friendly environment in classroom. Likewise, the mean value of item 1 "I use written and spoken language, which is gender neutral in my classroom" was (M = 4.08, SD = .839), indicates majority of teachers have confidence, they are used gender neutral written and spoken language in classrooms. Among the items on language used, teachers self-reported the lowest practice on language was "My harsh language in classroom can cause students especially girls to become fearful from mathematics" (M = 3.75, SD = 1.209). This result indicates that most of the mathematics teachers were not using harsh language because they were sensitive to such language creating fearful environment in classroom, especially for girls.

***Teaching Materials***

Since the Skewness and Kurtosis of each item regarding teaching learning materials were calculated. The scores on Table 14 show that each items have skewness values at the feasible level of parametric tests. If skewness value of data were between +2 and -2 then the distribution was considered normal (George & Mallery, 2016). Likewise, the absolute Kurtosis value is less than 7. An analysis for descriptive statistics was computed for each item under teaching material for GRP to provide mean and standard deviation. Analysis was conducted on the nine items related to teaching learning materials domain on GRP practices. The five point Likert type scale was used to analyze data on GRP practices related to teaching learning materials. Hence the obtained mean value greater than average value 3 indicates that the teachers are positive on using gender responsive teaching materials while teaching mathematics. The descriptive values regarding teachers' practices on gender responsive teaching materials is depicted in Table 14 as follows.

**Table 14.** *Descriptive Statistics on Teaching Materials*

| S.N | . Statements | N | Min | Max | M | SD | Skew | Kurt |
|---|---|---|---|---|---|---|---|---|
| 1. | I consider both female and male authors and researchers equally when giving reference to students while teaching. | 205 | 1 | 5 | 4.13 | .825 | -1.353 | 2.484 |
| 2. | I obtain and use instructional materials (examples, pictures etc.) which are gender neutral in my lessons. | 205 | 1 | 5 | 4.04 | .896 | -1.193 | 1.547 |
| 3. | There are gender biased illustrations and examples in mathematics textbooks and other resources. | 205 | 1 | 5 | 3.00 | 1.278 | -.123 | -1.093 |
| 4. | Awareness about the gender-stereotyped issues should be incorporated into all school subjects. | 205 | 1 | 5 | 3.86 | 1.044 | -1.082 | .706 |
| 5. | I do not add any interpretations and examples to capture gender responsiveness whenever there is a gender biased illustration and examples in textbooks and other resources. | 205 | 1 | 5 | 2.88 | 1.293 | .055 | -1.241 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 6. In mathematics textbook, mathematical illustrations and examples only include males name and character more than female. | 205 | 1 | 5 | 3.03 | 1.175 | -.149 | -1.113 |
| 7. I describe mathematicians and scientists as both males and females, valuing their intuition and emotions. | 205 | 1 | 5 | 3.90 | .929 | -.916 | .630 |
| 8. I always use gender non-stereotypical materials in my classroom. | 205 | 1 | 5 | 3.52 | 1.003 | -.488 | -.180 |
| 9. I explain to students the construction of mathematical materials and their use in society. | 205 | 1 | 5 | 4.09 | .781 | -1.090 | 2.507 |

*Note.* M = Mean; SD = Standard Deviation; Min = Minimum; Max = Maximum; Skew = Skewness; Kurt = Kurtosis

Table 14 shows that the items on the teaching learning materials for GRP practices on which, teachers self- reported having the highest practicing gender responsive teaching materials was “I consider both female and male authors and researchers equally when giving reference to students while teaching” (M = 4.13, SD = .825). It indicates that mathematics teachers believe themselves that they valued both male and female authors and researchers while teaching and taking references. Teachers also self- reported having high GRP practices regarding teaching materials was “I explain students the construction of mathematical materials and its use in society” (M = 4.09, SD = .781), indicates teachers explain in classroom about materials construction and its use with the students. There was one item on which teachers reported their Neutral position “There are gender biased illustration and examples in mathematics textbooks and other resources” (M = 3.00, SD = 1.278). The one item that the teachers reported the lowest practice in the classroom was “I do not add any interpretations and examples to capture gender responsiveness whenever there is a gender biased illustrations and examples in textbooks and other resources” (M = 2.88, SD = 1.293). Teachers agreed on this statement suggested that they did not use any gender responsive examples and illustration for the replacement of gender biased materials and illustrations of textbook in teaching.

***Teacher's Classroom Activities***

Since the Skewness and Kurtosis of each item regarding teachers' classroom activities were calculated. The scores in Table 15 indicate that the absolute Skewness values for each item were below 2, and the absolute Kurtosis values were below 7. Therefore, the data were considered to be normally distributed, allowing for the use of parametric tests in the analysis. Since if skewness value of data were between +2 and -2 then the distribution was considered normal (George & Mallery, 2016). This analysis provided descriptive statistics as mean and standard deviation from the sample participants regarding participants' classroom activities based on GRP practices in the classroom. The analysis of descriptive statistics was conducted on 21 items in the teacher's classroom activities domain. The Likert type scale labels for GRP practices on this domain included Strongly Agree (5) to Strongly Disagree (1). For the negative statements, labels in reverse order as Strongly Agree (1) to Strongly Disagree (5). Moreover, the obtained mean score greater than average scale value 3, indicates that the teachers are positive on conducting classroom activities as gender responsive while teaching mathematics.

Table 15 shows that among the twenty-one items, nineteen items have computed mean value greater than average value 3, that indicates that majority of teachers claimed that their classroom activities were gender responsive. The means for the greatest agreement by the teacher participants of the item in this domain reflected the perspectives that "I encourage both girls and boys to carry out the same activities" (M = 4.28, SD = .777), supports the gender responsive classroom activities. Which suggested that mathematics teachers were confident that they encouraged both boys and girls to do the same activities in mathematics classroom. Teachers also self-reported about practicing gender responsive classroom activities with the means for the second greatest agreement of the statement in this domain was “I encourage both girls and boys to solve mathematical problems and to present the results they found in classroom’ (M = 4.25, SD =.722). They also reported having gender responsive practices in classroom activities in the item “I follow strategies to make passive students participate and active more in the group activities by allocating and rotating specific roles in a group” (M = 4.22, SD = .713). These statements also support the gender responsive classroom activities conducted by teachers in classroom. The result revealed that mathematics teachers encourage both gender groups while solving mathematical problems and apply different strategies to participate passive students actively in group activity in classroom.

The means for disagreement of the statements in this domain were two items. Teachers reported lowest mean value included the following item “I give more effort and time for girls to learn mathematics in classroom than boys” (M = 2.88, SD = 1.191). Teachers disagreed on statement, which indicates that a large number of teachers were not practicing such activities for providing more effort for girls than boys in teaching mathematics. They also reported having lower gender responsive practices on the items such as “I do not divide students in different groups for cooperative learning by equal gender representation in my classroom activity” (M = 2.82, SD = 1.201). They agreed on this statement, which means teachers have less practicing for developing different groups mixing boys and girls for cooperating learning in classroom. The results indicate that teachers have low priority of practicing mixed sitting arrangement of boys and girls for gender responsive learning environment. A summary of descriptive statistics of each survey item in the teachers' classroom activities domain is shown in Table 15 below.

**Table 15.** *Descriptive Statistics for Teacher's Classroom Activities*

| S.N | Statements | N | Min | Max | M | SD | Skew | Kurt |
|---|---|---|---|---|---|---|---|---|
| 1. | I take initiatives to establish groups by students them self to ensure gender representation. | 205 | 1 | 5 | 4.06 | .820 | -1.346 | 2.732 |
| 2. | I use mixed seating arrangements for both boys and girls in mathematics classroom. | 205 | 1 | 5 | 3.42 | 1.089 | -.619 | -.548 |
| 3. | I do not divide students into different groups for cooperative learning by equal gender representation in my classroom activity. | 205 | 1 | 5 | 2.82 | 1.201 | .250 | -1.195 |
| 4. | I usually give girls an opportunity to relate volume to capacity through questions and answer techniques. | 205 | 1 | 5 | 3.73 | .946 | -.760 | -.194 |
| 5. | I set up a classroom that mixes girls and boys to enhance participation of both. | 205 | 1 | 5 | 3.84 | .926 | -.992 | .707 |
| 6. | I arrange the desks that encourage girls to speak out and overcome their shyness and hesitation. | 205 | 1 | 5 | 4.01 | .810 | -1.246 | 2.516 |
| 7. | I highly include boys in classroom discussion related to mathematical problems rather than girls. | 205 | 1 | 5 | 3.78 | .978 | -1.166 | 1.009 |
| 8. | I distribute questions to whole class and ensure that each student participate equally. | 205 | 1 | 5 | 4.09 | .909 | -1.442 | 2.458 |
| 9. | I ensure the mix groups in classroom on which boys get more opportunity to talk and to lead the discussion. | 205 | 1 | 5 | 3.22 | 1.235 | -.442 | -1.052 |
| 10. | I initiate girls to become group leader equally as boys in the group work in classroom. | 205 | 1 | 5 | 4.17 | .826 | -1.595 | 3.785 |
| 11. | I encourage both girls and boys to solve mathematical problems and to present the results they found in classroom. | 205 | 1 | 5 | 4.25 | .722 | -1.125 | 2.454 |
| 12. | I follow strategies to make passive students participate and active more in the group activities by allocating and rotating specific roles in a group. | 205 | 2 | 5 | 4.22 | .713 | -1.177 | 2.417 |
| 13. | I apply different teaching methods like as group work, group discussions, role plays, debates, pair work, explorations and practical conduct in classroom. | 205 | 1 | 5 | 4.14 | .742 | -1.681 | 5.554 |
| 14. | I provide sufficient time for female students or those students lacking in speaking ability to develop their responses. | 205 | 1 | 5 | 4.07 | .678 | -1.232 | 3.691 |
| 15. | There is cooperative interaction between boys and girls in the classroom. | 205 | 1 | 5 | 4.11 | .726 | -1.252 | 3.486 |
| 16. | I enhance group dynamics by composing of group members heterogeneously by ability, motivation, sex, etc. | 205 | 1 | 5 | 4.04 | .827 | -1.226 | 2.303 |
| 17. | I encourage both girls and boys to carry out the same activities. | 205 | 1 | 5 | 4.28 | .777 | -1.669 | 4.498 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 18. I try to discourage gender stereotyped behavior in my classes. | 205 | 1 | 5 | 4.08 | .865 | -1.481 | 3.267 |
| 19. I give more effort and time for girls to learn mathematics in classroom than boys. | 205 | 1 | 5 | 2.88 | 1.191 | .246 | -.976 |
| 20. I let chance for girls solve mathematical problems by themselves. | 205 | 1 | 5 | 3.94 | .861 | -1.282 | 2.152 |
| 21. I assign exercises of mathematics that encourage girls to speak out. | 205 | 1 | 5 | 3.97 | .810 | -1.120 | 1.873 |

*Note.* M = Mean; SD = Standard Deviation; Min = Minimum; Max = Maximum; Skew = Skewness; Kurt = Kurtosis

***Assessment and Feedback***

Since Skewness and Kurtosis values of each item regarding to assessment and feedback were calculated. The scores on Table 16 shows that each items have skewness value lies under +/- 2, indicates the acceptable value for normal distribution. Likewise, the absolute Kurtosis value less than 7 was acceptable for normal distribution. An analysis for descriptive statistics was computed for each item under assessment and feedback for GRP to provide mean, and standard deviation. Analysis was conducted on the ten items related to assessment and feedback domain on GRP practices. The 5-point Likert type scale labels for GRP practices under this domain included Strongly Agree (5) to Strongly Disagree (1). For the negative statements or the statements reflecting of weaker commitments to GRP practices, labels were in reverse order as Strongly Disagree (5) to Strongly Agree (1). Hence, the obtained value greater than average value 3 indicates that teachers perceived they were practicing GRP properly on the basis of assessment and feedback domain.

The descriptive statistics (minimum, maximum, mean, standard deviation, skewness, and kurtosis) of teacher's GRP practices on assessment and feedback domain for each item was calculated. The values are depicted under the Table 16 as follows.

**Table 16.** *Descriptive Statistics Regarding Assessment and Feedback*

| S. N | Statement | N | Min | Max | M | SD | Skew | Kurt |
|---|---|---|---|---|---|---|---|---|
| 1. | I do bother evaluating students' performance on various assessment based on gender competence. | 205 | 1 | 5 | 3.57 | 1.241 | -.630 | -.772 |
| 2. | I give equally intensive and constructive feedback to both boys and girls in learning mathematics. | 205 | 1 | 5 | 4.31 | .593 | -1.356 | 5.707 |
| 3. | I provide more specific feedback to boys on their responses (Examples: praise, criticism, correction, etc.) than girls. | 205 | 1 | 5 | 3.61 | 1.099 | -.820 | -.261 |
| 4. | I always praise especially girls for their successes, as well as positive, constructive feedback to improve their performance in mathematics. | 205 | 1 | 5 | 3.40 | 1.148 | -.446 | -.792 |
| 5. | I rate boys' proficiency in mathematics higher than girls with equal test scores and similar classroom behavior. | 205 | 1 | 5 | 3.90 | 1.043 | -1.242 | 1.115 |
| 6. | Boys remain more confident of their mathematical abilities relative to girls with equal test scores. | 205 | 1 | 5 | 3.20 | 1.176 | -.367 | -.967 |
| 7. | I provide feedback to girls on the quality of performances but to boys on the appearances of performance | 205 | 1 | 5 | 2.56 | 1.086 | .724 | -.311 |
| 8. | I encourage and be willing to accept feedback from the students to improve my teaching process. | 205 | 1 | 5 | 4.17 | .789 | -1.522 | 3.801 |
| 9. | I follow up on the students with poor performance after assessment results. | 205 | 1 | 5 | 4.30 | .654 | -1.360 | 5.383 |
| 10. | When individual classwork is assigned to students during a lesson, I check the performance of boys more frequently than that of girls. | 205 | 1 | 5 | 3.78 | 1.140 | -1.143 | .558 |

*Note.* M = Mean; SD = Standard Deviation; Min = Minimum; Max = Maximum; Skew = Skewness; Kurt = Kurtosis

Table 16 shows that nine items among ten items under the assessment and feedback domain have a mean value greater than scale mean value 3. So, the majority of teachers have good GRP practices under the domain assessment and feedback in mathematics classroom. The strongest level of item of the assessment and feedback domain for gender responsiveness was "I give equally intensive and constructive feedback to both boys and girls in learning mathematics" (M = 4.31, SD = .593). It indicated that teachers have high confidence in themselves that they had provided constructive feedback while solving mathematical problems to both boys and girls in equal manner. They were trying to maintain gender equality in classroom. Likewise, teachers' second greatest agreement statement under this domain was "I follow up on the students with poor performance after assessment results" (M = 4.30, SD = .654). It suggested that the majority of teachers have more confidence that they had given high priority to students who shows poor performance in mathematics and had followed them for further improvement.

One can see on Table 16 that the one item on which teachers' lowest GRP practices under assessment and feedback domain was "I provide feedback to girls on the quality of performances but to boys on the appearances of performance" (M = 2.56, SD = 1.191), suggested that mathematics teachers in mathematics classroom have low practiced on providing feedback to girls according to their quality of performance and boys according to their appearance of performance.

Likewise, under descriptive analysis, the overall GRP practices scores of mathematics teachers also calculated using descriptive statistics mean and standard deviation.

**Table 17.** *Descriptive Statistics on GRP Practices as a Whole*

| | N | M | SD | Skew | Kurt |
|---|---|---|---|---|---|
| Overall GRP Practices | 205 | 3.69 | .318 | -.586 | 3.598 |

*Note.* M = Mean; SD = Standard Deviation; Skew = Skewness; Kurt = Kurtosis

Table 17 shows that the overall GRP practices values were (M = 3.69, SD = .318), which is greater than average score 3. Hence, this suggested that in general teachers have good GRP practices in teaching mathematics at secondary level.

In addition to the analysis of overall GRP practices of mathematics teachers, the survey data of quantitative phase were analyzed to determine the descriptive statistics as mean and standard deviation of each component —teacher-student interaction, language used, teaching materials, teacher's classroom activities, and assessment and feedback regarding GRP practices. The scores of each variable of GRP practices are depicted in Table 18 as follows.

**Table 18**. *Summary of GRP Practices on Each Variables*

| Variables | N | M | SD | Skew | Kurt |
|---|---|---|---|---|---|
| Teacher-Student Interaction | 205 | 3.54 | .394 | -.301 | .821 |
| Language Used | 205 | 3.90 | .532 | -.403 | .124 |
| Teaching Materials | 205 | 3.55 | .511 | -.047 | .394 |
| Teacher's Classroom Activities | 205 | 3.86 | .395 | -1.242 | 4.184 |
| Assessment and Feedback | 205 | 3.68 | .403 | -.430 | 1.138 |

*Note.* M = Mean; SD = Standard Deviation; Skew = Skewness; Kurt = Kurtosis

Since the Skewness and Kurtosis of each domain regarding teachers' GRP practices were calculated. The scores on Table 18 show that the absolute value of the Skewness of each domain was below 2, and the absolute Kurtosis value was below 7. Therefore, the data was considered normally distributed and hence acceptable for further parametric analysis. Similarly, among five components, the teachers' highest and best level of GRP practices was in their Language used (M = 3.90, SD = .532) in comparison to the other four components. This suggested that teachers have better GRP practices was on Language used in teaching mathematics. Moreover, the second greatest mean value was in the component teacher's classroom activities (M = 3.86, SD = .395), suggested that teachers have also good GRP practices on their classroom activities. Furthermore, the data also indicated that the teachers' lowest level of GRP practices in mathematics classroom was in the component teacher-student interaction

(M = 3.54, SD = .394) among all components. This result suggested that teachers have low level of GRP practices at the time of classroom interaction with students, which is the important component for maintaining gender responsive classroom.

***GRP Practices of Male and Female Teachers Among Different Variables***

To examine gender-based differences in teachers' GRP practices between male and female teachers, both descriptive statistics (mean and standard deviation) and inferential statistics (t-test with Hedges' g) were calculated and analyzed. Table 19 showed the male and female teachers' GRP practices based on five components as follows.

**Table 19.** *Comparing Teacher's GRP Practices of Each Component Based on Gender*

| Component of GRP Practices | Male | | | Female | | | P-value | Hedges' g |
|---|---|---|---|---|---|---|---|---|
| | N | M | SD | N | M | SD | | |
| T-S Interaction | 181 | 3.54 | .388 | 24 | 3.50 | .444 | .740 | .08 |
| Language Used | 181 | 3.88 | .537 | 24 | 4.08 | .460 | .609 | .38 |
| Materials Used | 181 | 3.55 | .508 | 24 | 3.56 | .544 | .863 | .02 |
| Teachers' Classroom Activities | 181 | 3.85 | .362 | 24 | 3.94 | .595 | .014 | .21 |
| Assessment and Feedback | 181 | 3.67 | .399 | 24 | 3.73 | .435 | .606 | .14 |
| Overall | 181 | 3.68 | .306 | 24 | 3.72 | .403 | .408 | .12 |

*Note.* M = Mean; SD = Standard Deviation

The survey data were analyzed for the comparison of means of all components between male teachers and female teachers towards the GRP practices. Among the components, the language used demonstrated the highest mean value of both teachers (M = 3.88, SD = .537) by male teachers and (M = 4.08, SD = .460) by the female teachers. Both male and female mathematics teachers have confident that they are using gender responsive language while teaching mathematics at secondary level. Whereas female teachers mean value greater than male teachers, indicated that female teachers have greatest confidence that they were using gender responsive language more in classroom than male teachers. Next is the teacher's classroom activities component had the second highest rated by male teachers (M = 3.85, SD = .362) and female teachers (M = 3.94, SD = .595), in favor of female teachers. Though, both male and female teachers felt that they were conducting gender responsive classroom activities in mathematics classroom. Moreover, based on the table 19, both male teachers (M = 3.54, SD = .389) and female teachers (M = 3.51, SD = .444) rated the lowest level of GRP practices on the components teacher- student interaction. Both male teachers and female teachers realized that their interaction practices with students is less gender responsive in teaching mathematics. In four components except teacher-student interaction, female teachers' mean value greater than male teachers', indicated that female teachers had slightly more GRP practices than male teachers in mathematics classroom.

Furthermore, I investigated whether there were statistically significant differences in GRP practices between male and female teachers across the five GRP components. In comparison among five GRP components, on the teachers' classroom activities GRP practices subscale, female teachers reported higher mean scores (M = 3.94, SD = .594) than male teachers (M = 3.85, SD = .362) (see Table 19). This mean difference was statistically significant ($P = .014 < 0.05$) with a small effect size ($g = .21$) in favor of female teachers. The data revealed that male and female teachers have different level of classroom activities regarding GRP practices, slightly female teachers have good GRP practices in classroom activities while conducting mathematics classes in comparison to male teachers. For all remaining four components, no statistically significant differences were observed between male and female teachers in GRP practices, including teacher-student interaction ($P = .740 > 0.05$) with a very small effect size ($g = .08$), language used ($P = .609 > 0.05$) with a small effect size ($g = .38$), teaching materials ($P = .863 > 0.05$) with a very small effect size ($g = .02$), and assessment and feedback ($P = .606 > 0.05$) with a small effect size (g = .12). Slightly mean differences have been found on these four components but not statistically significant. The result indicated that the male teacher and female teacher have similar level of GRP practices under these four components in mathematics classroom.

Overall, as shown in Table 19, female mathematics teachers reported a higher mean score (M = 3.72, SD = .403) in GRP practices compared to male teachers (M = 3.68, SD = .306). Both male and female teacher' calculated mean score exceeded the scale value 3, indicating that they generally demonstrate good GRP practices in mathematics. However, the difference in mean scores was not statistically significant ($P = .408 > 0.05$) and had a small effect size (g = 0.12). This result reported that the male and female teachers' perception towards their GRP practices was not differed from one gender to another gender. As a whole, male teachers' and female teachers' GRP practices in mathematics classroom was similar manner.

***Analyzing GRP Practices Among Teachers Across Four Districts***

The study examined the GRP practices among secondary level mathematics teachers across four districts—Dolakha, Sindhuli, Chitwan, and Kathmandu. Both descriptive (mean and standard deviation) and inferential statistics (ANOVA) with Post Hoc were employed for analyzing the data. Table 20 showed the descriptive statistical values of four districts as follows.

**Table 20.** *Descriptive Statistics of GRP Practices of Teachers Across Four Districts*

| District | N | Mean | SD | Min | Max |
|---|---|---|---|---|---|
| Chitwan | 48 | 3.73 | .254 | 3.14 | 4.29 |
| Dolakha | 36 | 3.69 | .302 | 3.08 | 4.67 |
| Kathmandu | 72 | 3.61 | .341 | 2.38 | 4.61 |
| Sindhuli | 49 | 3.76 | .335 | 2.43 | 4.67 |
| Total | 205 | 3.69 | .3183 | 2.38 | 4.67 |

*Note.* M = Mean; SD = Standard Deviation; Min = Minimum; Max = Maximum

Table 20 shows overall, the mean GRP score (M = 3.69, SD = 0.32) across all districts which is greater than scale mean 3, indicating that mathematics teachers of Bagmati province have moderately high level of GRP implementation. In district-wise comparison, the notable variation in the mean scores regarding GRP among the four districts. The data showed that Sindhuli has the highest average GRP score (M = 3.76, SD = 0.34), whereas Kathmandu reported the lowest average GRP score (M = 3.61, SD = 0.34). Whereas, Chitwan and Dolakha fall in between, with means of 3.73 and 3.69 respectively. The data revealed that mathematics teachers of Sindhuli district have strong adoption of GRP practices in the classroom. Since, Kathmandu as the capital city of Nepal, but mathematics teachers have relatively lower and diverse GRP practices in comparison to other districts. That might be the causes of school types — institutional and community school. In Kathmandu, maximum high performer students went to the institutional school, minimal students went to the community school and maximum from low family background and maximum girls. That causes variability teachers' GRP practices in community school of Kathmandu district.

To determine whether the observed mean differences in GRP scores among districts were statistically significant, one-way Analysis of Variance (ANOVA) was conducted for this study. The value is depicted in Table 21 as follows.

**Table 21.** *One-Way ANOVA Summary for GRP Practices Across Districts*

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | .823 | 3 | .274 | 2.778 | .042 |
| Within Groups | 19.848 | 201 | .099 | | |
| Total | 20.671 | 204 | | | |

Table 21 shows a p-value of (0.042<0.05), indicating a statistically significant difference in GRP practices among teachers across the four districts. However, the effect size appears to be small. That revealed that at least one district's mean GRP score is significantly different from the others three.

In this study, following the significant ANOVA result, I calculated Post Hoc test. This allows to investigate which specific districts differ significantly in mean GRP scores, in regards of GRP practices among mathematics teachers. The Post Hoc value is depicted in Table 22 as follows.

**Table 22.** *Scheffe Post Hoc Multiple Comparisons of GRP Practices Among Teachers Across Four Districts*

| District(I) | District(J) | Mean Difference (I-J) | Sig. | 95% Confidence Interval | |
|---|---|---|---|---|---|
| | | | | Lower Bound | Upper Bound |
| Chitwan | Dolakha | .036 | .965 | -.160 | .231 |
| | Kathmandu | .121 | .237 | -.044 | .286 |
| | Sindhuli | -.035 | .961 | -.215 | .145 |
| Dolakha | Chitwan | -.036 | .965 | -.231 | .159 |
| | Kathmandu | .085 | .625 | -.096 | .266 |
| | Sindhuli | -.071 | .789 | -.265 | .124 |
| Kathmandu | Chitwan | -.121 | .237 | -.286 | .044 |
| | Dolakha | -.085 | .625 | -.266 | .096 |
| | Sindhuli | -.156 | .070 | -.320 | .008 |
| Sindhuli | Chitwan | .035 | .961 | -.145 | .215 |
| | Dolakha | .071 | .789 | -.124 | .265 |
| | Kathmandu | .156 | .070 | -.008 | .320 |

The Table 22 shows that any district pairs do not show statistically significant differences in GRP practices of mathematics teachers at 0.05 level. Among them, the closest to significance difference is the comparison between Sindhuli and Kathmandu ($p = 0.07$). Hence, the Post Hoc Scheffe test showed that no statistically significant pairwise differences in teachers' GRP practices across the four districts. Although the overall ANOVA value was significant. Teachers' GRP practices were statistically similar across Chitwan, Dolakha, Kathmandu, and Sindhuli. However, the difference between Kathmandu and Sindhuli approached significance, suggesting the mathematics teachers in Sindhuli may engage at a somewhat higher level in GRP practices than those in Kathmandu.

**Student's Realization Towards Teacher's Behavior Regarding GRP Practices**

For students' realization, the data were collected using survey questionnaire to students who were studying at grade X at Bagmati Province of Nepal. The survey data of student respondents were analyzed to determine the mean and standard deviation for students' realization towards teachers' GRP practice. The questionnaire measuring students' realization contained 32 items on a 5-point Likert scale, with responses ranging from Strongly Disagree (1) to Strongly Agree (5). For negatively worded items, the scoring was reversed, with Strongly Agree scored as 1 to Strongly Disagree as 5. That's why, the score greater than Likert average value 3, indicated that students have better realization towards teachers' behavior on GRP practice in mathematics classroom. The descriptive statistics like skewness, kurtosis, mean, standard deviation, minimum, and maximum are presented in Table 23 below.

**Table 23.** *Descriptive Statistics of Students' Realization Towards Teachers' Behavior on GRP Practices*

| S.N | Statements | N | Min | Max | M | SD | Skew | Kurt |
|---|---|---|---|---|---|---|---|---|
| 1. | The teacher investigates students' math skills before starting to teach a new topic. | 452 | 1 | 5 | 3.75 | 1.160 | -.797 | -.305 |
| 2. | Boys and girls do mathematical problems in mixed group in mathematics classroom. | 452 | 1 | 5 | 3.30 | 1.242 | -.291 | -1.145 |
| 3. | Teacher encourages boys to share their mathematical knowledge and thinking process with girls' peer. | 452 | 1 | 5 | 3.35 | 1.162 | -.251 | -1.061 |
| 4. | Teacher encourages both boys and girls to share their understanding of mathematics in class and out of the classroom. | 452 | 1 | 5 | 3.93 | .984 | -.941 | .524 |
| 5. | I want to learn mathematics cooperatively. | 452 | 1 | 5 | 4.23 | .879 | -1.057 | .527 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 6. Mathematics teacher gives more values to boys rather than girls in classroom. | 452 | 1 | 5 | 3.74 | 1.197 | -.844 | -.182 |
| 7. Mathematics teachers equally pay attention to both girls and boys in solving mathematical problems. | 452 | 1 | 5 | 4.24 | .898 | -1.203 | .960 |
| 8. Mathematics teachers use inclusive language in the classroom. | 452 | 1 | 5 | 3.55 | 1.248 | -.693 | -.568 |
| 9. Mathematics teachers create appropriate learning environments where competition reduced, and co-operation encouraged in mathematics classroom. | 452 | 1 | 5 | 3.51 | 1.081 | -.604 | -.229 |
| 10. Mathematics teacher uses verbal and written language that respects the experience and diversity of girls. | 452 | 1 | 5 | 3.45 | 1.126 | -.548 | -.470 |
| 11. Girls receive less instructional and discussion time, less help and less praise than boys from mathematics teacher in classroom. | 452 | 1 | 5 | 3.56 | 1.198 | -.566 | -.730 |
| 12. Teachers evaluate girl's ability in lower rate than boy's ability where both have similar test scores in mathematics. | 452 | 1 | 5 | 3.72 | 1.181 | -.925 | -.039 |
| 13. In mathematics classroom, boys receive more attention and support from their teachers than do girls. | 452 | 1 | 5 | 3.43 | 1.216 | -.538 | -.693 |
| 14. Teachers ask higher ability level questions to boys related to mathematical content rather than girls in classroom. | 452 | 1 | 5 | 3.57 | 1.158 | -.791 | -.255 |
| 15. Teachers use a mix group setting for both boys and girls in mathematics classroom. | 452 | 1 | 5 | 2.96 | 1.298 | -.099 | -1.207 |
| 16. Teachers provide appropriate feedback and instructions in solving mathematical problems for both boys and girls. | 452 | 1 | 5 | 4.01 | 1.009 | -1.168 | 1.047 |
| 17. Teachers demystify mathematics through more than one solution and more than one process equally to boys and girls. | 452 | 1 | 5 | 4.04 | .962 | -1.161 | 1.221 |
| 18. Mathematics teachers provide an appropriate environment in which both boys and girls share their knowledge related to mathematics. | 452 | 1 | 5 | 3.92 | 1.034 | -1.142 | .978 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 19. Teachers encourage girls to solve mathematical problems by themselves by understanding their emotion and intuition. | 452 | 1 | 5 | 3.60 | 1.008 | -.541 | -.213 |
| 20. Teachers discuss with boys more frequently than girls on mathematical problems in classroom. | 452 | 1 | 5 | 3.57 | 1.190 | -.724 | -.390 |
| 21. Both boys and girls work in groups without any humiliation while solving mathematical problems in the classroom. | 452 | 1 | 5 | 3.57 | 1.152 | -.642 | -.400 |
| 22. Teachers provide sufficient time for girls or those students lacking in speaking ability to develop their responses. | 452 | 1 | 5 | 3.48 | 1.141 | -.515 | -.612 |
| 23. In mathematics classroom, boys help girls to learn and solve mathematical problems. | 452 | 1 | 5 | 3.41 | 1.202 | -.516 | -.743 |
| 24. Teachers viewed and expressed mathematics as a male domain subject in classroom. | 452 | 1 | 5 | 3.40 | 1.171 | -.495 | -.673 |
| 25. The teacher attributed boys' success to ability and girls' success to effort in mathematics. | 452 | 1 | 5 | 3.19 | 1.216 | -.283 | -.969 |
| 26. Teachers call boys more than girls to solve mathematics problems on the blackboard/whiteboard by thinking boys are capable in mathematics. | 452 | 1 | 5 | 3.47 | 1.209 | -.661 | -.628 |
| 27. Teachers give one-on-one instructions in solving problems of mathematics to both boys and girls equally. | 452 | 1 | 5 | 3.95 | 1.022 | -1.034 | .616 |
| 28. Teacher gives equally intensive and constructive feedback to both boys and girls in mathematics classroom. | 452 | 1 | 5 | 3.95 | .984 | -1.037 | .766 |
| 29. Teacher communicates with class regularly through class representative is gender neutral. | 452 | 1 | 5 | 3.27 | 1.071 | -.461 | -.468 |
| 30. I enjoy the class activities in mathematics class because of encouraging behavior of teacher. | 452 | 1 | 5 | 3.62 | 1.093 | -.746 | -.083 |
| 31. I find it is easy to get good grades in mathematics because of the teacher's motivating behavior to study mathematics. | 452 | 1 | 5 | 3.72 | 1.019 | -.902 | .511 |
| 32. Girls are neglected by teacher while doing mathematics in classroom activities. | 452 | 1 | 5 | 3.79 | 1.186 | -.905 | -.054 |

*Note.* M = Mean; SD = Standard Deviation; Min = Minimum; Max = Maximum; Skew = Skewness; Kurt = Kurtosis

Table 23 shows that each item regarding students' realization towards teachers' behavior have skewness value lies under +/-2, likewise absolute kurtosis value less than 7, indicates the acceptable value for normal distribution. The table shows that among 32 items value, 31 items have computed mean value greater than average mean value 3, that indicates the majority of students perceived their mathematics teachers have gender responsive behavior. They realized that their mathematics teachers showed gender responsive behavior in the teaching learning process in mathematics classroom. The table shows that students highly agreed on the item as "Mathematics teachers equally pay attention to both girls and boys in solving mathematical problems", (M = 4.24, SD = .898), which indicated that majority of students were confident that their mathematics teachers equally pay attention towards both boy and girl students, did not do discrimination on the basis of gender in mathematics classroom.

Likewise, the second highest level of agreement of students was on the item "I want to learn mathematics cooperatively" with means (M = 4.23, SD = .879), which suggested that majority of students expected to study mathematics in cooperative way. Students wanted a cooperative environment in mathematics classroom with teachers and peers. However, also the large number of students agreed towards their teacher's behavior on the statement "Teachers demystify mathematics through more than one solution and more than one process equally to boys and girls" (M = 4.04, SD = .962), which indicates that students believed that their mathematics teachers were simplify mathematical problems by using more than one process and more than one solution, valuing both boys and girls based on their specific leaning needs. Mathematics teachers showed gender responsive behavior while solving mathematics problems in the classroom. Moreover, a large number of students also agreed on the statement as "Teachers provide appropriate feedback and instructions in solving mathematical problems for both boys and girls" (M = 4.01, SD = 1.009). The data suggested that students felt that their teachers provided sufficient feedback and instructions for both girls and boys while solving problems of mathematics.

One can see on Table 23 that the only one item i.e item number 15, on which students disagree "teachers use mix group setting for both boys and girls in mathematics classroom" (M = 2.96, SD = 1.298), which indicated that students realize that their teachers did not use mix group setting arrangement for both boys and girls in mathematics classroom. That means boys and girls were seated in separate rows and columns. Mixed classroom set up was one of the good pedagogical practices to enhance gender responsiveness in classroom, but teachers did not do practice of mix group setting which is necessary for eliminating gender disparity in classroom participation and interaction. Since, Nepal is a male dominated country, still cultural stigma influenced teachers and automatically students in their every activity in schools.

Likewise, under descriptive analysis of students' realization towards teachers' behavior regarding GRP practices, the overall students' realization scores were also calculated using descriptive statistics skewness, kurtosis, mean, and standard deviation. Overall, students' preceptions of teachers' behavior regarding GRP is depicted in Table 24 as follows.

**Table 24.** *Descriptive Statistics of Students' Realization as a Whole*

| | N | M | SD | Skew | Kurt |
|---|---|---|---|---|---|
| Students' Realization | 452 | 3.63 | .509 | -.469 | .188 |

*Note.* M = Mean; SD = Standard Deviation; Skew = Skewness; Kurt = Kurtosis

Table 24 shows that the overall students' realization mean value (M = 3.63, SD = .509), greater than average mean score 3. Hence, this result indicated that students believed that their mathematics teachers' GRP practice in mathematics classroom is well while teaching mathematics at secondary level. They realized that their mathematics teachers showed gender responsive positive behavior in classroom, focused both boys and girls in solving problems in classroom. Students realized that their teachers' behavior towards them is gender friendly in mathematics classroom.

**Comparison Between Boys and Girls' Realization Towards Teachers' Behavior Regarding GRP Practices**

In this study, gender wise students' realization towards teachers' behavior about GRP practices were also calculated. There were 217 boy and 235 girl students' questionnaires were validated for this study. On which, in descriptive statistics, the mean and standard deviation, whereas in inferential statistics, t-value were calculated to compare boys' and girls' realization towards teachers' behavior on GRP. The mean, standard deviation, and p-value are depicted in Table 25 as follows.

**Table 25.** *Comparison Between Boys and Girls Realization Towards Teachers' Behavior*

| Gender | N | Mean | SD | P value | Hedges' g |
|---|---|---|---|---|---|
| Boys | 217 | 3.56 | .560 | 0.000 | 0.28 |
| Girls | 235 | 3.70 | .447 | | |

*Note.* M = Mean; SD = Standard Deviation

One can see from Table 25 that both boy and girl students mean value is higher than scale mean value 3, suggested tha both of them perceived their teachers' behavior as gender responsive in mathematics classrooms. Using an independent samples t-test, I examined whether there was a statistically significant gender difference between boy and girl students' realization towards teachers' behavior about GRP practices as a whole. On which, the results showed that girls reported a higher mean score ($M = 3.70$, $SD = .447$) than boys ($M = 3.56$, $SD = .560$). The mean difference between boy and girl students was statistically significant ($P = .000 < 0.05$), in favor of girls, with a small effect size ($g = 0.28$). This indicates that boys and girls perceived teachers' gender responsive practices somewhat differently. However, although the difference is statistically significant, the small effect size suggests that the practical or real-world impact of this difference is minimal. Girls were slightly more positive than boys about teachers' gender responsive behavior in the mathematics classroom.

# Chapter V

# GRP Practices: Qualitative Data Analysis and Interpretation

## Introduction

This study highlights the relationship of teachers' beliefs about understanding of GRP and mathematics teaching and learning; essential to the study is how the teachers make discursive claims for practicing GRP within mathematics classroom. In this chapter, results of the second phase of the study obtained from classroom observation and semi-structured interviews about GRP practices are presented. Qualitative data were collected through seventeen interviews, comprising five with teachers and twelve with students. Accordingly, six teachers' classes were also observed twice each in a natural setting. The interview and classroom observation process followed the results of survey data. The main aim of this second phase of data analysis was to obtain views or information from the teacher and student participants based on the survey findings of the first phase in order to explain the survey results in a deeper and wider way to provide a more comprehensive understanding. Moreover, the purpose of the observation and interview sessions were to explore, clarify, and explain the responses obtained from the survey data.

In the development of interview guidelines and classroom observation guidelines, the outlier cases, common cases, debatable cases, highly acceptable, and rejectable cases obtained through survey results were focused. The quantitative findings gave general understanding regarding mathematical content preferences, on which little differences were found on boys' and girls' satisfaction on some mathematical content areas. The quantitative data revealed that in maximum content areas (five areas), there were no statistically significant differences between boys' and girls' satisfaction level regarding content difficulty. Moreover, both boy and girl students perceived Geometry as a difficult content area and expressed dissatisfaction with it. Although the mean score favored girls, the difference was not statistically significant. Therefore, further explanation is needed to understand why such situations occur. Likewise, both boys and girls felt Arithmetic area would be more important in their future life and their mean differences were also statistically significant in favor of girls. Moreover, in most content areas regarding the mathematical content areas important for students' future life, the mean differences between boys and girls were not statistically significant. This finding called for further explanation, particularly 'why part' to address the lack of clear distinctions observed in the quantitative results. Consequently, the unanswered questions emerging from the survey findings drove the qualitative phase of the study, which aimed to explore the ‘why’ and ‘how’ aspects of the research questions. These aspects were managed through the development of interview guidelines.

Likewise, regarding GRP practices, the quantitative findings gave general overview, on which maximum teachers expressed that they were practicing GRP properly in mathematics classroom, but in some statements, they gave contradictory and debatable findings such as in mixed seating arrangement. Additionally, the finding revealed a significant gender difference in only one component —teachers’ classroom activities —while no statistically significant gender differences were found in the remaining four components of teachers GRP practices. That raised the question, why such condition happened? Thus, this unanswered question drove towards qualitative phase with the help of interview and classroom observation for this study. To further expand the qualitative part for detailing teachers’ GRP practices, I developed interview guidelines (see Appendix C) and observation guidelines (see Appendix D) based on above explanations. Similarly, statistically significant difference was found in teachers' GRP practices across districts. However, post hoc analysis revealed no significant differences between any specific pairs of districts, although the differences between teachers from Sindhuli and Kathmandu approached nearer to significance. These findings informed the need for a qualitative phase. Therefore, all participants for the qualitative stage were selected from the Kathmandu district. Since, the majority of teachers and students in Kathmandu came from various regions across Nepal.

Moreover, the quantitative findings answered students' realization towards teachers' behavior, on which in surface level, students were satisfied towards teachers' behavior, but some cases answered in a debatable way and demanded qualitative explanation of why and how parts. In addition, the quantitative findings of the study revealed statistically significant differences between boys' and girls' realization, with girls showing a more favorable perception of teachers' behavior regarding GRP practices. For in depth and detailed information, on the basis of quantitative findings, I prepared interview guidelines for students and tried to obtain answer to the research questions. Additionally, the quantitative findings informed me to choose teachers and students participants for the qualitative semi-structured interviews and classroom observations. I used many prompts to initialize the conversation as well as focused the interview on the research topic about GRP practice in mathematics classroom in the interview process. I exercised circumspection and research ethics in exploring subject matter that came up in the respondent's responses.

***Participants***

Out of the 205 teacher respondents who completed the survey questionnaires, six mathematics teachers teaching Grade IX and X in community schools were selected to participate in the interviews. Likewise, of the 452 student respondents, 12 students were selected for the interviews for the second stage of the study. Among the six mathematics teachers, two were female and four were male teachers; on which among 12 students, six were boy and six were girl students who were studying at Grade X. But one teacher who was not convinced for interview's audio recording. Hence his interview was not included in this study, though his class was observed and included in data analysis. Hence, only five teacher's interviews were included for the qualitative data analysis. These teacher respondents were selected from different schools having variety of perspectives based on both the larger and smaller number of students in the classroom, gender, years of teaching experiences, qualifications, and ethnicity (see Appendix I for detail). Similarly, student respondents were selected to represent the variety of perspectives in relation to gender, performance shown in the classroom, multi-cultural, (see Appendix H for details) from the same schools from which teacher respondents were selected for the interview and classroom observation. The pseudonym mark is used throughout the study to identify each school and each schools' teachers and students regarding qualitative phase.

**Semi-Structured Interviews and Classroom Observation Analysis Findings**

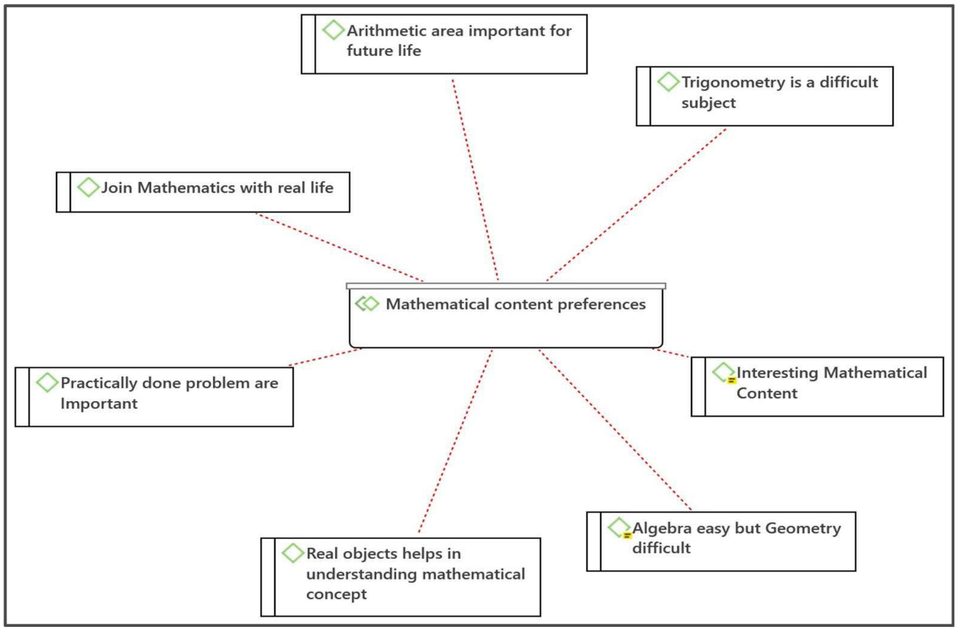
Since all interviews with both teachers and students were conducted in Nepali, they were audio-recorded, transcribed in Nepali, and then manually translated into English by hand to analyze the qualitative data. All English translated interviews were entered into ATLAS.ti 9.0 Pro Software, a qualitative analysis tool. I read through the transcripts and highlighted the contexts that related to the study. Then, coding the relevant data into software then merging similar codes to form single one, splitting to form different codes, deleting irrelevant codes and grouping similar codes to develop higher order themes was done. In this study, the codes were called basic themes, after merging and splitting and developing fine codes were called organizing themes whereas, grouping codes and developing higher order themes were called global theme that were developed by using software (see Appendix L).

The analysis of the interview data produced 193 codes in initial phase (see Appendix J), then similar codes were merged and produced 70 fine codes for analysis (see Appendix K), which were used to develop higher order themes of this study. In the final stage, I developed seven themes to address research questions of this study. One of the themes addressed the first research questions, which helped to provide understanding about students' Mathematical content preferences at secondary level. Remaining six themes addressed the third and fourth research questions that help to provide an understanding of the mathematics teachers' GRP practices and to provide an understanding about students' realization about teachers' behavior under GRP practices.

***Mathematical Content Preferences***

A general overview about students' content preferences for research question one was obtained through quantitative data in the previous chapter. Qualitative data were collected on the basis of outlier cases, common cases, and debatable cases based on quantitative results for this research question. In addition, qualitative data answered why students prefer mathematical contents differently by gender. The collected data were transcribed in Nepali and after that translated in English. However, to present an accurate representation, the translated data which was presented by the respondents based on their feelings about mathematical content preferences was coded. Only one theme is mathematical content preferences, generated through seven codes which were utilized under this theme. All mathematics teachers and student participants contributed to this theme. The theme mathematical content preferences and all codes under this theme are depicted under Figure 5 as follows.

**Figure 5.** *Codes Supporting to the Content Preferences*




There are eight different mathematical content areas at secondary level mathematics curriculum. Some students enjoy one content area whereas others enjoy another area, depending upon the nature of content and their difficulty and easiness. Gender differences also exist on the basis of content preferences among boy and girl students; boys feel difficult with one type of content whereas girls with another. In this manner, when I took semi-structured interview with boy and girl students and with their male and female teacher respondents, both boy and girl students expressed Geometry is difficult and it was not an interesting content whereas Algebra is easier and hence interesting content area in Mathematics. One of the boy respondents (B5) expressed:

> The content that seems to be a bit mind-blowing is interesting for me. I feel Algebra is interesting, because we have to use our brain on it. I like numerical type problems more than word problems. Geometry is not very interesting; it

> was difficult from the previous grades. I haven't been able to pay much attention to Geometry since the earlier grades. I really like Algebra, as I have always found it more interesting and enjoyable.

In similar manner, another girl respondent (G6) expressed “I feel interested to study the content like Algebra and Statistics. Proving theorems of Geometry is very difficult and is not interesting too. It seems very hard work and I think I can’t do whatever I do”. Another girl respondent (G1) also said that “I feel satisfied when I do Algebra. This is because of the fact that there we have to do a lot of factors that are interesting. It takes less interest is the area Set and Geometry.” Next girl also expressed the similar version as she felt Geometry difficult because she did not understand Geometry while teaching in classroom.

The above quotes indicated that there was no gender differences found on two contents as both boy and girl students felt that Algebra is interesting and easy content area, whereas Geometry is not very interesting content area and is difficult in mathematics. This was the reason by the above quotes indicated that both of them have misconceptions as ‘Geometry is difficult’ from the previous classes. Another reason was that they did not understand Geometry from previous classes and felt it was difficult. The reason students liked Algebra was slightly different between boys and girls: boys like logical and mind-blowing content since they thought Algebra is such type of content but girls like Algebra feeling it is easy to do.

Most of the boy students also expressed their belief that contents related to previously used formulas and numerals are enjoyable for them. But due to several formulae and process oriented, Trigonometry is a difficult content area in mathematics for boys: “I find Set, Mensuration, Arithmetic and Statistics to be a bit of a chore, all of which I'm interested in doing a lot” (B4); “I enjoy doing numeric problems or the problem of those numbers, Algebra is also enjoyable if it is understood because the formula used in it are already used in previous classes" (B6). Additionally, one of the boy students expressed his view that Trigonometry is a more difficult content area because there are lots of formulas. He said: "Trigonometry seems a little bit difficult. We have to pay more attention to it and have to read the formulas carefully. If we forget a little bit about the process, then everything is gone" (B2). Another boy (B3) also revealed a similar version,

> I find Trigonometry very difficult. The picture of it is a bit difficult to understand. If I understand it, I can do it. Geometry is fine. I think Set is useless: Set contains formulas and I don't know which formula should be used to solve a respective problem.

Likewise, the girl student (G3) at the same school realized that Trigonometry is difficult because she felt difficult to understand formulas as well as girls felt Geometrical construction difficult, "Statistics seems easy and interesting, and Trigonometry and Set seems difficult for me. It is difficult to understand due to different formulas. Geometry seems fine, but construction is difficult to understand."

The above quotes indicate that in comparison to all content areas, both boy and girl students felt Geometry is not interesting and difficult content because of a lack of basic concepts of Geometry from previous classes on which they felt construction of Geometry more difficult. In gender wise comparison, girls felt Geometry is more difficult than boys. Since boys preferred more complex, logical, and mind-blowing contents like Geometry and Algebraic problems on which logic is needed. Girl's preference in Geometry was seen in outer layer in quantitative data but in inner aspect they felt Geometry as a difficult subject. On the other hand, girls preferred Algebra and less complex manipulation type tasks and solving problems by applying formulae.

Moreover, gender differences found on Geometry content preferences as one of the boy students has contrasting opinions claiming that geometrical formulas and theorem related to Geometry content area are interesting due to its logical nature. He claims that logical contents are enjoyable for him. On this context he expressed:

> I like statistics very much and also the set. Geometry also seems good for me, especially because its formulas and also the theorems are quite interesting. I feel that the mathematical contents that gives logic is good. In Algebra, I found the contents fine up to Grade VIII, and in Grade IX, only topics like LCM, HCF, and factorization became easier for me. (B2)

Similar findings like as students emerged through teacher respondents' interviews. Most of the teachers had a belief that both boy and girl students are scared in Geometry and Geometrical theorems because they had lack of basic geometrical concept that are required for this level. Comparatively, they reported that their students are mostly interested in contents like Arithmetic because it is related to real life and with algebraic content at Secondary level. One of the male teachers (T2-M) stated,

> The student who knows Algebra is interested in doing it but the one who doesn't know will stop doing it, he/she doesn't want to do it. They are afraid from Geometry, and try to do Arithmetic feeling easy, but they do not understand what the questions said but they feel easy in their mind. Even if the real problem appears in Arithmetic, they felt they could do it. Looking at gender, as a costing like profit and loss, girls also seem to be interested. On average, both boys and girls find Geometry difficult, but usually boys do it

> with a little bit of interest, but girls find it more difficult. Since from the previous classes, they don't understand the basic things of point, line, line segment, shapes etc.

Another male teacher (T5-M) similarly commented,

> They enjoy Arithmetic a little more because the problems are a little practical and then a little numerical. They pay little attention while reading Algebra. When they were studying Geometry, they might not realize the geometrical figure, or they kept the concept that the theorem of Geometry is difficult. Hence, after entering into Geometry area, they have a feeling that we will not understand it, it is difficult for us. Hence, it is difficult for us from where to start to teach Geometry? Arithmetic is a practical matter for the student, whereas it is difficult to understand the language, but after that time, Arithmetic can be done easily. The first thing is that they have the pre-concept that 'math is difficult'. The next thing is the theorem of Geometry. They say, this is what we don't see, how we have to do? It is difficult to teach. They think Geometry means theorems, that's why they think Geometry is difficult.

The above quotes of two male teachers revealed they are also of the same line as of students. They reported their students have misconception and stereotype belief from previous classes that 'Geometry is difficult content'. Students attributed emotions of frustration to the study of Geometry. It shows teachers were not able to motivate students towards Geometry by joining it into real situation by using technology and gender responsive strategies while teaching. Hence, teachers also seem to be frustrated while teaching Geometry at secondary level, since students have lack of conceptual understanding from earlier classes. Whereas, students might not find any application of Geometry in real life. In genderwise comparison, teachers felt that boys are better in Geometry than girls. That's' why gender discrimination found in content preferences, teachers are needed to identify students specific content preferences and apply new gender responsive strategies for motivating each student in mathematics especially in Geometry.

Both teacher and student respondents were also asked in the interviews about which mathematical contents are important for students' future life. Both had similar beliefs that the contents related to students' everyday life that is Arithmetic related contents are more important for students' future lives. Additionally, teacher thought that Algebra related contents are important for only the students who could give logic and is important in advanced mathematics, but is less important in daily life,

> Arithmetic would be important for the future because it contains problems related to people's everyday life. There is a practical use in everyday life. Algebra is important for those who can give logic, which will increase their logical thinking but in practical life it does very little work. Algebra and Trigonometry also works later in advanced math but now the child does not understand that. (T2-M)

Students were also in line with the teachers, boys reported that Arithmetic content is applicable to fulfil daily necessities of people, but they were unknown about application part of other content areas of mathematics. B1 stated, "Arithmetic would be important for future life because the contents of Arithmetic are used in our daily life, but where are other mathematical contents used*?"*. In a similar manner, B2 expressed that "Arithmetic would make future life easy." In addition to Arithmetic, some teachers and students also believed that content related to Mensuration is also important for the students' later life. Teachers thought their students learned Mensuration related content interestingly if they used real materials while teaching.

Boy students also enjoyed learning Mensuration because it can be learnt practically using real material. B3 stated,

> The contents like Algebra that do not work in my life, it is little difficult for me that I just have to learn and ask others. The cylinders that fall into the mensuration are such content that I practically read just by imagining myself.

Male teacher T2-M similarly commented,

> When I have shown the real objects like prism, pyramid, cube while teaching area and volume then they try to do it a little more because from which the concept is clear. I feel students understood Mensuration while teaching, I feel it is important for their future life.

Next male teacher T4-M likewise agreed, stating,

> Contents of mathematics are not bad in itself but it differs in its use. It has not been used in real life, but is only taught and taught. If it has not any practical use, then what is the meaning of reading? That content is accepted by all from the ministry level to all the guardians.

In contrast, one of the boy students felt Algebra would also be important for future life for increasing logicality and creativity in their life as “Algebra content is creative like to give logic. It develops the ability to give logic, and is creative. But I don't have any idea where the application is? I only know it develops logic and to be creative” (B2). Likewise, another boy thought

The above versions indicated that teachers and students thought that the contents which have a practical use and use real objects while solving problems in day-to-day life would be important for students’ future life. Hence, both of them preferred the mathematical contents having practical use and applicable in daily life as Arithmetic and Mensuration. Though, in the context of Nepal, majority of mathematics teachers continue to rely on traditional chalk and talk teaching methods, while not making connections mathematical contents in real life situations.

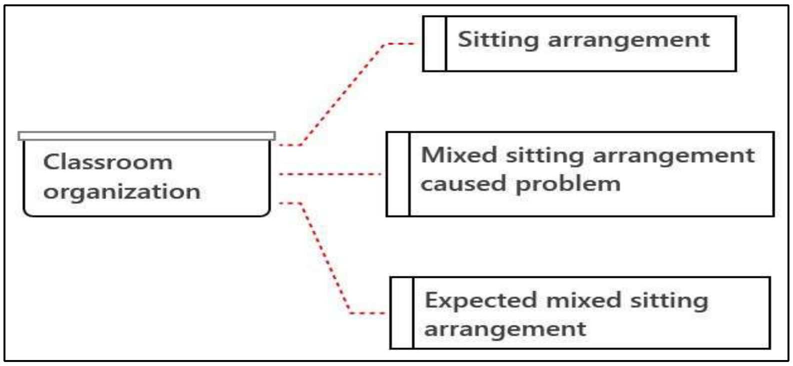
**Teachers' GRP Practices and Students' Realization**

To address research questions three and four —regarding teachers' GRP practices and students' realization towards teachers' GRP related behaviors —six key themes were developed. These themes, along with their associated codes, were directly related to GRP practices in the mathematics classroom. The themes are as follows:

***Gender Responsive Classroom Organization***

For effective teaching learning process, classroom organization is one of the important factors. Gender responsive classroom organization enhances the specific learning needs and interests of both girl and boy students. Classroom setup can help ensure both boy and girl students can enjoy equal access to learning opportunities and are supported to participate equally (MOE, 2014b). Mixing boys and girls in classroom setup encourages the participation of both girl and boy students. Teachers should have the ability to organize and set up classrooms for effective learning and is conducive to learning. It is necessary for teachers to understand how the configuration and maintenance of learning spaces affects the quality of learning and gender responsiveness of the education provided therein (Mlama et al., 2005). The typical traditional seating layout, with desks and benches managed neat rows facing the teacher, does not encourage child centered learning environment and is not suitable for enhancing active participation of student especially girls (MOE, 2014b). Three codes were utilized under this theme where both teachers and student participants contributed are presented in Figure 6 as follows.

**Figure 6.** *Codes Supporting Gender Responsive Classroom Organization*




Teachers expressed their feelings about classroom organization practices based on gender responsive and students also expressed their realization based on teachers' classroom organization practices. During the semi-structured interview, while participants were discussing the classroom seating arrangements, most of the teacher participants expressed that they are practicing traditional seating layout in mathematics classroom. They were not prepared how student's seats should be organized in the classroom, students themselves seat where they want to seat, normally based on their needs, generally boys sit with boys in one separate row and girls' seat with girls in another separate row. Students have freedom to choose their seat themselves. They had not taken any responsibility in classroom arrangement regarding gender. Since mixed seating arrangement would be important for both boys and girls to learn mathematics in a gender friendly environment. Based on the action plan developed by TIGER project in Africa, for gender-responsiveness boys and girls should sit together on the same bench. Concerning the classroom set up, one of the male teachers stated, "Even in seating, there is no any rule. The students form their own group. They seat wherever they like to sit. There is freedom to choose their seat. We have no any seating arrangement" (T4-M). Likewise, the similar version shared by a next female teacher respondent, "The seating is same as before, where students want, sit" (T3-F). Interestingly, another male teacher respondent reported that boys and girls sit together if there is scarcity of benches for one gender group, otherwise boys' and girls' seat in mathematics classroom separately as their wise, "If there are no seats available in one gender group and the row is empty in another side, then boys and girls sit together, otherwise girls sit in separate rows and boys sit in separate rows" (T5-M).

The gendered pattern was also prominent in classroom organization in classroom; teachers discriminate their students based on sex at secondary level. Most of the male and female mathematics teachers expressed that they have not done gender responsive classroom set up practices mixing boys and girls based on their ability in today's classroom. On the other hand, teacher participants (both male and female) reported that in the past, they tried to practice mixed seating arrangement in classroom between boys and girls but having boys and girls sit next to each other at the same bench was problematic. Female teachers mentioned that students showed irrelevant behavior with their opposite sex while mixing together, hence they left to mix boys and girls together in seating. Mixed sitting arrangements created gender violence in Nepalese classrooms. One of the female teachers (T3-F) expressed,

> The boys and girls do not sit in mixed groups. We found some problems with mixing. Some of them are just sitting intentionally with themselves, waving and moving their hands here and there and, some were showing irrelevant things intentionally while seating in classroom. In the case of some intelligent students, it doesn't matter if they are sitting together, learning and teaching is easy and they share with each other, but here we have separated the boys and girls by seeing the negative impact. We have also practiced mix seating, but they hugged and teased each other, intentionally sitting together, that's why we asked them not to sit together.

Next female teacher (T1-F) shared her feelings, “No, No, …we don’t mix, we used to mix both boys and girls together in the past, but we found irrelevant issues between boys and girls and hence we left to mix them gender wise at secondary level”. This was similar to version shared by male teacher participant where cultural transmission issue is prominent for mixed seating arrangement. Teachers claim that mixed sitting raises cultural and social problems in society because, traditionally the proximity between the boys and girls is supposed to be inappropriate. Accordingly, they were blooming through family and society. Hence, both teachers and students were not convinced to adopt new seating arrangements, it is hard to accept it. This opinion was shared by male teacher (T2-M),

> The physical facility is a little bit normal; the places are too narrow for boys and girls to mix. On the other hand, we understand the behaviors of students who have been studying here since they were young, but it is difficult to recognize behaviors of newcomers. We also have a problem with mixing them (both boys and girls) up in one place because we don’t know everything about their inner behaviors and workings. Attempts were made to mix them together, but the worst side was dominant.

T5-M similarly stated,

> The reason for not mixing is that even a little bit of environment keeps bothering. They are in the teenage stage, their age affects. At that time, they are not doing the work what have to be done and are not paying attention to their studies, they would be self-deprecating and there is a love cycle. They are in love affairs. It is more in Grade 6, 7, 8 and it is less in 9 and 10. And the environment is deteriorating because of that, instead of mixing them, boys and girls sit separately as boys with boys and girls with girls but they are seated in

> rotation. They are psychologically convinced that boys and girls should have to sit separately. Also, they might feel that their peers will tease if they go and sit on the other side.

Moreover, teachers were not responsive to knowing the specific learning needs and inner behavior of students. Moreover, it is possible to mix boys and girls next to each other on a single bench. But one of the teachers felt that mixed seating is good for mathematics learning but due to the large number of students, and lack of well-equipped infrastructures, it is difficult to mix them. He stated, “The seating arrangement should also be mixed in the classroom. It is also good to keep the boys and girls together, but the seats are not sufficient to meet the students’ needs. Hence, we can’t mix them” (T2-M).

During the semi-structured interview, both boys and girl participants also explained that in mathematics classroom mostly boys sit with boys in one different row and girls with girls in next separate row with girls and their seat is not changed. There is no mixed sitting in classroom. The first day’s seating determines their seat for the whole year. One boy student participant (B3) expressed, “Whoever sat in the seat on the first day will sit in the same seat the next day. Girls seat on one side and boys on the other side, they don't sit together in classroom”. Likewise, B2 reported that “Seating arrangement depends upon the class teacher. Now, boys and girls are sitting on separate rows. Teachers do not mix boys and girls. Earlier, the benches were used to be mixed, but now they are not due to Covid.”

Next boy student B6 explained,

> The mixed seating of a boy and a girl is not happening. Once in grade three a teacher tried to mix boys and girls but at that time students refused. Now we are sitting in separate rows, in one row boys and in another row girl.

Interestingly, like as the similar version of the boy respondents, one of the girl students reported that talent students always sit on the first and second bench and weak students on the last and second last bench,

> Boys sit on one side and girls sit on the other side, where one stayed the first day, next day they sit in the same place. As far as those who are talented sit on first and second benches, whereas others sit behind at back benches as much as those who are weak. (G6)

Since the students do not realize that teachers as well as school managed seating arrangement looking student's ability and gender. B4 stated,

> Those who have groups with their best friends stay with their own group of friends. Teachers do not necessarily create a group. There are a lot of friends, 2/3 whose house are nearby, and they come to school together sit on the same bench. But there is no rule from school regarding the seating arrangements. There is no rotation. Boys and girls sit in their own row separately; there is no mixed seating between boys and girls.

In addition, the rest of the students reported that in their classes there is no mixed sitting. Whereas, teachers rotate their bench from first to last each day, benchwise rotation occurred, but not student wise observing their ability and gender. One of the girls (G2) expressed,

> The boys and girls are sitting in separate rows, but the bench is rotated, the bench wise rotation occurs. Next day, the whole group sitting on a bench will be rotated. There is no mixed seating of boys and girls, boys are seated with boys and girls with girls.

Sometimes teachers exchange students place just for punishment if students make noise in class. The changes are not made for learning purposes. Students have expectation of mixed seating arrangement among gender wise and performance wise to increase their learning. But discrimination exists in seating arrangement regarding to their performance and talent. B5 stated,

> In a seating arrangement, boys sit in one row with boys and girls sit in another row with girls. If the friends make a lot of noise, sometimes teachers change them here and there, that's just for punishment. I think it is better to keep mixing boys and girls, talent and weak students together.

But one of the students explained that in his school some benches of boys and girls are mixed up, but boys and girls are seated in separate benches on which most of the talented students are seated together and in previous benches and in middle rows. Discrimination in seating is also seen in performance level, on which talent boys' group and talent girls' group were seated together. Boy student B1 stated,

> In my room, talent students are seated mostly in the middle column and in two side columns, in some bench talent students and in some bench weak students are seated. There is no mix up between boys and girls in one bench, but some benches of boys and girls are mixed up.

All teacher participants explained that mixed seating arrangement created social, cultural and biological problems and hence rejected it. But both boys' and girls' participants expected the mixed seating arrangement like as mixing boys, girls, talented and weak ones which will help teachers to teach large number of students in mathematics classroom. If separate tables and chairs were kept in the classroom, then mixing arrangement would be possible. The boy B1 offered a very reflective response:

> I feel, it will be better if the teacher teaches by developing a group by mixing boys, girls, talented and weak students together. Because in government

> schools, teacher can't be able to teach more than 50 students individually. If different level students are kept together and one helps another then the teacher does not have to go to each student's bench.

But a female teacher of B1 school gave an opposite viewpoint. She reported that talent and weak students are mixed, and rotation has been done in classroom:

> What I do in such a situation is that in a class, on one bench at least one talented student can be reached while sitting. And even in the sitting arrangement, we have planned in this way for the purpose that if a talented student is placed on a bench, then the other student who cannot ask many things with teacher due to hesitation, can ask his/her friend. This is done initially in the seat planning and the rotation has been done. And the student who is talent, treats his/her circle for a few months. (T1-F)

Furthermore, mixed seating organization was not done either from any sector such as from any teacher or school administration, and it was sometimes done only at the time of exam focusing exam, but not for creating gender friendly learning environment. In this manner, a girl participant G5 reported:

> It would have been nice to have a mixed group seating. If it had happened, even those who did not study, it would have been better to learn. But no such strategy was applied either by teachers or school administrations. Once, when the exam neared, sir kept us mixing talent and weak students including boys and girls to teach those students who were weak and did not know, otherwise it was free for us to sit in any place with any friend.

In addition, G6 also added that such separated classroom organization persisted the competitive environment between boys and girls that creates fear among girls with others to interact and became backward in learning day by day. Next girl (G6) reported, “If mixed sitting happens, it will create a friendly environment between boys and girls, and one would teach other what they know. Else there will be competition happens and it is over. Then, the competition creates fear and what we have known the contents.”

Mathematics teachers sometimes mixed boys and girls together but they did not sit after the teacher left the class. The physical set up among boys and girls together is not possible due to the cultural stigma implicitly existed in classroom. A girl participant G5 stated, “It has been mixed, boys and girls are kept together, but they sit until the teacher stays in the classroom. Once the teacher goes the students go to their own seat.”

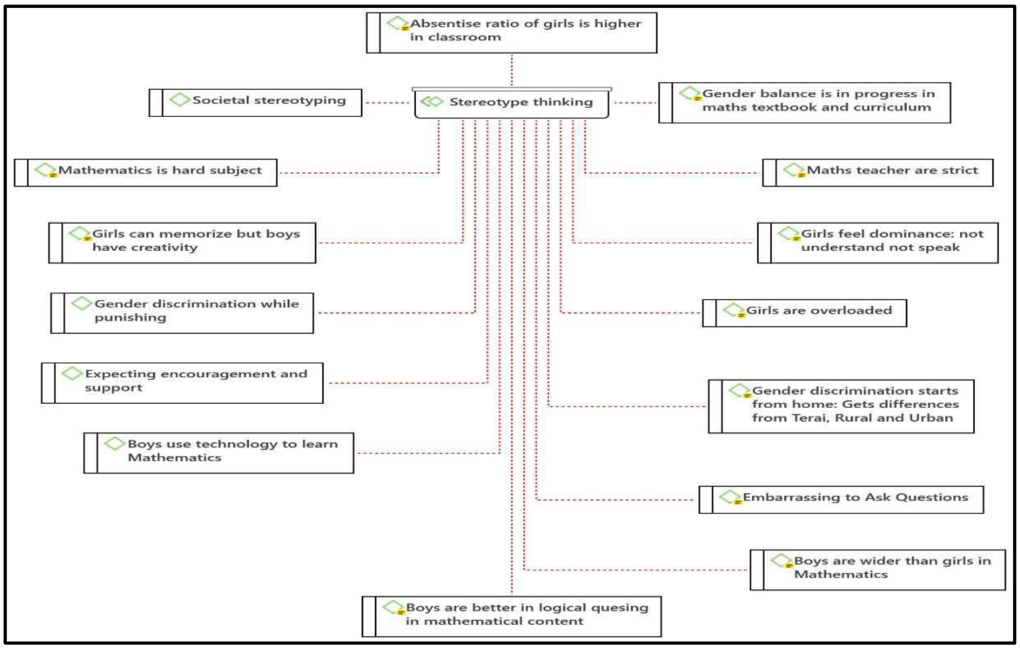
When I observed all teachers’ classrooms whom I interviewed, I found in all the classroom students were seated in the traditional way, rows facing towards the whiteboards. In five teachers’ classrooms, boys were seated in one row and girls were seated in another row separately but in one teacher’s (T1-F) classroom some benches of boys and girls were mixed although groups were not formed with a mix of girls and boys. Mixed sitting arrangements was not done based on gender, ability, and students’ height. In the classroom, desks and benches were attached including attached drawer in each desk for keeping students’ personal belongingness. Though there were sufficient windows with natural light entering the room, the rooms were uncleared. Even though, in one of the teachers’ classrooms (T5-M), desks and benches were old fashioned and were not fit for students. Another teachers’ classroom was overcrowded with a large number of students (65-70), but generally, other teachers’ classrooms had 45-50 students. All classrooms had only whiteboards. There were no other facilities such as a mathematics lab and overhead projectors. Classrooms were fully packed with desks and benches and, there was not sufficient space for teachers to meet students and to manage group work.

Mixing boys and girls together next to each other on the same bench might be possible also in an overcrowded classroom. But the interviews and classroom observation revealed that in the context of Nepal, mixed sitting arrangements in secondary level classroom has not been practiced. Nepal is socially and culturally diverse developing country. The mixed sitting arrangement is the best option for gender responsive classroom set up that was developed by western country and implemented in developing country such as Africa and Bhutan. But teachers believed this arrangement creates gender differences and cultural stigma in secondary level student's classroom in Nepal. Moreover, inversely both boy and girl students have high expectation of mixed seating arrangement to develop learning in friendly environment. They reported that mixed sitting arrangement would increase interaction between boys and girls and increase active participation of both gender groups. To give equal access to both boys and girls in learning, classroom organization should be gender responsive. Teachers and the school administration should pay attention towards gender responsiveness of classroom set up. If school manages separate chairs and tables in the classroom, mixing could be possible in our school context.

***Gender Stereotypes in Thinking***

Gender stereotype is a subjective perception of how boys and girls show their behavior in schools or at homes (Igbo et al., 2015). Stereotypes such as boys are intelligent, brave, logical, and talent in mathematics in comparison to girls are often heard of. Knowingly or unknowingly teachers held gender stereotypes in mathematics classroom and are guilty of gender stereotypes practices at school. Teacher's views on gender roles may influence student's behaviors, attitudes, beliefs, and outcomes directly and indirectly (Alan et al., 2018). There were fifteen codes related to gender stereotypes in thinking. All mathematics teachers and student participants contributed to this theme. The theme and codes under this theme are depicted in Figure 7 as follows.

**Figure 7.** *Codes Supporting the Gender Stereotypes in Thinking*




During the semi structured interview, both teachers and students expressed that their perceptions were influenced by gender stereotypes. Most teacher participants, both male and female, believed that boys were more likely than girls in asking logical questions, giving logical answers in the mathematics classroom. Boys have logical mathematical mind despite being less active in the classroom. In addition, teachers have stereotypical thought that boys are better in mathematics, they study mathematics deeply, they are better in logical and hard content like as Geometry whereas girls are better in solving textbooks' problems, but they have fickle mind, and they are unable to think mathematics deeply. Such situation creates gender discrimination in classroom and badly impacts in learning. Male and female teachers shared similar version in this manner. Male teacher stated,

> Boys are the ones who get ahead in questioning and answering logical questions, that's what I got from some boys. They are forward whether they are not in the first or second position. Even though, boys are not active in the classroom, some boys seem good with logical mathematical minds. In fact, the boys deeply give logic in mathematics. Even though girls are active in the contents of textbooks, boys are good at logical things in text. Even the obedient boys are also good at hard things or more difficult problems. Girls try to be familiar, try to practice to solve the problems, but in logical questions, logical answers and hard things come from obedient boys. When we compare students of the same level, only boys look good in logical mathematics. I feel that they think mathematics a little deeper. Girls have a fickle mind; they don't think deeply about anything, but boys want to know why and how it happened. The less active, the better in logical process. (T4-M)

Female teacher concurred, stating,

> Looking at the content of the math, in the logical thinking part when conducting the geometrical extra questions, even though the girls are very talented, they are not able to create fact logic. It seems that boys are now a little ahead rather than girls in geometrical logic, but normally girls are not far behind. (T3-F)

Likewise, male teacher (T5-M) also supported the above statement, “If we look at activeness, boys are ahead than girls in mathematics, although they are less in number, boys are better than girls in mathematics” (T5-M).

Further one of the female participants also supported above statement and reported that in the context of Nepal, girls are very backward in Mathematics, they have not logical mind, but boys have logical mind and look mathematics broadly. Also, the question patterns raised by boys in mathematics classroom are broad not only limited in textbook. In this context she expressed,

> I found that the way boys think about math and give logic is different, since the way girls give logic which is less logical than boys. The girls focus on the content of the whole curriculum; they just want to know what it is in the textbook. However, boys want to know the broad things. Since both boys and girls are interacting and asking questions, but the pattern of the questions asked by the boys is a little different, they asked more logical questions than girls. The boy is broad whereas the girl is little narrow. (T1-F)

Same female teacher (T1-F) also added,

> What can we do for girls to look at mathematics with a broad mind? A lot of research has shown that mathematics is better for boys than girls in their later life. But in our context, the condition of the girls is backward in mathematics.

Moreover, another female teacher responded she felt in comparison to higher ranking boys and girls, higher ranking girls are also better in problem solving type questions like as boys but not lower ranking girls, “In comparison with boys, the girls also do problem solving type questions, but the lower ranking girls cannot do so” (T3-F).

The above quotes revealed that not only male teachers, but also the female teachers had deeply rooted gender stereotypes thought as mathematics is a male dominated subject. Boys were more gifted and logical minds in mathematics than girls. Girls’ actual capabilities of solving mathematics problems were determined by teachers' undermining cultural and social practices. The quotes also revealed that teachers' highly focused high cognitive level girls like as boys, but not valued low level girls in classroom that initiates higher in high and lower in low. It causes vast gap on girl's ability in learning mathematics and backward students still remains backwards and inequality still remains. Teachers were not paying attention to all students regardless of sex, race, talent, weak.

Similarly, both boys and girl students also reported gender stereotype feelings in context of mathematical mind of boy and girl students. Both boy and girl students responded that in mathematics boys are active, gifted, logical, tougher and harder on mathematics in comparison to girls, even though girls are first second position in classroom. Boy students showed gender stereotyped expression that boys either talent or poor, they are active and asked more logical mathematical questions in classroom but only few talented girls only asked questions and those were only based on syllabus. This expression was gender biased and in favor of boys as boys are supremacy on mathematics rather than girls. One of the boy students (B1) expressed, "Girls are also talent like boys but not equally to boys. Talent girls also asked question, but they asked according to the syllabus. Whereas boys asked more questions and some boys also asked logical extra things." Another boy (B5) similarly stated,

> Looking at the school, boys are a bit active, only a few girls are also active. Boys are active in questioning, and they ask more logical questions than girls. Though the girls rank in the first or second position in the class, they are poor in math.

Moreover, B1 and G1 students of the same school realized that in their class a large number of boys (above two third) are talent in mathematics in comparison to girls and they asked more questions. Girls have low participation in mathematics classroom that might be the cause of pedagogical practices conducted by teacher. B1 stated, “Boys are better in Mathematics on which one girl is also better, large number of boys are good in mathematics. May be 70%/30% ratio of boys and girls respectively”. Moreover, G1 significantly declared, “All the boys in our class are talent in Mathematics, around 70% of boys and 30% of girls are talent, in that situation, girls don’t ask many questions” (G1).

Interestingly, one of the boy students also supported the above statement as boys are better in mathematics than girls. He added that girls are weak in mathematics due to the reason that girls did not pay more attention in mathematics in classroom and they have to do household work at home as indicated by the excerpt, “I think boys are better than girls in math. Girls don’t know mathematics because they don't pay attention to mathematics like boys. Another reason is that girls have separate work at home, they need to do household chores” (B5).

In contrast, another girl respondent shared the following version:

> Boys make a lot of noise, and they don’t pay attention to their studies, but talented girls are a little bit hardworking. Some boys are also talented in mathematics; they have got very good marks in math, higher than the girls who ranked in the first position in the class. One boy goes to the board and solves all the problems of mathematics. We have not solved the problem but the boys solve the problem, and ask the question from that. (G2)

The above statements indicated that girls are also suffering from gendering stigma. They thought that girls are talented due to their effort and hard work, but boys are inherently talented in mathematics because they didn’t pay much attention in classroom. Not only boys but girls also have stereotypical thought that boys are better in doing mathematical problems, but girls can't do. Girls themselves have less beliefs with their ability for solving mathematical problems.

Both boys and girl students at the same school 6 have stereotypical thinking, they were influenced by cultural stigma that boys do less practice in classroom but have creativity in mind and talent in mathematics. On the other hand, girls have memorization ability, they do more effort while solving mathematical problems based on the textbook and curriculum. Girls also accepted mathematics is a male dominated subject. That influenced masculinity in mathematics classroom rather than femininity. Hence, it might be difficult to change learning, unless not changing such gender stigma rooted in society, culture, and school. In this context, G6 stated,

> Looking at the classroom, girls are good in mathematics, but looking at the mind, it seems that the boys know more mathematics than girls. Boys have creative mind hence they know more in mathematics. Girls are obedient and talent in the knowledge of the book, the content what teacher teach, and to memorize the content but boys are good at creativity and have mathematical mind.

Similarly, B6 mentioned,

> On Grade VIII a lot of boys obtained good marks in mathematics however, less marks were obtained by girls. And after 9/10 class, girls obtained higher marks. Boys can't memorize, but they have a lot of creativity. On the other hand, I feel girls have opposite, girls can say whatever there is and can memorize but they have less creativity.

Likewise, stereotypical thought also exists in female teachers' responses that girls have unequal basic understanding and pre required knowledge of mathematics that creates unequal participation in classroom. Hence, most of the weak girl students feel dominance and they do not like to speak and interact in classroom because they do not understand the basic concept. In this manner female teacher stated,

> Students who do not know do not try to speak; they do not speak as much as they know. The ones who know are the ones who interact, the ones who ask are the ones who understand, the ones who don't understand, keep quiet and remain silent. Probably the ones who are poor think that they are teased by both peers and teachers for not knowing. (T3-F)

This was similar to a version shared by a male teacher that girls are naturally afraid and hence they are devoting in learning, but boys are disturbing in learning and mostly devoting with new technology:

> There is no direct dominance of girls in case of learning. Girls are naturally afraid to do bad things and to take the lead in bad things, but boys seem to be a little more fearless. That's why rather than reading and writing, their learning seems to be influenced by new technologies. (T2-M)

Similar findings emerged from the students' interview. Most of the students, especially girls, have beliefs that they do not ask anything because they do not understand anything, and another reason is that they felt dominance through teacher and other peers if they asked questions. Hence, they remain silent in the classroom. One participant stated,

> Here in government school, there are large numbers of students and also due to lack of sufficient time …teacher asked anything to the whole class like as everyone understood? and the students who may not understand, do not speak but who understand said I understand, and it's over. Sometimes, I also did not understand, but I kept myself quiet because everyone said we understood then what to do? (G1)

Next participants explained:

> The weak girl students do not know the problem; hence they remain in dilemma either to speak or not. Even if I asked, they say, “you haven't done it till now?” and I can’t say anything and so we girls who don’t know have always become dominated and backward. (G2)

The above quotes revealed both male and female teachers as well as students have cultural stigma, like understanding boys are brave, powerful, creative, and fearless than girls. This understanding causes differences in classroom behaviors of teachers and peers. That automatically leads to low participation of girls in mathematics.

Three of the teacher respondents also stated that girls need more encouragement and support from their teachers to flourish themselves rather than boys:

> Girls are more likely to seek teacher’s help and encouragement, teacher would have called out, would have given support, and would have asked questions more to girls than boys in the classrooms. If that happened then they would flourish, otherwise it is difficult to flourish themselves. To flourish their talents, they must always be motivated and move forward, if so, they will try to do. Otherwise, they will remain silent. (T2-M)
>
> If girls get an opportunity and start to speak then they continuously speak and speak. Those who speak, they speak without hesitation. It depends a little more on the teacher, and how they are treated, whether they are given the opportunity to speak or not. And if we are familiar with them that there is something wrong and correct them, then they will speak continuously. (T5-M)

These statements indicated that girls would be highly participated in classroom activity if teachers encourage, motivate, and talk with them continuously. Mostly girls need encouragement and support by teachers since weak girl students are afraid to ask questions in classroom.

Two students (B1, G1) reported that they are embarrassed to ask questions. Girls' especially weak girls' learning is influenced by learning time at home and learning environment created by teachers and talented peers in school. Not only girls, but weak boys also hesitated to ask questions in classroom. Boy (B1) stated, "If everyone has already understood then, I feel hesitant to ask". Another girl participant G1 similarly commented,

> The friends who are sitting next to me said we have understood then it's a little embarrassing for me to say that I haven't understood. Then I feel, I will go to the home and investigate into the problem by myself. When I reach home, it is already getting night. In the evening, when I look at it, I don't understand, and left it.

The above quotes expressed by teachers and students revealed that lack of GRP practices was not seen in physical appearance, but was seen in inner manner, in hidden way because humans were socialized in accordance with gender stereotypes from their moment of birth. All the society, culture, teachers, peers, learning opportunity, and environment influenced gender discrimination.

However, all teacher participants have found family/cultural stereotyping by gender in their classroom practices. One of the teachers expressed that gender discrimination was not only found in rural areas' schools, but was also found in urban areas. Gender discrimination was more prevalent in families who came from the Terai region in Kathmandu. Parents send their son to school and coaching classes regularly.

In addition, they managed home tuition only for sons but not for daughters. Instead, girls had to do all household work. The teacher tried to convince, but they could not succeed in sending the girl to coaching class. Gender discrimination still highly exists in Terai region also in well-educated families between son and daughter by birth that automatically transformed in schools. Hence, social and cultural stigma flourished in Terai region and gender stereotypes behaviors are shown by parents. Girls were overloaded in household chores and were discriminated against in learning opportunity like their brothers. It influenced their learning performance in Terai reason. This is indicated by the following excerpt:

> What I have experienced is that in this school there are more students from the Terai belt. Even sometimes when I go to their parents' house for home tuition, there is a lot of discrimination between sons and daughters. It is shown in their behavior, they are sending their sons to school and for extra classes, but they are not sending their daughters for extra classes. After convincing the parents, he/she said "um, I would do it", but he/she didn't do it, they didn't send their daughter for extra classes. In addition, home tuition is also managed at home for sons but not for daughters. Likewise, all the housework also has to be done by the daughters. It was found in such a well-educated family who came from Terai region. (T5-M)

Interestingly, one of the Terai belt teachers who was teaching at Kathmandu, reported that large number of boys went to Institutional school in comparison to girls, gender discrimination remains at school of city area where there is an access to boarding. Due to such family discrimination, girls at Government schools are becoming better than boys with their ego with parents. T4-M stated,

> I have not seen such discrimination in the school in the village because there is a lack of boarding facility and everyone (boys and girls) have to go to the same place, same school. While teaching boys and girls in different places, ego is seen in girls, because of their family background, girls have become better. When the family tries to discriminate, our government school is benefiting.

And in another part of interview the same teacher T4-M stated gender stereotype between son and daughter exist due to economic condition of family, "Discrimination against son and daughter is in the middle class to the backward family, not in the high-profile family. The main is the economic condition, after becoming economically backward, everything became backward" (T4-M). Next female teacher stated, "Now, in this urban area, there is not much discrimination between sons and daughters but in rural area, it still remains and it happens". (T3-F)

Both male and female teacher reported gender discrimination started from family background. Teacher noted in their classroom practices that still in the context of Nepal girls are overloaded. Girls went schools after finishing household chores and hence girls do not have sufficient time for practicing mathematics. Hence boys learned mathematics quickly and in creative way rather than girls. Hence, different factors such as learning opportunities, environment at homes and schools, household chores, and overall ecosystem affected girls' involvement and participation in learning mathematics. Female teacher (T1-F) stated,

> In many places, there is still gender discrimination. One reason may be the family background where a girl has to do little more household chores from an early age than a boy. Now there is a situation where many girls have to come to school by cooking, feeding their siblings at home. Father and mother go to

> work in the morning handing responsibility over to their daughter. She cooks rice, feeds her small brothers, eats herself at home, and brings the brothers together at school, and take them to home after finishing school classes.

Likewise, male teacher (T5-M) stated,

> If we can give a little more environment to boys, then they will participate more because they don't even have to work at home and the load is less. If they are motivated and interested in math, they will catch up quickly. But girls have more housework load, they have to look after the house, look after their siblings, cook food, go to work with their parents, they have to do several works hence they have several problems. Now girls didn’t even come to the extra classes, and after searching about the reality, it was found that some must go to school for their brother, some must cook food, some must do other various household chores, and the different problems have come up with them.

However, some girls are better in learning due to their hard work, they showed high performance in school. One male teacher (T2-M) stated: “Here is a girl who is first at Grade X, but she is taking care of her brother and, sister at home. Her father and mother go to work, and she does all the housework and studies whole night after finishing the work”. Next male teacher (T5-M) also thought that boys are creative and logical in math and do problems using logical mind and in a creative way because they have sufficient time at home; they have not done any household work at home. But girls have scarcity of time hence they solved mathematical problems only memorizing the steps without thinking logically.

> What is happening is that the boys have a little extra more time, so they are always looking for new things, but girls don’t get sufficient time, and they just keep watching and following the steps of math. What is in the step, they can

do it directly. Only those who are good in mathematics, they can do it logically, otherwise others can't do it. Even the girls didn't get a little time to read that's why they didn't get sufficient time to think about it logically. And in that short time, they can see and just copy what has been given and done. But in boys, it is found that they look at math a little more logically and do it in an extra way. (T5-M)

This quote revealed that boys' creativity and logicality were connected to opportunity they obtained in homes and schools. It showed that gender sensitivity consciousness is seen high in all, but clearly the environment for gender equality is difficult to see. Since our society is male dominated, gender discrimination is started to seen after the birth of the child in families and flourishes in schools.

Similar gender stereotypical thinking was also obtained through student participants like as teacher that both boys and girl students realized that girls are overloaded; they must do so many household chores. On the other hand, boys were free from doing their work at home. Girls felt that gender discrimination heavily furnished at their homes which automatically pushed them backward at school. Mathematics is a subject that needs so much time to practice but lack of sufficient time they cannot do better whatever they can do,

> Yes, I have to work at home, I don't have to do that much work, but when mummy and daddy are not there, after having a big family, there are a lot of things to be done such as cooking, washing clothes, taking care of brothers and sisters, all household chores should be done. I feel that I could have performed much better if I had spent sufficient time for practicing mathematics. There is no one at home to teach me, even if someone taught me at home, I could have done better. (G3)

> It doesn't feel like that at school, but at home, boys don't have to do housework, and they are free to do their own work, but we have to do housework and at that time we feel weak and hurt. They can study without working, at that time I feel a little bad. (G5)

Likewise, similar to girl's version, boys also expressed that girls have so many problems at home, they have to do household chores but they (boys) have nothing to do at home:

> Girls have problems at home; they have to work. That is a problem for many of them. But both boys and girls should be given a minimum of six hours time to study at home. But there is a situation of not getting time, there is a problem for girls. (B2)
>
> It is time to study at home. I have to come for coaching in the morning at 7:30. Then, I have to go for a meal and return to school for formal class. It will be time for studying in the evening. There is no work for boys at home. (B5)

One of the girls also added that she had mental torture at home due to family environment, her mother and father always fought because her father was alcoholic. At higher classes, she had limited time to do mathematics due to household work and family problem:

> Math used to be good up to 6 th class, now in higher classes, there is no time to study. There is no time at home, there is also mental torture. It is too late to reach home, and there is pressure of housework, stress, family torture, and tensions. I don't know what to do. (G2)

She (G2) also added that “I can’t focus well on study. Most of the time, Mummy, Baba’s fight was fierce, and this is the reason that my Baba always comes home drinking alcohol.”

Absenteesm of girl students was also high at secondary level, due to household problems and their physical problems. At the time of menstruation, girls did not come to school. One female teacher (T1-F) respondent expressed that, “There are some girl students who work in someone else’s house and do not come two days to school in a week, some do not come for four days to school in a week. Their studies totally depend upon school.” Likewise, next female teacher also commented,

> Some girls are absent from the classroom because they have abdominal pain to some extent due to menstruation. Some of them who come to school at that time have to stay in the classroom by nodding down their head. They must serve hot water from time to time and some girls say that I am too tired and want to go home. The two days are very difficult for them. Some girls say such things, but some do not share. (T3-F)

Two girl students (G4, G1) similarly supported the version of female teacher,

> Also 2/3 girls never come to school. Even if they come, they don't want to read, they come and make noise. Those two girls live in the last place, sometimes they come and do not understand when sir says to do any problem, and then they don’t do their homework. (G4)
>
> Girls are absent ... Sara Magar has come to school after so many days. She comes but most of the times she remains absent. Today she is in school after about two weeks. The other 1/2 girls are also mostly absent. (G1)

The above quotes revealed that both female teachers and girls realized that girls' absenteeism was higher in school than boys due to physical problems, and other household problems.

However, one of the boy participants of this study had strong realization that teacher did gender discrimination while punishing, he hit boys more than girls while they did not know answer to the questions. Teachers still used physical punishment to boys. The same teacher at school 6 used symbolic punishment for girls and corporal punishment for boys; both punishments affect badly in learning. In this sense B6 stated,

> There is no more discrimination but sometime I feel such discrimination because we have noticed many times that teacher asked some questions and when the boys can't say answer, he hit them a lot, hit them 2/3 times and when the girls can't say answer, he hit them only once or don't hit them. (B6)

Girls in our society realized that gender discrimination started through home and society that cause stereotypical thinking as boys can do every mathematical thing and girl can't do mathematics in creative way. Society restricted boys from doing household work. G4 expressed:

> In our class, girls try to study, but they have not seen the creative mind in our class. Maybe it is because boys and girls have already been discriminated against in homes and society that boys can do everything, and girls can't do it.

G5 similarly commented:

> If people of our society saw the son of our neighbor washing utensils, then they asked where did your sister go? Why are you washing utensils? And after that, they feel that washing utensils is the work of girls and they have to do but I don't have to do it. (G5)

Students thought Mathematics is a hard subject that depends upon each individual differences, as opposed to the gender, both gender groups feel difficult. The reasons mathematics became difficult were due to less practice, lack of understanding what teacher taught, insufficient time for girls to practice and due to household responsibilities, and lack of basic mathematical concept through previous classes. B6 stated,

> But after coming to class ten, there are only difficult formulas, also new formulas have different formats and doing all that is becoming more and more difficult. The school was not open from the beginning, there was a lockdown, and it was a little difficult to understand mathematics.

B1 similarly stated, “May be, mathematics is difficult, because of unclear in concepts”. G2 reported similar feelings, stating, “Mathematics is difficult, in previous classes, I used to think it was fine, but now I am failing in Mathematics*”* (G2). Likewise, G4 shared her feelings as “My seniors shared that optional math is difficult, even teacher also said Trigonometry is a bit difficult*”* (G4). Girls also give less value for mathematics and felt difficult. G6 said, “Mathematics needs more time but doing other homework consumes time and I don't give time to math. I do it at school, but I don’t pay attention to the mathematics at home.”

One particular girl participant revealed some mathematical content like as Trigonometry not related to the previous classes was difficult. She also added that it also depended upon the teacher’s behavior and personality. G6 stated a more reflective response,

> It’s hard to understand, to read, and to do the new content like Trigonometry. If the former sir would have taught, it would have been easier to understand, but it is a little difficult with the new teacher (G6).

Teacher respondent also offered that everyone and everywhere have stereotype thought as mathematics is a hard subject. He stated, “One is that everyone and everywhere thought mathematics is hard subject” (T2-M).

The above quotes indicated that teachers’ and seniors’ beliefs heavily affected girl students’ beliefs as mathematics is a difficult subject.

All of the Mathematics teacher participants stated that gender balance is going to progress in mathematics textbook and curriculum in comparison to previous textbook and curriculum. Even though, teacher reported some mistakes remained in Government textbooks and hence textbooks from the private publications were used. Both genders names were included in textbooks, they found no gender disparity in textbooks at the time of their classroom practices. Female teacher T1-F expressed,

> I have not seen such gender discrimination in the mathematics curriculum and textbooks. Now, I have not found gender disparity in Mathematics textbook. Here, we have taught private books as based in main curriculum. Now there is a little mistake in the government book that’s why based on the curriculum, what is required in the curriculum is taken out from the private textbook and taught to the student. Earlier in the government book there was some discrimination in unitary method but now there is no such thing I didn't notice that much.

T3-F similarly commented, “Now girls' names are also included in mathematics textbooks, but taking that nomination may not have much effect, depends upon our thought. Now in textbooks, both boys’ and girls’ names are included.” Male teacher T2 also offered, “In the past, the questions used to be asked keeping boys name more, but now there are girls’ name too. Also, there are names of fathers, sons, mothers and daughters” (T2-M). Male teacher T5 likewise stated, “Generally, the names of both boys and girls are kept in mixed way as an example in Mathematics textbook. I don't think there is such discrimination”. Male teacher T4 stated similar thought, “There is no such thing as gender discrimination in math books” (T4-M).

One of the teachers also reported that if he found any discrimination in gender names, he used to take both gender names while teaching,

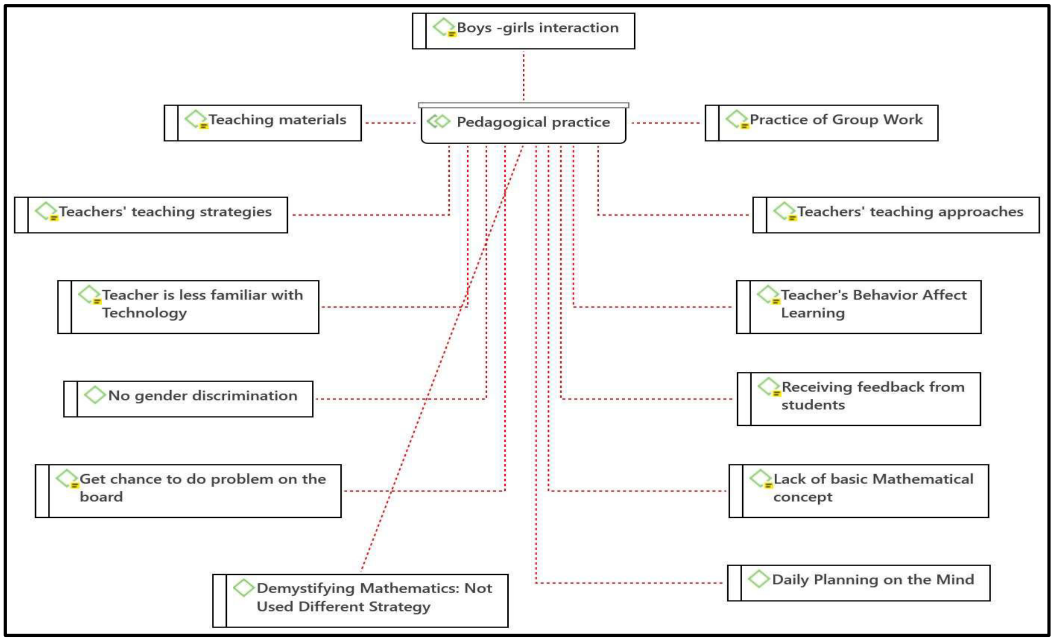
> There is no gender discrimination in math books. What I do is that while giving an example, sometimes I use the girl's name to solve the problem and sometimes I use the boy's name. If there is gender discrimination in math, it seems that there is discrimination between those who know and those who don't know. (T5-M)

Likewise, interviews, similar types of gender stereotype practices were seen in some of my classroom observations. In the entire classrooms, both boys and girls were equally involved in discussion with the teacher while the teacher was doing problems on the board. But boys were always seen first in raising hands while asking questions and giving answers to the teachers’ questions. The girl seemed to need the support and encouragement of the teacher. Girls were asked question individually when teacher met them near their benches. In most of the teachers’ classroom, boys asked more logical questions related to mathematics. They said alternative definition rather than teachers. Teacher showed discrimination while asking questions, asked questions individually to only girls, not asked to boys. For example, when female teacher (T1) was teaching the lesson from Geometry area, the topic was “Exterior angle of a cyclic quadrilateral is equal to the opposite interior angle” theorem’s application. The theoretical proof of this was already done in previous class. She asked one girl student “What is cyclic quadrilateral?” She said “no ma’am, I was absent that day. Then continuingly, asked other three girls, they became silent, and fifth girl said related answer, teacher asked them all to sit down. She only asked questions only to girl students. Then the teacher again elaborated the concept of cyclic quadrilateral. The teacher asked the whole class if they had any confusion of that theorem. One boy student stood up and said I have not understood, please do again. Teacher started to solve this theorem interacting and discussing with students. More boys were participating in interaction and answering while the teacher was solving on the board. The boy stood and said the alternative definition as “Inscribed angle is half of center angle”, teacher appreciated him by saying “oh, good, logical answer”. That classroom observation supports the interview data as boys are more logical in mathematics. Most of the girls seem confused in geometrical figure. It would be better if the teacher used Geozebra software while teaching Geometrical portion of mathematics.

***Pedagogical Practices***

Teacher is the key subject of conducting good pedagogical practices. Effective pedagogy is important for students to develop high order thinking skills and for successful learning. Teachers must consciously work to create gender responsive pedagogical practices by using different teaching strategies, interaction techniques, teaching methods, and creating good environment in classroom that supports and promotes equal involvement of girls and boys in mathematics classroom. Sixteen codes remained on the theme pedagogical practices. All of these codes are related to gender responsive pedagogical practices conducted by teachers and students’ realization about teachers’ practices in mathematics classroom. All the teachers and student participants contributed under this theme. Thirteen codes and their represented theme are depicted in Figure 8 as follows.

**Figure 8**. *Codes Supporting the Pedagogical Practices*




In this study, during semi-structured interview, students expressed that mostly boys and girls did not interact with opposite sex in mathematics classroom. When mathematics teachers teach in classroom, both boy and girl students shared that interaction happens with same gender group, boys with boys and girls with girls and such interaction mostly happens among with talented boys and girls. In this context, G2 explained, “If I do not know, my friends teach, watch and explain it but I don't want to have such interaction and learning with boys.” Next girl G2 similarly commented, “I don't really talk to boys.” One of the boys B2 likewise reported, “We interact separately.” Another boy student similarly stated,

> There doesn’t seem to be much interaction between boys and girls in our class. A boy and a girl do not interact, but girls interact with other girls and boys interact with other boys. In any case, interaction will happen between those who study more, but limited to the same gender group. (B6)

G4 shared similar opinion, only first girls interacted with boys not others. She hoped that interaction would increase if teacher insisted boys and girls mixed seating arrangement:

> The first female is a friend of mine who sits nearby me. She is highly outgoing and can communicate effectively with anyone. She even goes with boy peers and asks questions about subjects she doesn't understand. We ask our questions only to our female peers; no one else to ask and talk with a boy. No longer do other boys come to ask girls. The first girl is unique; she joins other groups and absorbs information from all sources. If we need to inquire, we ask the teacher or peers of the same gender group. There will be more interaction if the teacher keeps the boys and girls mixing together. (G4)

However, two of the boy and girl students of school 1, expressed that most of the time they interact with same gender group but sometimes if one gender group did not know the answer at that time boys asked with nearby girls and vice versa. B1 expressed, "I interact with the girls who are very close, knowable, and are seated on the front and behind us, but I do not speak with those who do not speak" (B1). Likewise, G1 reported, "Most of the time boys interact with boys and girls with girls but if one does not know then the boy will ask girls and girls will ask boys" (G1).

In contrast, two girls (G3 and G5) and one boy (B5) students who were talented in class commented on feeling comfortable to interact with all gender groups. G3 stated, "In our class, both boys and girls interact with each other, if boys do not know they ask us and if we do not know we also ask them to do the problem". B5 similarly commented,

> There is interaction between boys and girls. They talk to each other and sit together; they ask each other about problems that they don't know. Girls come to ask with me too, I answer them, and they also ask for a note.

G5 likewise stated,

> Interaction! that is very common in our class. If I don't know, I do not say boys or girls, I will learn by sitting on girls or boys' bench too. One who is the first boy in our class, we will go and learn with him.

But B5 expressed that boys' and girls' interactions in the classroom have not been fostered by the teacher. "Sir has not made any interactions between boys and girls; it has not happened very often."

The above quotes indicated that most of the boy and girl students have less practice of interaction between both gender groups, some interaction happened between talented boys and girls only. Their responses also revealed that if teachers managed the interacting and friendly environment in classroom, then students would increase their learning capacity and improved their mathematical performance.

For gender responsive pedagogical practices, group work is one of the best pedagogical practices. The semi-structured interview with teacher participants indicated that maximum teachers were not teaching by developing group work mixing boys and girls for best pedagogical practices of GRP. Majority of participants from both male and female teachers did not apply group work activity while doing problems related to mathematics which would be more helpful for all levels and both gender group students' active classroom participation and to increase interaction between boys and girls. They reported that due to overcrowded classroom seating arrangement, it was difficult to maintain quality group work mixing both genders. Female teacher participants stated, "We used to give them group work by forming a group in mathematics classroom in previous years. But now I have not done" (T3-F). Male teacher similarly commented, "It is difficult to do group work due to large number of students in classroom. They can learn well in mixed group work, but it is difficult to implement" (T2-M).

Interestingly, some teachers had conducted group work practice only for increasing students' result for SEE test only at the coaching classes. They focused SEE result not students specific learning needs and student-centered learning approach. That means teachers were aware that group work would be the best approach for participating students of both genders but they were not practicing group work in classroom. Male teacher T2-M stated, "But in a coaching class, we make small, small groups by keeping one talented person and other person unfamiliar (weak) and we teach him/her what he does not know, and he/she teaches the other peers in group." The teacher's knowledge about group work was found narrow, he reported mathematics curriculum was not developed for practicing group work, he had shown limited knowledge about development of group work is the teachers' own teaching methods. Male teacher T4-M stated,

> When we talk about group work, but the project method and group work are almost the same. When the problem is to be given in a group and the answer is to find out by themselves, where is that concept in our country? But to give a problem to a student from the very beginning, to ask them look for an answer and ask to make a presentation, why should I do that thing, which is not given in our curriculum.

One of the female teachers T1 of school one mentioned, the group work was done within benchwise and within two benches turning opposite side. Mixed group work was not done. T1-F stated, "To conduct group work, sometimes one task is given to a bench. And if it happens, then two benches can be given a work by turning one bench in the opposite direction, depending on the capacity of the room". In contrast, B1 and G1 of school 1 realized that the group work was not done till the date by teacher T1 in mathematics classroom. When I observed her actual classroom practices, I did not find conducting group work. Both of the students have positive feelings about group work; mathematics learning would be better if such environment of group work happens in classroom. It would be more beneficial for all levels of students, weak, average and high level. Boy student B1 stated, "If there will be the environment of group work it will be better. But we did not get such environment if we get such environment, we can do mathematics easily. We have not got such environment till the date." G1 likewise commented, "No, group work is not currently practiced by our teacher. However, if it were implemented, weaker students could improve to an average level, average students could get better enhance their skills further, and those who are taking on teaching roles within the group would also benefit from those experiences."

All other students mentioned the same things that their teachers were not conducting group work activity in the classroom; they positively expected group work and discussion on groups would help them to learn mathematics effectively. B2 similarly stated, "Earlier in some chapter in Mathematics some group work was done by giving project work, but now it is not done." Likewise, G2 also stated, "There is no environment of group work by mixing students of different levels." Another girl participant G3 stated:

> Ma'am hasn't done that kind of group work while teaching Mathematics. She teaches us, done the problems on the board, but our notebook is also not checked. We have to check the answer by ourselves by looking answer of the

> textbook. If the answer does not match with the book's answer, then we tell the problem to ma'am and she will do it on the board.

This statement reported that all of the mathematics teachers did not apply any group work focusing student, they applied traditional teacher centered approach while teaching mathematics. They did not empower shy and less talkative students especially girls. Students believed that teacher should practice student centered group work that helped shy and submissive students to interact with each other. Both boys and girls shared that they feared to be asked and answered but they were able to share their ideas freely in groups. It would be also benefitable for students who were shy with teacher to ask simple basic concept but flourished with their friends in groups:

> It would have been better if teacher had made a rule like if there is a talent student, it would be better to form a group of 3/4 students and study by discussing with each other. Even since, someone doesn't know but hesitate to asks with teacher then, if they don't know, they ask me, If I don't know, I take help from another one. Since we all do not know the basic concept of Mathematics, then if I don't know basic thing, I will ask with friends, but it is shame to ask basic thing with teacher. (B4)

The semi structured interview with teacher participants confirmed that they were unaware of gender responsive pedagogical approaches and did not implement gender responsive teaching methods and approaches in mathematics classroom at secondary level. Mostly teachers used traditional teaching methods while teaching mathematics. Although teachers shared, they use different teaching approaches such as lecture method, discussion, demonstration, question-answer and somehow problem solving also but none of these approaches were gender responsive. Most of the teaching methods they used in classroom were traditional teacher centered but less applied child centered approaches. One female participant T1-F stated, "In the classroom, I use one discussion method, another demonstration method, then the main one is student centered method." Next male teacher T4-M similarly reported,

> In teaching Mathematics, I use continuous question-answer method and problem-solving method. There is no talk of practical and no project work, no projective method. Sometimes it is done in exceptional case but only to a large extent used problem solving and question and answer method.

In the same way, next teacher stated ZPD is the best teaching approach but he did not apply in classroom practice, he had limited knowledge about teaching methods most fitted in mathematics classroom and about the methods he used in classroom, "Behavioral, insightful, constructivism (ZPD) in the teaching approach seems to be better to use. I try to use those approaches but I can't use ZPD in the classroom" (T2-M). Male teacher T2-M continued to express that students did not know mathematics from earlier classes and hence he solved all the problems in some cases, this response revealed that he totally used traditional teacher centered approach while solving problem, "Whatever they try to solve the problem, they do not know. In some case, if there are 20 problems in an exercise, then I have to do every 20 problems by myself." For instance, teachers were not responsive for the specific learning needs of both the gender while teaching mathematics, "It has not been studied in the way of gender, we have seen in general. There are no any vast differences between boys and girls" (T2-M).

Like teacher participants, all of the student participants realized that their teachers mostly used traditional teaching approaches. Most of the time, teachers themselves solved mathematical problems on the board, explained it, asked students to memorize the formula and copy down it, but they did not explain its application and did not give chance for students to solve problems at first for practicing child centered approach. G1 stated,

> Ma'am first explains the chapter and then teaches us the formula then after explains problem. Then, she does the problem on the board. After doing it on the board, we get an opportunity to ask something what we don't understand about this lesson.

G2 similarly commented, "The teacher comes and does the problems on the board. Sometimes, only we get a chance to solve the problems before our teacher does it on the board." G5 likewise expressed,

> When teacher teaches a new lesson, he will first explain the basic concepts of it. And after that he took the book, explains the formula first, then tells us to memorize it. And after memorizing it, first he does the problem on the board and gives a problem to us to do and then enters in another one, and asks us if we understand or not. He then tells us that he will teach us if we don't understand.

Boy participants also give similar responses like as girls. B2 stated,

> Teacher teaches at the beginning, reviews it on the board, and tells us to do the exercise as much as possible. The next day, he gives an example and students do accordingly whereas students who know and are sitting together teaches the other who doesn't know. Teacher also requests who know to help others who don't know.

Another girl participant (G4) stated,

> There are two mathematics teachers. Previous teacher who taught at Grade IX, was little bit better he told the application and use of mathematics. But present

> mathematics teacher only teaches the lesson what he is in, he doesn't say anything like the applications and others.

The above findings indicated that still at government schools, mathematics is taught by using traditional teaching strategies. Teachers were dominated in classroom. Students' role was only to pick knowledge. Traditional lecture method was still dominant teaching method in mathematics classroom. Students did not realize teacher's behavior either it was gender responsive or not. Teachers thought they taught equally to both boys and girls, which would have been the best practice of GRP.

In semi-structured interview, students especially girls shared their realization that their teachers' positive or negative behavior impacted their mathematics learning. Majority of girl students experienced, if teacher behaved strictly, they were scared and did not do well in mathematics; they automatically lost their mathematics learning. They have experienced after learning mathematics with different teachers that if teacher was friendly with them then they encouraged and improved learning otherwise their learning was lost. Hence teachers' behavior must be the prominent factor for improving student's learning and teaching process. One girl participant G6 shared,

> Maybe, I'm scared at school, not at home, I'm friendly with everyone at home, I talk to everyone. In a society where I live in a rent, I can talk to the people in that house, but I can't talk to the people outside. I used to speak very well with previous math sir, when that sir taught me, I scored 100/100 in mathematics. Now that sir is not with us, he used to teach very well. Math sir's behavior affected me. (G6)

Next participant similarly stated that her recent teacher valued, encouraged, and motivated her to learn mathematics that improved her learning. G5 stated,

> Once I was in class 6, my math was good till Grade V and when I came to Grade VI, sir didn't give focus on me or I didn't do it. And after that it got worse and after when I went to 8th class, I got a very low mark below 40 in math. By the 5th Grade, it was up to 90/95 score, from the 6th it got a little worse and by the 8th it was very low. At that time, sir just wanted to do the problem, just explaining it, not checking homework, and didn't really care and didn't give us value and I became little bit weak from 6th grade. But he was not focusing as much as he should have. Then, I lost my interest in math and I became weaker when I went to higher classes. When this sir came in class IX, I have started feeling mathematics is easy. He started giving motivation and then mathematics seems very easy and I felt interested. (G5)

The same student G5 also added,

> If sir gives focus and gives us value, then I get motivated to study it. I would like to look sir. If teacher doesn't give me focus, then I felt sir does not give focus and then nothing I have to do, I do not seem to have any value.

Boy student also reported the similar version like as girls that teachers' positive behavior would be the encouragement key for learning mathematics. B6 similarly shared a very reflective response,

> In 8th class, I had a best friend and still is a friend and we both sat on the same bench. On the other side, the first, second girls sat and there was competition among us. When sir wrote the question on the board and who would have done the first and then the two of us could have done the first one, before sir finished writing question, we two wrote the answer. It seemed to be easy to

> understand more efficiently and a little earlier. If one does not know, the other teaches, one uses calculator and another writes, in this way we used to be very fast and became first and used to understand, but now it is very difficult to understand.

Gender responsive lesson planning can be undertaken to ensure boys' and girls' specific needs and interests so that all students can achieve their full potential in learning. But both female teachers reported that they were not aware to develop gender responsive lesson planning, they did not develop written planning keeping in view the specific needs of both gender groups of students, their planning depended upon their mind only. One female teacher stated, "I haven't done written planning. I have been teaching for many years till now, we have come with mental planning rather than written" (T3-F). Likewise, next female teacher revealed:

> I made annual planning and monthly planning terminal exam-wise. But the daily plan is only in the mind: there is mental planning, what happens only by writing on the copy? I have prepared on the mind for today about the topic what I have to teach and how much is to teach. Whatever possible, I have planned to ask questions and everything to both genders equally. (T1-F)

In references with the teachers' pedagogical practices, when boy students responded they felt teacher called boy students to do mathematical problems on the board more times rather than girls. They shared their feelings that girls would only got chance to do problem on board if teacher called randomly. Boys were motivated by teachers and got more such chance. One of the boy students B1 stated,

> If teacher called randomly then anyone could get the chance. But some time teacher asked who can do on the board, then the talent student especially talented boy got chance. However, weak students especially girls should be

focused but it has not been practiced; such students get the chance only when teacher calls randomly.

In line with the same view, another girl participant reported in their classroom that both boys and girls equally got chance to do problems on the board, in such situation some gender responsive pedagogical practices happened. This response was not necessarily intended to be negative manner the context of GRP practices in mathematics classroom. G5 shared,

> That's very high now in 10th class, most of the time all of the students get chance to do problem on the board. Those who have done will go in front and show the copy for check. Those who have done, the teacher will call them on the front and ask them to do it on the board. Those who have done it, they will show it out of curiosity. Then teacher asks those who have not done it why they did not do it. If they do not understand, teacher will explain it to them. Then the next day, teacher will give them similar type of problems to the same student and ask them to do on the board. Both boys and girls get equal chances to do problems on the board. (G5)

The responses of boy students revealed that students at Grade X have lack of basic mathematical concept. Majority of boy student participants shared; most of the students did not understand mathematics due to lack of basic concept of mathematics. They felt mathematics is difficult and stated their teacher focused only on the content of textbook and did not focus on the basic concept for that topic according to their student's specific ability. Boy students were not satisfied with their teachers' pedagogical practices. Boy student's version revealed that teachers were not focusing students' specific learning needs, they just taught focusing on textbook. Teachers have lack of pedagogical practices for gender responsiveness. In this manner, one participant B1 stated,

> The teacher said this concept was already taught in the previous class, so you need to know this. Like Trigonometry, if someone has not understood the base of this subject, he/she does not understand the whole concept. The talented student then studies and others do not.

B4 similarly shared, “I didn’t know the basic concept of mathematics. If I didn't know what the teacher taught in class after going home without asking in class, I learn that first by myself.” In line with the same view, next student B6 as a participant expressed:

> If the Corona virus was not there, then the school had not been closed. It would have been better for us, because we had been reading now, but the base of mathematics was lost due to break. Yes, teachers are less motivated in teaching basic concepts in mathematics, that’s why it might have been more difficult for us.

In the same manner, the mode of teaching also affects students’ learning. Girl students have also lack of basic mathematical concepts like boys and felt mathematics is a difficult subject. G6 stated,

> After the lockdown from class IX, it was difficult to understand mathematics. In 8th grade, good grading 100/100 was obtained. My studies were disturbed because of the lockdown otherwise I would have done better. Now, in grade X, there are only two months remaining for conducting physical classes. It is difficult to understand mathematics and I do not know basic things.

Both boy and girl students’ responses were supported by male teacher’s version that students have not sufficient basic mathematical concepts to study mathematics at Grade X, “There are some students who have no basic knowledge of mathematics and have no idea to study” (T5-M). The same teacher added that in comparison to boys, girls became lost due to lack of basic concept of mathematics. Girls need more motivation, value, and encouragement. If they got specific value and treatment, then they improved their mathematics learning with motivation. Students’ mathematics learning might be increased if teachers apply pedagogical practices focusing gender specific needs. T5-M stated,

> I have experienced a little bit of that when I started teaching from 8th grade, girls keep getting lost without knowing the basic things of previous classes. When they know the way to do mathematics problem and they started doing it with a little motivation then they became more active.

The majority of teacher participants revealed that they never took students’ feedback for improving their teaching learning process. T4-M stated,

> I have not done anything to get feedback from students. But from the expression of student themselves, I understand either they understand or do not understand the reading items. I ask questions and depending upon students’ answer I evaluate myself.

Another female teacher participant T3-F similarly stated, “I have not tried to get feedback from the students for teaching improvement.” In a similar manner, another male teacher expressed:

> I have not taken feedback formally from the student, when asked them do you understand? to whole class, I know they don’t know, they also try to hide their point and some say, we have to read tuition sir, we can do after reading tuition, but I have not asked them individually. (T2-M)

Whereas, one of the female teacher participants stated that she used to take feedback from students orally, but not in written form to know students' perspective towards her teaching in previous years, but not now:

> I used to take feedback from students once in a year, but now the school is just open, I have not done. Up to last year, after taking one-week class with new students in each class, I had taken feedback from them to know how the student perception at me, whether they understand or not, since in the classroom they say yes, yes. (T1-F)

Likewise, one of male teacher participant also took feedback to know students' family background, their problem, their interest or less interest towards mathematics:

> I used to take written feedback from them in previous years when they were asked to write what they would like to write about me and convinced them it would not be published. How do you feel about math, what do you think about it? I asked them to write all things, and I studied it and found something about each individual student. That was a good way to find out the reason for their family problem, not being able to read math etc. (T5-M).

The above quotes related to feedback revealed that maximum teachers were not practicing of taking feedback from their students though it is beneficial for gender responsive pedagogical practice.

Moreover, student participants shared similar version like teacher that their teacher never took feedback from students in class and less practice of giving feedback in classroom to students. B1 stated, "I don't know teacher has taken feedback from student to improve their teaching." Female participant G1 similarly stated, "No such thing has happened in math class till now. Teacher never took feedback from students to improve teaching." Likewise, G2 also shared that their teacher never gives feedback after checking their notebook. They checked copies only for formality, "Teacher teaches some lesson and collects our copy twice in a month. He has not given any feedback. He has just signed at the end. We could do corrections if he checked in class daily."

The above findings indicated that in pedagogical practice, teachers do not have the practice of taking feedback from the students to improve their teaching strategies. Likewise, they were backward to check up answer copy to give necessary feedback according to students' specific needs.

Teacher and students both reported that in pedagogical practices teachers were less familiar to use technology while teaching mathematical content like as Geometry:

> The next thing is they even don't use theory; they won't use it. We have used technology while teaching from the net, but now we have not used technology at school. There are no facilities of math lab. If we could use technology, students would be interested in Geometry. (T2-M)
>
> The class is running in lockdown, but the teachers don't even know how to share the screen. They use mobiles only for their personal use, they have not got any training for online teaching. That's why online class was just only for formality, we have not been benefited in Grade IX. (B4)

The boy participants reported the similar version as "I don't feel that teacher use technology in teaching Geometry, he is not efficient in using the technology" (B6).

On the basis of teaching materials, student participants shared that their teacher did not use any teaching materials while teaching mathematics. Teachers have not practiced using new technology to make mathematics concepts clear. On this manner, G3 stated, “The use of materials is limited while teaching Mathematics in classroom” (G3). Second boy participant reported:

> Technology has not been used till that date. They had not shown real material. In previous school, at grade VIII teacher had shown real material but here in this Government school such materials are not used. It is not used; each thing happens on the board. (B1)

Likewise, another student participant explained:

> The teacher teaches us by keeping a protector in front of the whiteboard and says how to do this. When using materials, I feel it makes me understand a little. If the material is used, even 80% of the students will be understood because it is clear in front of them, this is how to use the material, they know exactly (B2).

In the same manner G4 stated, “Sir brought it today! Until today, sir has not brought any material in Mathematics classroom” (G4). Boy respondent B6 expressed:

> But in any case, he teaches the pyramids by using the real object, he brings the materials and shows them, but the technology is not so much used. When teaching construction, he brings compasses, in others content he doesn’t use any materials.

The above quotes indicate that students realize their mathematics teachers have not given focus in use of teaching materials. They used only basic tools like protector, scale etc. only while teaching Geometry. Students hoped if the teacher used materials while teaching Geometry, they would improve their geometry area. Materials help teachers to teach according to students’ specific needs and join mathematics as real life.

In all the classroom observations, most of the time teachers dominated the class. They used lecture methods mostly in which teachers stand in front of the class near the board and solved the problem with explanation while students take down notes. Teachers tried to take answers with students while solving problems on the board, but they did not give sufficient time for students and hence also class was dominated by them. In the teaching-learning process, mostly they applied traditional lecture, question-answer, and explanation methods. There was no sufficient practice of interaction and problem-solving method that helps to increase gender responsive pedagogical practice. It was observed that teachers were unable to give sufficient feedback, have discussions, and interact with students.

Likewise, students somehow interact with the same gender groups, who were seated nearby, boys with boys and girls with girls. It was not observed mixed interaction between boys and girls while solving problems of mathematics. Due to the sex-segregated seating arrangement of all teachers' Mathematics classroom, students' interaction and discussion were only limited within single sex. All of them were not seen to apply any strategies to put extra effort to motivate and encourage students, especially girls. This observation reflected to me that teachers are not aware of students' specific learning needs for gender responsive pedagogical practice. Except for a few girls, a large number of girls appeared submissive, shy, less confident, quiet and silent in the classroom. I have not observed; teachers were applying gender responsive pedagogy in practice. In maximum classrooms, boys seemed more proactive, confident in solving problems of mathematics, but making noise mostly. Teachers were not being successful to treat them according to their specific needs. Some of the boys also were silent and were not doing and copying problems, but teachers were unable to focus each and every student on the basis of their specific needs, do not paying attention towards them. In all of the teachers' classrooms, I observed that few girls were equally active, talkative, and confidently shared their views with teachers and boys' friends. This reveals that girls are somewhat in progress in community secondery school.

In one teachers' classroom (T2), there were 65 students in the class, and the classroom was overcrowded and noisy. When he taught the problem related to "plane surfaces" such as "The sides of a triangle are in the ratio of 12:17: 25. If the semi-perimeter of the triangle is 270 cm, find its area". At that time, he directly started to solve the problem on whiteboard with explanation. At that time mostly first and second bencher girls who were interacting gave answers teachers' questions. The teacher asked as a whole, but mostly boys were making noise and they were at their own pace. I found that two boys who were sitting on the last bench were silent, but they had already finished that problem, and were doing others continuously. That showed that boys were good in mathematics task either they were silent or talkative in the classroom. Teacher was unable to control the noise; he was doing problems without controlling the class. Mostly last bencher girls were busy copying down answers, I observed they copied wrong answers as it was difficult to see the board from the last bench where they were sitting on. They seemed confused about the answer. The teacher was also not focusing on them. They were making problems at their own pace.

Moreover, in the classroom of female teacher (T1-F), where all the students had chosen optional mathematics. They were silent and all of them were devoted in solving problems. Teachers seemed friendly with students both boys and girls, however more boys were actively engaged in questioning and answering. I observed maximum teachers not giving chance to any students to do problems on the board similar to interview data whereas two teachers (T1 and T5) asked students to do problems on the board. Whereas, in both classes only boy students got chance to do problem on the board, but at that time no one any their peers and teacher focused on the board. Teachers were busy in teaching individual students who asked him questions individually from their own seat. Students did the problem on the board keeping them silent, but its' explanation was done by the teachers. This indicates that still in deeper manner, gender discrimination remains in classroom in favor boy students, teachers have fixed mindset and stereotype thought that boys are only capable to solve mathematical problems on the board.

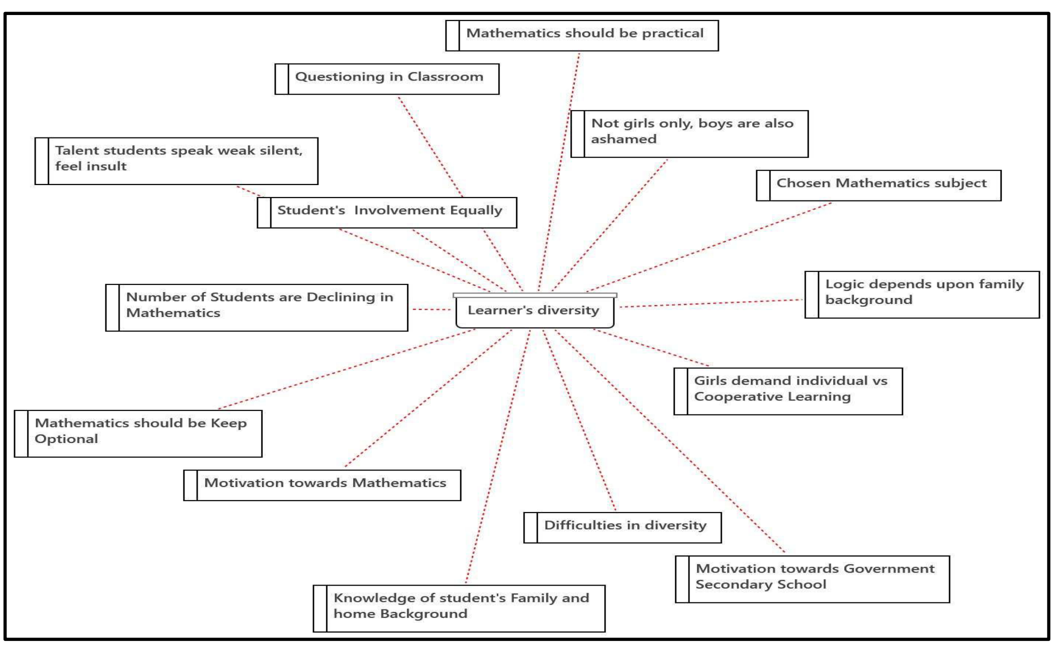
Similar to the interview data, I observed maximum students on which maximum girls who were talented and even weak did not have sufficient knowledge of basic mathematical concepts. Whereas, teachers also did not focus on the basic concepts while starting to solve the problems. Therefore, it seemed the maximum number of students were only picking notes rather than actively participating. Teachers in all classes appeared to lack the application of GRP in the classroom. However, female teachers generally appeared calmer, more friendly, and more approachable in comparison to male teachers in the mathematics classroom.

***Learner's Diversity***

In school, there are a wide variety of students with different characteristics, academic ability, physical ability, language, gender, and personal experiences. Likewise, in teaching strategies, there are talented, gifted, medium, and slow learners and some of them have special needs. Likewise, students' academic, physical, social, and emotional learning needs may differ from those of their peers. These differences can be influenced by different factors such as cultural background, learning requirements, socio-economic status, exceptional ability, physical, cognitive, emotional, or social disabilities. Learner diversity can be expressed based on different characteristics such as ethnicity, gender, religion, disability, language, culture, personal motivation, expectation, social context of education, learner's personal lifestyle, learning style, and individual approach to learning (Dimitrova et al., 2003). For effective teaching, teachers should include and consider all types of students, learner's diversity, not just with students with higher ability. Teacher should be gender responsive to include both boys and girls in learning mathematics. Teachers in classrooms may develop individual learning plans with collaboration with parents and students for students who require additional support based on diversity academically, physically, socially, and emotionally.

In learner's diversity theme, fifteen codes were utilized. The main purpose of creating this theme was to capture the essence of the codes generated by original data. It was found that all the fourteen codes were somehow connected to diversity of learner based on gender on which both teacher and student respondents contributed with the help of semi-structured interviews.

**Figure 9.** *Codes Supporting the Learner's Diversity*



To promote participation and engagement in learning, emphasis should be given to a variety of teaching techniques according to boys and girls students' specific learning needs and exposing each of them in all activities and assessments. The decision to take mathematics as an optional subject in Grade IX gets affected because of the students' different abilities. Hence learners' diversity based on gender had been found in subject choices. Male teachers reported that teacher themselves participated to select students to study optional mathematics by making criteria who have mathematical interest, are hard-working, can give sufficient time at home, and had high score in mathematics in previous classes. But teachers were not paying attention to learner-centered design principles because each student has the right to study any subject. One of the male teachers stated,

> To choose optional mathematics, we choose those students who have little more interest in mathematics, who can work hard, who have time at home, and who have more numbers in other subjects. In general, we chose students who had scored more than 60% marks in Grade VIII. But some students come to optional math class because they feel other optional subjects are difficult. Because of the difficulty in language, they are not interested in studying language related subjects and come in optional math class, but such type of students does not know any basic knowledge of mathematics. (T2-M)

The teacher has a fixed mindset as mathematics is a difficult subject and only talented students can learn it. They did not motivate students to learn mathematics. T2-M also added that he felt it was difficult to teach weak and girl students and found it difficult to finish the course on time. Teachers themselves discourage weak students from taking mathematics as an optional subject, not paying attention towards learner's diversity while using pedagogical approach in subject selection. Teacher discriminated students based on their ability,

> We have difficulty in teaching weaker students, we can say optional mathematics is very difficult, you cannot study it. and we recommend them not to study. When they come to study optional mathematics, their basic concept is very weak, and we have difficulty finishing the course on time if we start teaching them more basic things. (T2-M)

In this context, one female teacher respondent shared that in present the number of girls is increasing equally as boys for choosing mathematics as optional subject in Grade IX in comparison to the past days. In the past days, large number of boys choose mathematics subject to study technical subject, but few talented girls only chose mathematics because girls were busy in housework activities,

> In the past, the boys had little more logical thinking in mathematics. In the past, boys used to choose mathematics in higher number, but a lower number of girls chose mathematics in Grade IX. But who was first and second in position, both boys and girls did not choose mathematics? Normally, girls were busy with their housework, hence to some extent, weak boys used to choose mathematics, but talented girls had not chosen mathematics. But most of the time, there was the version from family members, guardians, siblings that they would send boys to study technical subjects. After taking optional math, they had feelings that boys would get chance to study technical subjects and boys choose mathematics. But the girls didn't have to go out of the district due to their housework and hence they did not take mathematics except a few talented ones. (T3-F)

The above version of teachers indicates that both male and female teachers were irresponsive and had not taken any strategies to empower students especially girls for taking optional mathematics. Moreover, teachers are not respecting and encouraging the diversity of girl students. They added misconceptions about mathematics as a time-consuming, and difficult subject. They did not try to understand their learning needs and ways to overcome that.

Likewise, when I interacted with student respondents with the help of semi-structured interview, majority of student respondent also shared similar version like teacher that their teachers had not done any motivational things to attract them to study mathematics. One boy student respondent stated, "He has not been motivated to read Mathematics. He says, in any case, math is important, you should read it, but he has not been able to say that this content is applicable here, this content works here" (B6). Another girl respondent G2 stated,

> We have gone to study optional mathematics, but sir returned us. My mathematics grade is very low; hence he told me that one of my mathematics grades is already weak and how would I take another mathematics? You have to work hard. Therefore, you study another optional economics subject.

Next girl G4 explained,

> Ah, no, sir didn't do anything, I chose optional mathematics by myself. I do not know mathematics anymore. My friend had taken optional mathematics hence I had also taken after thinking that she would help me. My friend who took this optional mathematics first of all she got admission on Economics, but now everyone is afraid with head ma'am, that's why she is studying optional mathematics.

The above quotes indicated that teachers did not use any pedagogical approach that encourages and motivates students, especially girls, towards mathematics, showing its' importance in future. They discriminate students on the basis of talent and being weak in mathematics. Teachers demoralized girls saying you are weak, not paying attention to all students regardless of sex and race. Students realized that their teachers could not understand students' diversity. But in contrast if girls meet proper guidance through teacher, friends, siblings, and family, they are interested and are motivated to study mathematics. Girls need others' support and encouragement. One girl shared,

> Looking at the previous classes, it seems mathematics is very easy. At first, it was very bad and after this sir came to teach, he started to give a little focus and after that it started to be a little easier than previous one. At first at grade IX, I was a student who wanted to go to economics. I did not take optional mathematics. (G5)

Next girl also said,

> No, it's not a boy or a girl, who works hard takes opt math who doesn't do work hard doesn't take it. My brothers told me to study optional mathematics and after being first, the teacher also told me to take opt mathematics in school. (G3)

In contrast, one boy students shared with his teacher motivated them to study optional mathematics by sharing his experiences and importance of mathematics. The boy felt mathematics was mind blowing subject and totally different from others. B5 stated,

> Sir teaches optional mathematcs and says if you study science in class 11/12 then you should study opt math. Sir also shares his experiences while he was studying in school and colleges then we get motivated from that. After

> studying mathematics, the mind becomes sharper than studying other subjects. It is different from other subjects. It totally attacks our mind. We also get individual feedback from sir. He told us you should read in this way properly, if you can't read it now, you can't do anything later.

One boy student himself who was highly motivated towards mathematics shared,

> There are some students who would not want to study mathematics, but I tell them that mathematics is very easy. Mathematics subject, what we need is required in our whole life. Without mathematics, our life has no meaning because math is required to enter any sector in future. (B2)

The above quotes of boys and girls indicated that diversity has been found between boys and girls in mathematics subject selection. Mostly boys are inherently motivated to study mathematics and perceived mathematics to be more important for their whole life than girls do. However, girls also do better in mathematics if they get more support, encouragement, and motivation from their teachers in schools.

Moreover, the male teacher stated that the number of students taking mathematics are declining daily because students lost their hard-working habit, lack of level-wise mathematical knowledge, and decreasing their mathematical ability from previous classes to university,

> The number of students studying mathematics from school level to university level is declining because the development of hard-working habits has slowed down. Because of this, they don't have to work hard, the next one is the increment of level-wise knowledge, and the capacity should not be as high as that of. They have a low level of mathematics from the bottom, so the students' mathematics knowledge is in a very weak position. (T2-M)

On the other hand, the teacher respondent felt difficulties to justify each student in Mathematics classroom. They found diversity in the classroom and hence they felt that they were unable to fulfil the pedagogical aspect of the mathematics curriculum. Male teacher (T2-M) shared,

> The course is on one side, the theory is on the other side, the student on the other hand has a different level, students with different abilities have to be kept in the same place, that is why the kind of pedagogical aspect we have expected is difficult to fulfill.

Next male teacher (T5-M) explained,

> Some students say, sir taught only easy problems, we would not have done difficult problems. Some students asked the teacher to give easier problems in the examinations. Some students said it would be better if it was only a numerical problem, it would not be a verbal problem because we do not understand it.

Mathematics teachers themselves had dissatisfaction towards mathematics. They felt that mathematics should be kept as optional subject, as overall thinking is that the students who are interested in mathematics will only study, “It is better to keep mathematics optional in overall. It is difficult to manage everything from teacher training, if it kept optional, students who have interest internationally, they could study” (T2-M).

The above quotes of male mathematics teacher indicated that they had negative attitude towards mathematics, they themselves give less importance to mathematics. Rather than paying attention to learner diversity and applying pedagogical approach focusing students’ specific needs they reported mathematics should be optional subject. Then students were not motivated towards mathematics rather than teachers' encouragement.

But one mathematics teacher expressed that mathematics subject should be made practical and necessary trainings should be given to teachers to help them to motivate students to learn mathematics:

> The unitary method was removed without making it practical. If it is no longer practical and there is no learning achievement, it must have been removed because it was not right. I don't agree with that; I'm dissatisfied without practicality. Our education system is given practical only for name, no period is given for practical, no one is given training how to do practical and hence no one practicing it. Nor are there any practicality in mathematics. I am surprised to see there is practical in Nepali, but everything must be practical. A subject like mathematics whose life does not exist without practical is not practiced in practical. If this thing is not kept on this subject, then I wonder what kind of education we are giving! Which cannot happen without practical. The soul of math is practical. (T4-M)

Students' diversity has been found in government secondary school on the basis of their economic condition. Teachers shared that large number of students at government schools were from poor family background but from Grade IX, normal and high family background's students were joining at government schools for the scholarship at higher level education. One female teacher (T3-F) reported,

> Due to the cause of scholarship, even students from medium backgrounds have also come at Grade IX/X. Now, there are 18 new students admitted in Grade IX this year from boarding school. Some students have a good family

background, and some have a medium. Normally most of the students are from normal family background in Kathmandu.

Next male teacher (T2-M) also shared that,

> The children who come here are very poor financially, some of them are laborers, some of them are abandoned by their mothers, some stay and work at other's home, some of them are very weak financially. The children of a well-employed family are very low in number.

Similar findings emerged from the students' interviews. They joined the government secondary school at Grade VIII and IX, by keeping expectation of scholarship at their higher education. They were motivated due to their family members. One girl respondent reported,

> I have come here from 9th class, Mummy said that it would be even harder for her to come here. My Mummy convinced me saying if you study now in government school at Grade 9/10, it will be easier for you later, the government gives priority for scholarship to those students who have studied in government school. (G1)

This was similar to version shared by boy respondent B4,

> I studied in a boarding school till grade VIII at Bara, but when I came here, I found government and boarding schools are the same. The boarding school in Bara is similar to the government school here. The studies are good here and then there's the chance of a scholarship for further studies in future.

Likewise, some girls were motivated to come to the community schools due to their low economic family condition, "From 8th class onwards, I am studying here, in previous classes, I used to study in boarding school. There was a family problem. Since then, I have been studying here in the community school" (G2).

The above quotes indicated that only economically weak students were studying in government secondary school, but middle and high family background students entered at Grade IX for expecting government scholarship at higher education.

Furthermore, students' diversity has been found in how they want to learn mathematics in the classroom or at home. The majority of girl participants expressed a preference for learning mathematics cooperatively in groups including boy and girl, as working together in groups allowed them to share different learning strategies cooperatively and support each other in understanding mathematical contents. On the other hand, most boys shared that they want to learn mathematics individually in silent places without others' help because they want to think and create new ideas and calculations of mathematics independently. Girls need other seniors' help if possible. But they realized that their teacher did not create such a type of environment at school. One boy participant B4 shared, "I start to do problem harder than harder by myself, that does not need to take help from the teacher." Another girl said, "I want to learn mathematics cooperatively" (G1). Next boy reported, "I like to study math individually and in a peaceful environment. I used to sit alone at home and do math problems, but at school friends are together" (B5).

In this manner B4 also expressed:

> I mostly do mathematics individually; I enjoy learning mathematics alone. I study mathematics at night immediately after my brother sleeps. It's better for me to think, sometimes when I make that calculation or problem at that time, I am thinking, and when someone comes and disturbs me, my mind thinks to hit of hitting him/her. I like to read mathematics sitting alone so I study mathematics after all fall asleep at night.

Another girl G2 shared her version as,

> In the classroom, I like to learn mathematics cooperatively, but it only happens sometimes. But at home, everyone is busy with their own work. Instead of learning from others, I have practiced by myself that understandable in my mind. I feel like I have to study and understand the problem by myself.

G4 also stated,

> If we cooperate with each other, then everyone will have knowledge. If one student knows one thing, the other will know other and those who don't know anything will get a chance to learn. It will be easy if we do that, but sir has never given us group work, till now.

Additionally, girls also need individual treat, encouragement, and support from teachers and others in solving mathematics problems but wanted to learn cooperatively in groups with friends that would be beneficial for every level (talent and weak) of students. G5 stated,

> I like to read mathematics individually. I feel like sir's focus is only on me, I will do better if sir pays attention. It is easier to read in a group. If we are in a group, friends say things that I don't understand and I say things that they don't understand and we understand after discussing and when we read in a group, I feel like I understood. I think it is better if sir used to give feedback by looking at individual copies, but while reading I like to learn cooperatively.

Next girl G1 concurred, stating, "If someone comes and explains something individually, I get a better understanding. I understand better if someone teaches individually than I did in that group."

In mathematics classroom, gender wise learners' diversity has been found in asking questions and answering. The majority of boys and girls expressed that more boys were involved in asking questions and giving answers with teachers, but there is low number of talented girls who are involved in questioning and answering because girls felt it was difficult to ask questions like boys. Boys asked more questions in mathematics classroom compared to girls. The differences have been observed with their involvement in questioning in mathematics. B6 shared,

> I am not afraid to ask the teacher anything else which I don't know. If sir tells the importance of some things, then I ask questions whether its importance is in it or not while solving problems. I don't see any such questions from girls. The first and second girls are asking questions, the third girl doesn't ask any questions. I have never heard any other girls asking such questions.

In this manner G2 shared that she wants to solve problems at home individually rather than asking with teacher, "The boys ask more questions than girls. When I feel difficult to ask questions in classroom, I go home and try to learn by myself" (G2).

But in a similar manner teacher respondents reported that in their classroom both boys and girls were involved equally in classroom participation. One female teacher stated, "There are very few students who are so shy, they are free and frank. Both boys and girls are the same overall to do and to say everything" (T3-F). Likewise, next male teacher respondent shared, "Even while doing some work, we call both the boys and the girls and took both of them together" (T2-M). Another male teacher stated, "But if we look at school study, both boys and girls look almost equal. Since the number of girls is more and hence, they get more participating opportunity" (T5-M).

Students' shyness also affects participation and interaction in the classroom. Each individual student, either boys or girls, has their diverse behaviors. Interestingly, the majority of teacher respondents shared that both boys and girls were ashamed if they did not know the answer and hence remained silent thinking that their friends tease them if their answer would be wrong. In that condition, both female teachers reported that they were talking with each non speakers, asking, and giving value and attention in an individual manner. One female teacher stated,

> The shyness in today's children between boys and girls might be seen if they do not know the answer. There is no point in not answering by being ashamed. I found that the students do not like speaking if they don't know the answer thinking that their friends will tease them. It is seen in both the genders and hence they are sitting without asking a question. (T1-F)

Second female teacher concurred, stating,

> Shameful feeling while giving the wrong answers may be the same problem for both boys and girls. If they did something wrong, they have the feeling that they wouldn't know it, that's why they don't try to expose themselves. So, I am provoking them by saying what are you doing? How are you doing? Since the students in the classroom are not bigger than 30/35, they can be watched normally in the class. But the weak students do not want to expose themselves. (T3-F)

The next male teacher expressed,

> Those who don't speak in mass are also boys; they often fall behind in everything. What can they ask if they haven't read? There are boys who feel ashamed because they do not study. In contrast, those who know and seek knowledge, read, and ask questions, then they do something themselves and strive to learn. (T4-M)

Another male teacher's version also justified that talented boys were also non-speakers, "Here are 2/3 boys, they know mathematics very well but remain silent in classroom" (T2-M).

Like teachers, all students both boys and girls shared talented students either boys or girls speak and ask questions with teachers but weak remains silent. One boy student respondent stated, "The girl who is talent, asks but who is weak in math, does not ask thinking what other of her friends will say (…)?" (B1). This was similar version shared by a second boy respondent "In our class there are equal number of boys and girls, the talents speak and ask questions, weak ones remain silent" (B4). Likewise, the similar version as boy respondent girl respondent (G2) stated, "Most of them are girls who interact with teacher; the girls who know speak, if someone don't know, s/he will say nothing".

In another part of interview, additionally G2 shared weak girls did not ask questions in classroom and did not participate because they feared being ridiculed by their classmates, mostly by the talented girls. Weak girls were dominated by talented girls in classroom not only by boys,

> When we asked questions, our friends laughed and said, "You can do this simple problem, but we don't know that", they don't understand such things and because of that reason I don't like to ask anything in classroom. Mostly the talented girls do such domination, girls dominate girls (G2).

G2 also stated that weak girls could not do problems of mathematics and many of them copied answers from their friends,

> Talented students do it easily but weak students either don't do it or copy talented students' notebook in the next day of class. Otherwise, they join

> tuition class near their house. If we understand it’s ok, but if don’t understand then copy down the next day (G2).

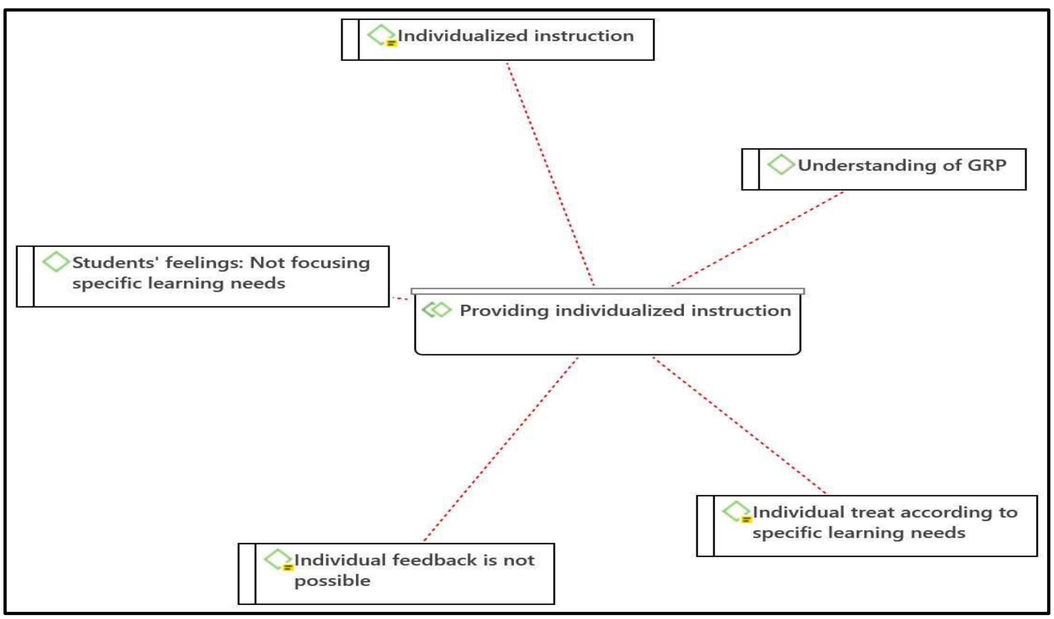
The findings indicated that when teachers did not value girl students, they slowly left to do mathematics and felt difficult. When teachers asked questions and called them, they would be motivated towards learning mathematics. Girls especially needs more value and encouragement from their teachers. Hence, if a teacher has knowledge of learners’ diversity, then he would become gender responsive. Therefore, teachers have to pay attention to learner-centered design and principles, and create a cooperative learning environment that addresses the students' individual needs. Teachers need to implement gender responsive strategies to encourage all levels students based on their pace and interest.

***Providing Individualized Instruction***

Mathematics is a critical enabling course and is abstract in comparison to other subjects. There are different types of students in the classroom, some are learning above their grade level, and some are behind their grade level. Some students need special help to overcome the areas where they struggle. The most experienced and best teachers reach every student by giving each student great importance in the classroom. They should create an environment in which each student realizes that teachers give value and listen to their voice. Individualized instruction is considered essential for supporting each individual students' unique development according to their specific learning needs within a regular classroom settings. Three key aspects might be followed by teachers while implementing individualized instruction in the classroom such as providing different tasks for different students, providing individualized attention in the form of specific instruction or feedback to specific students, and providing different amounts of time for different students working on the same task, by extending time frame for slower learners and providing additional material for faster learners (Tetzlaff et al., 2022).

There are five codes remaining on the theme providing individualized instruction for GRP. All the five codes generated by the original data such as individualized instruction, individual feedback, individual treat, and student's specific learning needs are related to providing individualized instruction and contributed the theme. All the teacher and student respondents contributed to this theme. The theme and its' codes are depicted in Figure 10 as follows.

**Figure 10.** *Codes Supporting Providing Individualized Instruction*




Students especially need feedback and guidance while doing mathematics problems through others, especially through their teachers. Continuous feedback would help them to motivate towards mathematics classroom participation. Teacher would be gender responsive if he/she would be considered specific learning needs of girls and boys while teaching. Majority of teacher both male and female stated difficulty to give individual feedback according to student's pace slower learner and faster learner due to overcrowded classroom and pressure of course completion.

Hence, they were motivated to do maximum mathematical problems on the board by themselves rather than paying attention towards child centered design. Female teacher T3 stated, “Feedback is only given in classroom in what we were able to do, we did not have to do calling them personally. Just look at their copies in the same class and say something if it happens”. Male teacher T2-M concurred, stating,

> While solving the problem in the classroom, we are giving different kinds of feedback even when we are allowed to do any activity. And we also explained everything that comes in every step related to the problems, but I can’t give feedback individually on the class work or problem done by 65 students in class. That’s why, I have to do a lot of mathematical problems on the board by myself. Due to the large number of students and the completion of courses on time, it is difficult to give individual feedback.

The above quotes indicated that both male and female teachers are still bond with their traditional patriarchal beliefs and structures in teaching, they were not responsive towards each students’ specific learning needs. At that situation, especially slower students did not get chance to improve their learning and day by day they would become weak and demotivated towards mathematics.

Both boy and girl student participants also shared the similar version that their teachers did not provide any individual feedback while doing mathematical problems in classroom. In this manner, B1 a boy respondent stated, “Sometimes she (teacher) collects copy and checks, daily checking and giving feedback is not done” (B1). Likewise, G1 a girl student respondent shared, “She has not taken feedback individually from us yet. In the case of the whole class, she teaches, explains and asks us whether we have understood or not. She does not give any feedback for us individually” (G1). Similar version was shared by next girl respondent (G2), "Individual feedback is not a matter by teacher. It would have been easier if there were only a few students".

The majority of teacher participants shared that they were unable to reach each student and to fulfill their specific learning needs. The large number of students, timely completion of the course and incompatible students' level are some of the reasons that they were unable to teach according to students' pace. Male teacher T5-M insisted,

> We can't teach according to the level of the students because in one side the course has to be completed and on the other hand, the level of the student is not compatible. The problem I did today in the classroom is not according to the students' level because only 50% understood it and the other 50% didn't understand anything. I had just done this problem only for the exam.

This was similar version shared by a second male teacher,

> The number of students is very large (65). To bring everyone to the mainstream and to provide the same kind of knowledge to all is very difficult. Because without learning they don't know what to do, at present, the hardworking habit is declining. (T2-M)

T2-M further emphasized that "It is not possible for a large number of students to solve their individual problems at the usual time." Next female teacher respondent also shared similar version:

> Absent girls would be able to get the help of a friend who could teach them. If they asked us, we would teach them if we could be able to give 2/4 minutes' time. But we could not be able to give them proper time for individual treatment according to their needs. Their gap periods and leisure periods are also being managed. If they have missed something in the classroom and they

try to learn in the same place, then I teach them in the class period. Girls are frequently absent from class. If few students are absent, then it is not possible to revise the same course the next day. And as a whole, managing extra time to meet their needs is not possible in our school. (T3-F)

The above quotes indicated that both male and female teachers were unable for providing individualized attention with the help of providing feedback for specific students for GRP in mathematics classroom. Teachers accepted that all of their students did not understand through their teaching approach, but they could not do anything for those students who needed personal help and guidance. Girls' absentee ratio is high in classroom, but teachers were unable to manage their learning during their class time. That means they were irresponsive towards girls specific learning needs, hence on GRP.

A similar version emerged through student respondents like teachers; boy students stated that their teachers did not treat individual students according to their specific learning needs. Teachers did the common problems on the board and mostly focused talent students' problems and did not give value to a non-speaking student. B2 stated,

> The problem is that there are a large number of students sitting in only one room. Earlier only 40-50 students were kept in a classroom, but since last year, 60-70 students must stay in the single room because of Covid. Due to which everyone has not been treated individually.

B3 similarly stated,

> Ma'am tells us to ask the problem that we feel difficult then I ask that I find it difficult, and my friends also ask and ma'am does it on the board. She does

> not treat us individually; she finds the common problem and does the problem as a whole on the board.

Likewise, similarly B5 stated, “Sir looks at weak students by the same way, he looks at talented students. He can’t give more focus to the weak students in solving mathematical problems”.

One of the boy students B6 also shared that individual treat was not possible from teachers since students were afraid with teacher but they would learn better from friends in friendly environment but such groupie’s environment was not created by the teachers in classroom,

> No, it does not happen, he does not give a value to a non-speaking student, does not encourage them. It has to be done by peers not just from teachers only, because students are afraid with teachers whereas they are friendly with peers. But there is not such an environment. That kind of groupies is not done by teacher in the classroom.

In contrast, one female teacher shared that somehow, she was practicing individualized instruction while doing mathematical problems according to their pace,

> It is not better to stop fast learners to wait weak learners. They have to move on, so after learning as a whole, I give them a way to move on, let them do more exercise, even if they teach a friend, they will also have some learning. Then I have been teaching those weak students on an individual basis, I teach them sitting on their benches, which happens in the same class during the class time. (T1-F)

She further added, “Some girls don't even speak; we have to approach the quiet ones individually and ask them individually how they are” (T1-F).

This was similar to the version shared by student respondents. Boy student also mentioned that his female mathematics teacher is friendlier, creates friendly environment in classroom; hence each student was able to ask questions without fear. In compared to male teacher, female teachers are more gender responsive in classroom for both boys and girls. Boy student B1 stated,

> Both male and female teacher are same, but ma'am creates such environment on which we can learn by asking questions and becoming familiar with each other. Ma'am individually treats us by asking not to be afraid, ask what you do not know.

Girl respondent (G3) who was first in class also stated that her female teacher is also friendly in classroom, she gives high priority for weak students, but she also is not able to provide individual treatment. G3 stated,

> There is no discrimination on the basis of gender. When asking a question, she gives more priority to those students who don't know. Those who know will do it by themselves and she focuses on those who don't know. But she does not treat those students individually by going to the bench. She does that problem on the board for all.

The majority of both boy and girl students felt that their teachers did not focus on their specific learning needs while teaching. Teachers were not aware of applying gender responsive pedagogy in mathematics classroom. Mostly teachers are teaching in traditional ways applying traditional approach. But there were different levels and different paced students who needed specific needs. Students mentioned that their teacher only practiced gender equality, doing problems on the board thinking doing gender equality but did not practice of equity and justice. B4 stated,

> There is no teaching according to the quality and the need of the student. There is no rule to cover the course if someone's course is left due to his/her specific problem. But according to the wishes of the students, the chances of justice and equity are very low in government schools. There is only the practice of gender equality.

Next student participant B6 stated,

> That does not happen, sir does not focus students' specific learning needs at most of the time, but sometime teacher asks students who do not speak like as why you do not speak, do you know that problem, which formula fits on this problem, but he doesn't care about everyone.

This was similar version shared by girl respondents. Girls stated that their teachers were not focusing on them individually, who have specific needs and needed extra encouragement and effort. Teachers were not payiny attention who were less speaker and shamed girls. G1 stated, "Teachers tend to scold students if we absent and ask help. There is no any support available for those students who have specific needs" (G1). G2 said, "Only if we ask a question, sir will tell us, but there is nothing according to the needs of the students who have the problem" (G2). Another girl respondent G6 insisted,

> Sir talks to those who talk, and does not speak to those who do not speak. Sir does not pay attention towards students of different levels, those who are less talkative but need encouragement. There are some students in our class who are not interested to study, and they are not much noticed by the sir. Even if they don't want to read but if they ask, teacher replies and explains to them. Otherwise, there is no way followed by teacher to encourage them.

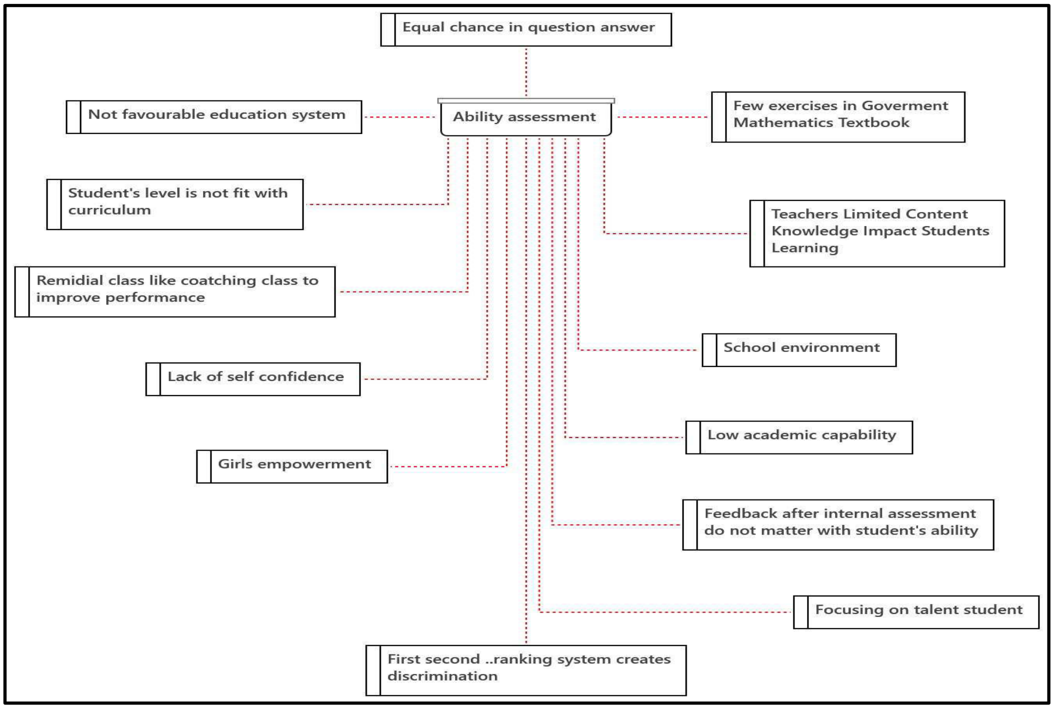
Girls shared that their teacher did not provide any support at the time when they had left the class due to their personal problem. G3 mentioned, “There is no separate individual treatment from the teacher for those girls who leave the class due to problem, we have to manage by ourselves. Nothing is done from the teacher’s side”. Likewise, G2 shared, “Nothing happens from the teacher for specific needs. Either we need to leave the topic or problem, or we have to do it by ourselves”.

When I observed the classroom, all the teachers first solved the problems by themselves then after assigned the problem for students in class period and walked inside the class here and there. They reviewed students’ work, but they were unable to reach every student to provide appropriate feedback. They marked the students’ work if they completed it correctly but if they did wrong, the teacher just watched and suggested them for correction. They did not ask them why they got that answer and did not give any instruction to improve it and bring their work for further feedback. I observed that the teacher only gave value to those girls and boys who finished and showed the work. No student got any instructions according to their levels and paces. It did not provide individualized instruction for each student according to their specific learning needs. Teachers did not focus slow learner, most of the last bencher girls did not copy the answer from the board, but the teacher continuously went ahead in pace of the faster learners. In the context of Nepal, the practice of providing individualized instruction for every student who needs specific support was very weak in classroom practice.

***Ability Assessment***

In the ability assessment theme, thirteen codes were utilized. The main purpose of creating this theme was to capture the essence of the codes generated by original data. It was found that all the thirteen codes were somehow connected to assessment of the ability of boys' and girls' genderwise, on which both teacher and student participants contributed with the help of semi-structured interviews. The theme ability assessment and its codes are depicted in Figure 11 as follows.

**Figure 11.** *Codes Supporting Ability Assessment*




During the semi-structured interview, while teacher participants were discussing the classroom improvement of weak and backward students after internal assessment. They expressed that there was not any provision to improve students' performance after taking terminal examination who needs specific support. Teachers had not given any feedback to students after their examination. Teacher had not provided different assessment strategies based on student's ability; all students were not benefitted through terminal examination. A female teacher stated, "But for the weak students, looking at the marks of internal assessment, there is no extra class, there is nothing extra" (T3-F). Likewise, a male teacher also shared:

> No work has been done here to improve the level of weak students after terminal examination of students. There is no development of the sector to

> improve the students' ability who need specific needs. We only call parents and tell them that their son/daughter is very weak in learning and advise them to take time to learn. But neither the parents follow nor the school. (T4-M)

Student respondents stated that their teachers, especially class teachers, asked weak students to practice more, either boys or girls, though they also felt such feedback was not sufficient for them to improve their learning. Teachers did not tell them about their mistake and the area they had to practice more; only told their score. Hence, teachers had not applied any techniques of feedback after formative assessment based on students' ability. That's why they did not find a way of improvement based on their ability. B2 expressed,

> The teacher of each subject does not give feedback individually. The class teacher called the parent of a very weak student and told them what was wrong with their child. But in the case of a good and normal student, class teacher only told their marks in the classroom. (B2)

This was similar version shared by a girl respondent, "Our class teacher only gives our test paper to see, but there is no practice to give feedback, and we do not get chance to ask the things that we are not satisfied with". In the similar manner, G4 shared,

> At the time of result distribution, the teacher tells the students to read a more carefully whose score is a little less. They say that you should read well, but don't tell us how to read, where the mistake is etc.

It is evident from these facts that teachers take formative assessment only just for formality. Students were not treated according to their ability. Teachers were not responsive towards students' ability while assessing them. At that situation gender wise assessment was not practiced in schools.

A boy student stated that in their schools there was the practice of first second ranking system according to final assessment's score. Though, he had a belief that their teachers discriminated between weak and talent students, teachers unanimously concurred that first second students either boys or girls are more talented than others and treat accordingly. Teachers judged their students having their fixed mindset as first second are always talent than others, knowingly and unknowingly creates discrimination in classroom. Hence, he felt students roll number should be kept alphabetically or randomly to change teacher's mindset about talent and weak,

> Now, when students are ranked in the first, second position after a test it creates a difference in the perspective of a teacher to look at the talented and weak students. They think students having roll number one is a bit more talented than others. Instead, if we kept students' roll number alphabetically or randomly; it would seem that noone would discriminate from the ranking. Teachers' concepts would be changed. (B6)

The majority of the boy students reported that their teacher mostly focused and paid attention towards student who had high ability and talented in mathematics at classroom. They felt their teacher taught only first and second or only talented students. Teacher gives value to the questions of talent and ignores the questions of weak students. Teachers were not responsive towards weak students, either boys or girls. One boy student respondent shared,

> Top students are asking more questions. Since sir gives some tasks to all students for homework and asks which problem you did not know. If topper students know 4 problems out of 5 and he/she said sir, I do not know this problem after that teacher does this problem on the board from which topper

> gets benefit but others… did not know other problem also but they copy down other topper friend's copy and said yes sir I have done. (B1)

Another boy reported,

> Some friends have not done problem but do not ask with teacher. Teacher teaches quickly, asks if there is any problem, the students reply there is no problem, go ahead, sir. Talented students say so in loud voices, which usually come from the front and the low sounds come from back seats. (B4)

Next boy student reported,

> Mathematics teacher is such that we feel he is teaching the first, second, and third girl only, just asks them questions, if they ask, he will do it on the board, but he does not focus us, does not teach us. And if the teacher does it on the board, then he does it without discussing with students. He doesn't watch us whether we copy or not. When he looks at the bench, he only looks the copy of talent students. If someone asks him, he will teach, but if we do not ask, he will not teach. (B6)

Like as the voice of boy respondent, girl students revealed the similar version as their teacher only focused and heard the voice of talented students hence, they always kept silent in the classroom. Teacher never looks toward weak students in the mathematics classroom. Weak girl students felt inferior and did not try to speak. Girls realized that their teacher focused only on talented girls but did not focus on weak girl students. One of the girl respondents shared,

> It is not done (not given feedback) by any teacher. Now, sometimes teachers help even the students who did not understand. But most of the time, the teacher heard the voice of talented student who knows. I mean, even if there's only one odd in even, it's bad. That's why weak students may feel bad in that

situation. It's the same thing that happened to me; everyone knows but I only don't know. Hence, I feel odd. (G1)

Next girl stated,

Sir focuses on us talented students in the class, but even those who aren't quite studious are weak he doesn't look at them. Those who are medium and are trying to do it, sir looks at them and motivates them saying you can do it. And someone does if sir will focus on, but whoever doesnt do, will not be cared by the teacher. (G6)

Another girl shared similar version,

He doesn't do anything like that. Teacher asks the one who speaks more. If any student who don't ask, like as if I don't speak, and then one of the students will know the whole thing and if says I know everything, if the others don't say anything, then Sir goes to the next chapter and asks nothing to others such as Did you do? What happened? or anything. If a student who knows and tells sir that we have finished and goes to a next new chapter, then teacher enters to the next chapter. (G4)

The above quotes indicated that mathematics teachers focused only on talented boys and talented girls, but weak students were not focused. Not only weak girls but also weak boys were not satisfied with teachers' behavior about GRP practice in classroom. Teachers did not practice gender responsive pedagogy according to their specific learning ability. They were not able to assess their students according to their specific learning needs. They assess students according to their ability and focus and pay attention towards high ability students and do not give value towards weak and low ability students. Teachers have not created a cooperative environment between students of different ability. Each student's empowerment and encouragement are necessary for effective teaching.

Weak boy and girl students shared that due to their talented peers and teachers' negative behavior, they did not freely participate in mathematics classroom. Peers and teachers demoralized weak students, mostly girls, by teasing them with their wrong answers and their easy questions. Hence, they demotivated to active participation. In this manner, B1 shared, "Friends said it is easy problem you can do yourself; you do… and sometime teacher also said it is like easy problem, you do yourself. Then, I felt uneasy and untidy, and I did not ask the other day." Next girl respondent expressed,

> I asked the teacher and he also replies and does the problem what we ask. But friends say it was easier, and it would have been better to do the next problem. But I tremble and get angry. They don't know how difficult it is for us to solve that problem; how do they know about us? (G2)

G4 similarly stated,

> Rather than the talented students in mathematics, a large number of students are weak, they don't speak more but try to read and know something, but teacher asks questions to the one who speaks a little more in class. Those who want to understand a little, teacher asks them a little more, but some students only speak when are called by teacher.

She expected that teacher should be responsive more towards weak and less talkative girl to motivate her in learning:

> The class runs on the basis of one talented student, who asks questions, and the teacher gives the value. Teachers must pay more attention to students who don't speak rather than those who speak. Teacher must have to know why they

> are not able to speak or are not learning well, or do not understand what teacher has done. (G4)

Teacher is also not paying attention towards students who make noise in the classroom. B5 shared, “Sir should not pay attention to the student who makes a noise in class, he should not pay attention to all of them. Priority is given to those students who know a little and try to understand” (B5).

Mathematics teachers both male and female shared that today’s school girls were becoming more empowered than girls from previous batches. Girls were equally competing with boys in asking questions, interacting, and participating in mathematics. The main cause of it would be the increasing number of female teachers in school and their motivation to students to be a teacher:

> This is also due to the awareness of the girls as the government has many types of awareness program for female. The society, NGOs / INGOs have made it known that women are more active than ever in information and in teaching and learning activities like asking questions and interacting with each other. (T2-M)

T2-M also added,

> Now girls are competing and coming competitively this is because the number of female teachers has increased, and girls’ level of consciousness has increased. Female teachers motivate them to be a teacher and others. Listening to them, it seems that motivation and empowerment has increased in girls. The girls in the classroom are a little more active and curious; they are more interested in reading. They are more active in asking questions than boys. I feel that the family seems to have a hand in this, and the family seems to be giving them some kind of feedback. It seems to me that consciousness has

> penetrated them as you have to be aware, have to stand on your own feet for tomorrow and have to be self-employed. (T2-M)

This was similar version shared by female teacher respondents,

> In the past, in the case of menstruation, we were afraid to say, we felt shy and did not go to school but now-a-days, girls talk openly with both male teachers and female teachers. "I’m going to get a pad, I’m going to home because I have menstruation, they share openly. In this manner, today’s girls have become so forward” (T1-F).

Another female teacher stated, “In the current context, girls are actively studying math just like boys” (T3-F).

The active girls are equally participated in classroom activity while solving mathematical problems like boys. Whereas, some passive and less talkative girls did not want to participate in any activities of the classroom. They want to escape from any interacting activities. Hence, rather than gender, students’ ability also created discrimination in the classroom in some situations. In present situation, girls’ activeness becoming increased like boys, but in talented groups. T5 explained such version,

> Even if we look at the girls, some active girls say that I will go and solve it, but some passive girls say it is better if teacher didn’t call me, I don’t know anything, I couldn’t do it, it’s happening in mathematics classroom with girls rather than boys. (T5-M)

Additionally, he also shared, “That’s how girls feel guilty when giving wrong answers, and they feel “I made a mistake”. Usually, they don’t ask questions that happens with girls” (T5-M).

This version indicated that girls have less confidence with their mathematical ability, and hence they became backward from the classroom activity. Gradiually, they fall behind and loss their creativity. They needed teachers' encouragement and support on time. Teachers aware such type of girls' activity, but they were unable to practice gender responsive classroom activity in classroom.

This was similar with the version shared by girl participants that they realized they are afraid to interact and speak in classroom. They have a shy nature, they themselves are not actively involved in learning. On the other hand, their teacher did not pay attention towards them. G6, shared the following:

> It happens to me that I can't speak and hence I have a fear. What I mean is I'm afraid to speak and I don't speak, I'm afraid in class. I'm more afraid with sir than ma'am. I feel weak in studies and also in competition. My study in class is good but I feel weak, and I feel I can't do anything.

In the similar manner, G4 shared,

> There are 2/3 girls in our class, they have a shy nature, they don't ask any questions. And some of the girls don't pay attention to their studies. Like as they are coming to school because of their compulsion, they do not ask questions, don't pay attention to their studies and are sitting and talking about other things.

In addition, G6 also shared that she is scared with mathematics teacher:

> Maybe, due to fear I'm scared. Even if there is some competition I participate in everything, but I am very scared and I can't speak. I was scared to see our current mathematics teacher. I was terrified, I couldn't see sir, I was in tears. Now while mathematics teacher is teaching us, I sometimes ask questions, but I don't speak. I still have some fears with mathematics sir.

Mathematics male teacher experienced while teaching mathematics and shared that their students at Grade X have low mathematical academic capability. Students even first, second also did not know basic mathematical concept and lack of generalize ability of simple mathematical things. Secondary level students have lack of basic concepts of mathematics as required by the curriculum in this level. One teacher respondent stated,

> Most of the students fail in mathematic; they have failed in mathematics since class one. Only about 10% students who passed mathematics are present in secondary level. The tenth-class students have to be taught addition/subtraction of arithmetic rather than arithmetic and algebraic equations. One of the students seemed to know a little about mathematics, but he was also asking sir what is this length? Again, they said to study in english language, but it is difficult. They just became addict to Facebook, they don't understand anything about questions, and they don't know what they are going to do. They don't have a chance to study mathematics and science tomorrow, in my understanding. Today's students do not know how to add x and y variable, when adds write xy. Here, only 10% of the students understand the problem, the first second student (girls) also asked sir, these three variables which are different (x and y) cannot be added? I say and write while I doing a problem, but they have to u but they don't use it while solving next problems. Students can't generalize even simple concepts of mathematics, either who is first or second in class positions. (T2-M)

Another teacher respondent also explained: "Grade 10 students do not know how to do LCM of simple arithmetic problem, today I myself taught that thing individually and tomorrow, if they ask that thing, I will also teach them" (T5-M). In addition, in another part of interview the same teacher reported due to less favorable education system, students' capability was decreasing in Mathematics:

> There are some students in the class for whom it was barely possible to be studying in the 10th standard. It seems that they reached Grade 10 by passing Grades 6, 7, 8, 9 without being present in any classes due to the tendency to pass students. There are some students who have reached class 10 without getting one mark in Mathematics. That might be due to the education policy of our country. How is this called a dollar initiative? Now the academicians themselves are trying to apply here the same things that applied in the American environment. But that environment is not the same here, so it is difficult to apply it here. (T5-M)

In another context, the same teacher T5-M also shared that the curriculum of mathematics did not fit with students' level of interest, mathematics curriculum should be developed according to students' level,

> In terms of the mathematics curriculum itself, the level of interest of the students is not matched. Apart from that, curriculum should be developed of two types for those who are active and have interest in mathematics and for those who are weak and not interested to learn mathematics, there should have been different kind of contents as their level. Those who don't need math, they think that I don't study math. For such students, simple and practical curriculum of mathematics should be made. If there were such two methods, there would be no problem in Math, it would be good for the student. (T5-M)

The government mathematics textbook was not sufficient for the students' SEE test as it contained only a few exercises. Teachers expressed that few exercises were included hence students must have to buy extra books, which added extra economic burden for students in community schools. There was not matching between the government mathematics textbook and the test paper constructions for SEE. The female teacher stated:

> Currently, there are very few exercises included in government mathematics textbooks for practicing. Government school children are getting free government books, but we must have to buy the practice books available in the market, which run by the private schools. Because there are no more problems, there is no sufficient problems not more than 4/5 in one exercise in government mathematics textbook. There should be at least 10/15 problems in each topic. If one problem of one type is given, there is no other problems of such types. Then either we have to create a problem by themselves or buy a practice book. Then it seems that we have made a little economic load for the student. (T3-F)

Students also realized that the Government Mathematics book of Grade X was not sufficient for them to practice for SEE hence the talented students must buy extra ones: “If we have done all the exercise of this government books by ourself, 60% marks will not be deducted. That’s why I have a practice book and have 10 sets for that, and I practice from there” (B4). In addition, in another part of interview the same teacher respondent B4 also expressed, “We 2/4 talent students have 10 sets, we will solve the problem of 10 sets after finishing that book. What to do after finishing the exercise? I self-study by myself from other 10 sets of mathematics.”

The above quotes indicate boys were engaged in solving extra mathematical problems by themselves. They felt problems are insufficient of the textbook used by government for Grade X. Teachers were unable to teach talented students according to their needs and at their own pace.

Like interview data, I observed similar things through my classroom observation. In all teachers' classrooms, teachers mostly stood near the board and solved maximum problems by themselves. Somehow, they gave mathematical problems to solve as classwork, but a large number of boys and only a few girls were doing that problem, showed the teacher. I observed that must girls finished the problem but they made basic simple mistakes, but boys did not make such type of mistake. However, the teacher did not give sufficient feedback for both boys and girls in the classroom, only a few talented girls and boys got feedback. However, a large number of girls seemed unable to start to solve the problem, they nodded their head on the desk; teacher saw but did not ask their problems. The teacher had given answers to those who asked. S/he was unable to teach according to students' ability. A large number of students, especially girls, seemed unable to do simple mathematical operations. Since male teacher (T6-M) asked students to solve problems related to "Ratio and Proportion," one first bencher girl was unable to break down brackets on the term $(dk^3)^2$. Likewise, on the same problem girls were unable to generalize the formula $(a-b)^2$ to $(c-d)^2$. The teacher only just said their answer, but did not explain why that happened. That's why they still seemed confused, how to solve it.

Likewise, in another teacher's (T5-M) classroom, girl students were unable to understand the simple LCM that was done by teacher on the board while solving tax related problems on the board. Girls were not able to solve the problem; they were still confused, but as boys finished the problem the teacher (T5-M) started to solve the next problem on the board by himself. I observed that girls lacked basic mathematical concepts, compared to boys. It would have been better if teachers taught according to students' ability, but they did not seem to use any alternative strategy for students who had specific needs. They did not practice of gender responsive pedagogy in mathematics classroom. They did noy pay attention towards boys and girls specific learning needs while teaching mathematics.

**Summary of Classroom Observation Based on GRP**

This is the explanatory sequential mixed research design, on which interview and classroom observation were taken for the second qualitative phase. I observed 12 classes of six mathematics teacher participants, two classes of each. The detailed data of classroom observation were presented above in thematic analysis mixing with interview data. The summary of each teachers' classroom observations was depicted separately in matrix form as follows in Table 26.

**Table 26.** *Classroom Observation Summary*

| Teacher | No. of Class observed | Date | Contents | Gender specification | Interpretation |
|---|---|---|---|---|---|
| T1 -F | 2 | 2078 -07-14<br><br>2078 -8-28 | Combined solids (Cylinder and Sphere)<br><br>Geometry (Cyclic Quadrilateral) | • Not used mixed seating arrangement<br>• Not used any real solids materials<br>• Boys questioning and answering by standing without any hesitation more often than girls<br>• Not valuing nonspeaking boys and girls<br>• Boys only got chance to do problem on the board<br>• Selected only girls in questioning<br>• More boys were participating in interaction and answering while the teacher was solving problem on the board.<br>• No or low interaction between boys and girls in class | The teacher seemed less sensitive to applying real solid objects and any software to give a clear concept of cylinders, spheres, and geometrical concepts. She showed gender stereotype behaviour that only boys can do problems on the board. Lack of using any mathematical software, students started to route the concept without understanding the related concept and visualize the picture. The students, especially the girls, who were not speaking and asking questions, did not benefit from her teaching. She showed gender irresponsive behaviour. The teacher was unable to provide feedback, especially of girls who were shy and less speak in the classroom for the improvement of mathematics learning. Only talented students benefited from |

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| | | | | • But girls were asking questions individually from the bench<br>• Boys were asking logical and critical questions and saying alternative definitions | this class. Therefore, the teaching and learning activities of the teacher are likely to be conventional type only focusing on equality and ignoring the student's specific learning needs. |
| T2 -M | 2 | 2078 -07- 29<br><br>2078 -08- 20 | Plane Surfaces (Area of Triangle)<br><br>Radical Equation | • Not used mixed seating arrangements<br>• Mostly teacher engaged in solving problems<br>• Not given individual feedback but solved talent students' problems on board<br>• No selection of boys and girls in questioning individually<br>• Talent girls were needed teachers' support and asked questions, but talent boys were solving by themselves individually previous than teachers<br>• Not focused back benchers' girls: seemed silent and busy on copied answers<br>• Class was overcrowded: boys making more noise | I observed that the teacher did not try to interact with each student. He gave priority only to content delivery rather than focusing on students' specific learning needs. The teacher was more active and gave less time for students' activities. He did not allow enough time for students to ask questions and to answer. He did not focus on girls who need more time to express themselves. Some boys who asked questions got some feedback but most of the students did not get any feedback to improve their learning mathematics. |
| T3 -F | 2 | 2078 -07- 15<br><br>2078 -08- 14 | Factorizati on<br><br>Compoun d interest | • Practiced child-centered teaching<br>• Paying attention towards all students both boys and girls<br>• Boys solved the problems faster and correctly than girls, girls made basic error<br>• Not used group work and mixed sitting arrangement | I found that she seemed gender responsive in questioning, solving problems, and providing feedback but in some cases, her language reflected girls were weaker than boys in mathematics. She did not practice group work and mixed sitting arrangements and hence peer interaction between boys and girls was not found in the classroom for gender responsiveness. Likewise, girls seemed weaker in basic mathematical concepts in compared to boys. |
| T4 -M | | 2078 -08- 08<br><br>2078 -10- 25 | Prism and Pyramid<br><br>Highest Common Factor (HCF) | • Asking questions selecting both boys and girls<br>• Not use any real materials, handmade materials, and any technology to give the clear concept of Prism and Pyramid | I found that the teacher seemed gender sensitive in questioning and language used. Still, he was unable to apply group work, and interaction. Likewise, he was unable to provide sufficient feedback according to each student's specific learning needs and not mixing students according |

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| | 2 | | | • Not paying attention towards passive last bencher girls<br>• Not use any group work and interaction practices | to gender and their ability. During this observation, I also found that teachers were not using instructional materials and technology and hence most of the students especially girls were very weak in the basic concepts of factorization (basic operation, bracket, square, simple formula etc.) and prism and pyramid. The teacher tried to conduct a child-centred teaching approach but most of the time he was dominated by the lecture method. The teacher mostly focused on students who were asking, questioning and interacting with him. |
| T5 -M | 2 | 2078 09-12<br><br>2078 -10-20 | Value Added Tax<br><br>Simplification | • Used problem solving method: Both boys and girls equally involved in discussion<br>• Only boy got chance to do problem on the board<br>• No selection of either boys or girls in questioning<br>• Not valuing passive students both boys and girls | Teachers practiced gender equality in solving problems and providing individual feedback, but only the students who were active and forward in the classroom got the chance. The teacher did not pay attention to the students' specific learning needs. The gender stereotype practiced also seemed to him that only boys could do problems on the board. |
| T6 -M | 2 | 2078 -09-07<br><br>2078 -11-20 | Ratio and Proportion<br><br>Combined Solids of Prism and Pyramid | • Boys were more interacted and discussed than girls.<br>• Boys only got chance to do problem on the board and got more valued than girls.<br>• Boys quickly and fairly solved the problems as a classwork rather than girls<br>• No group work and interaction happened with boys and girls | I observed that teachers mostly used traditional teacher-centered teaching methods. Boy students seemed more active and talented in the classroom and hence they got more value and attention from the mathematics teacher. Teachers were not paying attention towards girls who had problems with the basic concept of mathematics. In the classroom, the teacher was not practicing group work and mixed sitting arrangement, and hence weak girls did not get a chance of interaction with boy peers who were forwarded and talented in mathematics. |

# Chapter VI

## GRP Practices: Key Insights from Mixed Findings and Discussion

The main purpose of this dissertation was to explore teachers' GRP practices and students' realization towards teachers' behavior, and their mathematical content preferences in mathematics. Teachers today should not be aware only towards GRP, but they should also utilize GRP within and beyond their classroom teaching learning process. For active participation of each boy and girl students in mathematics learning according to their pace, without discrimination based on gender, their teachers must exercise GRP practices in their daily teaching learning activities in meaningful ways. Today's teachers must be aware about GRP and best practices so that all students, especially backwards girls, would be empowered and motivated towards mathematics in the upcoming days.

In this section, the joint display of mixed findings was interpreted as well as the main findings of the research study were discussed. The findings obtained from quantitative and qualitative strands of sequential explanatory mixed methods design were compared to facilitate the inference process (e.g.Teddlie & Tashakkori, 2009). The results obtained from quantitative research question 2, that focused on teachers' awareness towards GRP, were discussed in relation to existing literatures and relevant theories. Additionally, findings from mixed methods research questions 1, 3, and 4 — regarding students' mathematical content preferences, teachers' GRP practices, and students' perceptions of teachers' behavior regarding GRP —were interpreted through the integration of both quantitative and qualitative findings, and discussed using relevant literature and theoretical perspectives. Likewise, the findings of each research questions were discussed question-wise, starting by considering quantitative findings, and qualitative findings are then examined to explain the results of quantitative findings and also taking account of the major theories taken in theoretical literature review and other reviews.

**Joint Display of Mixed Research Findings**

This section presents the key findings from the study's first phase, derived from quantitative survey data, followed by the main qualitative findings gathered through participant interviews and classroom observations in the second qualitative phase. Finally, a mixed methods interpretation is provided in matrix form, as follows in Table 27.

**Table 27.** *Mixed Research Findings*

| Quantitative Findings | Qualitative Findings | Interpretation |
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| Least satisfied area was Geometry and mean difference was not statistically significant. (Boys' M=2.69, Girls' M=2.74, P-value=.263>0.05) | Both boys and girls reported that Geometry as a difficult content area due to the lack of basic geometric concepts from previous classes**.** The main difficulty was on proving theorems**.** Boys enjoyed and satisfied on Geometry more often than girls due to its logical and critical nature. | The findings revealed that Geometry is perceived as the most challenging and least satisfying content area in mathematics for both boys and girls, with no significant gender differences in their dissatisfaction levels. Both felt difficult due to lack of its' conceptual understandings, on which theorems proofs as key challenges. Regarding gender-wise comparison, boys tended to view Geometry more positively and enjoyed than girls, since they liked logical contents. |
| Both boy and girl students felt the Arithmetic area was more important in students' future lives in comparison to others. Mean difference among boys and girls was statistically significant in favor of girls (Girls' M=4.38, Boys' M=4.21, P=.000<0.05). Teachers thought was also similar with students. | Both teacher and student participants stated that the Arithmetic area would be more important for students' future lives rather than other content areas, since such contents are applicable to their daily lives. | Both quantitative and qualitative data revealed that the mathematical contents which are important and applicable in students' day-to-day life (Arithmetic) would be preferable for students' future life. Girls expressed a significantly stronger belief in its relevence in comparison to boys at the secondary level. |

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| Greatest level of GRP practices was found on 'Language Used' in comparison to other components for both male and female teachers, mean difference among them was not statistically significant (Male M=3.88, Female M= 4.08, P-value= .609>0.05). | Observed data revealed that both male and female teachers used gender-neutral language while solving problems on the board and discussing as a whole in classroom. Likewise, they used gender-specific language while asking individual questions and interacting individually. | Both quantitative and qualitative data revealed that mathematics teachers have good GRP practices while using languages in mathematics classrooms at the secondary level. Teachers' language practices were seen in progress and gender responsive language they used. |
| Lowest level of GRP practices was found on 'Teacher-Student Interaction' component compared to others. Mean value was in favor of male teachers, but difference was not statistically significant (Male M=3.54, Female M=3.51, P-value=.740>0.05).<br>Agreed on statements "More girls ask questions to me first than boys do during a lesson" (M=3.10). | Participants stated that boys interacted more with teachers and asked questions more frequently and logically than girls. Teachers did not provide any individualized treatment for girls to interact more often, where as they reported girls need more encouragement and support than boys. Likewise, teachers mostly heard the voices of talented students and did not value the weak students, especially girls in the classroom. Moreover, participants of both gender groups have gender stereotypical thought — boys have logical and critical mathematical minds, but girls have bookish knowledge and superficial mind. Gender discrimination found in classroom participation, since girls' absenteeism was high and they were engaged and overloaded more in household works more than boys. | Explicitly, teachers have good gender-responsive interaction practices in mathematics classrooms. But in inner aspects, ample stigma such as gender stigma, cultural stigma, and gender stereotypes thought persisted with them, that affected them for practicing gender responsive classroom interaction. Data revealed boys have criticality and logicality, on the other hand girls were overloaded in household works, it concluded that creativity and logicality might be affected by opportunities students obtained in school and at home. As a whole, data revealed that teachers have low or no GRP practices in classroom interaction with students, especially with girls. |
| Good GRP practices were found on "Materials Used" of both male and female teachers. Mean difference between them was not statistically significant (Male Mean=3.55, Female Mean=3.56, P-value=.863>0.05).<br>"I obtain and use instructional materials…" (M=4.04) | Participants stated that gender stereotypes words or names are not more often used in mathematics textbooks. Teachers did not use any teaching materials or technological devices to pay attention to each boy's and girl's specific learning needs while teaching mathematics. | The quantitative data indicated that mathematics teachers reported using teaching materials effectively, and in a gender, responsive manner. However, contrasting findings emerged from the qualitative data, which revealed that mathematics teachers did not actually incorporate teaching materials and technology in their teaching instruction. This discrepancy suggests that, in practice, they |

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| | | were not implementing gender responsive teaching materials in the mathematics classroom. |
| Good GRP practices found on "Teachers' Classroom Activities" of both male and female teachers, but their mean difference was statistically significant in favor of female teachers (Male Mean=3.85, Female Mean=3.94, P-value=.014<0.05).<br>"I use mixed sitting arrangements of both boys and girls in mathematics classroom with mean value M=3.42".<br>"I enhance group dynamics by composing of group members heterogeneously by ability, motivation, sex, etc. with mean value M=4.04" | Data from participants' interviews and classroom observations indicated that mathematics teachers did not implement mixed gender seating arrangements to support gender responsive classroom activities. Typically, students were seated in two separate columns—one for girls and the other for boys. Although, mixed seating had been attempted in the past, it was discontinued due to created cultural and social problems with students. Teachers acknowledged that mixed seating could enhance gender responsive interaction and participation. Furthermore, teachers mostly used conventional teaching methods and did not practice group work activities. Teachers were not providing individualized instruction to encourage quiet and background students, and overall, the classroom environment did not promote meaningful interaction and collaborative learning in mathematics classrooms. | On a surface level, mathematics teachers expressed awareness of gender responsive practices and claimed to implement mixed gender seating and group works in their present classrooms. However, in the inner layer, deeper observation and interview data revealed a different reality. In practice, teachers did not apply gender responsive teaching strategies such as mixed gender seating arrangements, group work activities, and individualized instruction—particularly for students needing additional support, such as for girls and academically struggling students. As a result, the actual classroom practices of mathematics teachers appeared to be minimally gender responsive in the context of Nepalese mathematics classrooms. |
| Teachers have good GRP practices found on "Assessment and Feedback" component of both male and female teachers and mean differences among them was not statistically significant (Male Mean=3.67, Female Mean=3.73, P-value=.606>0.05). Both were implemented similar types of practices while providing feedback and assessing students. | Participants interviewed data stated that teachers have low or no practices of providing sufficient feedback based on their results and were not conducting any motivational work for backward and fellow students of both gender group after formative and summative assessment. They did not implement a variety of assessment strategies that addressed student's diverse needs and abilities. Teachers were not aware about gender responsive assessment and had not practised it in the classroom. | Mathematics teachers were practising gender-neutral assessments while evaluating students, but did not practice gender responsive assessment methods focusing boys' and girls' specific needs. Although teachers were sensitive about the importance of feedback, but in actual classroom practice, unable to provide sufficient feedback for students who needed specific supports, only forward and outspoken students benefited. Since, receiving feedback from students and providing feedback to them are essential for |

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| | | improving students' performance, but teachers did not prioritize or effectively implement these activities in the classroom. |
| Both boys and girls perceived their teachers as having a gender responsive behavior, showed significant mean differences (Boys Mean=3.56, girls Mean=3.70, P-value=0.000<0.05), in favor of girls. Girls rated their teachers' gender responsive behavior significantly higher than boys. | Students observed and realized that teachers did not practice of mixed seating and group work, but they expressed a need for these practices to enhance active participation and gender responsive interaction. Both boys and girls realized that boys mostly involved in questioning and answering and teachers only insisted, valued, and heard the voices of talented girls and boys. They overlooked and discouraged weak and average-performing girls for pursuing optional mathematics. Girls reported lower confidence on their abilities and expected more encouragement and individual support from teachers, while family-based discrimination led girls to more absenteeism and increased household responsibilities. | Explicitly, both boys and girls felt that their teachers did not discriminate on the basis of gender in classroom. But in the inner layer, not only boys but girls also have gender stereotype thought that boys have logical and critical mathematical minds and girls have fickle mind. On the other hand, teacher's classroom practices lacked gender responsive strategies, like as mixed seating, group work, and individualized instruction on the basis of their diversity, on which students themselves express a desire for. Criticality and logicality may depend on opportunities they obtained at home, where family's gender discrimination limits girls' absenteeism and added burdened with household responsibilities, widening educational disparity in mathematics. |

## Discussion Based on Research Questions

In this topic, I have highlighted the major findings and examined and discussed these findings with the prior research findings based on research questions and corresponding categories.

### *Content Preferences*

Content preferences of boy and girl students in mathematics would be discussed on RQ1 as follows:

**RQ1: Do the Preferences of Mathematical Contents Included in the Curriculum Differ by Gender? Why?** The findings for mixed research Question 1 that focused on the students' mathematical content preferences who were studying at Grade X as measured by the survey questionnaire and interview guidelines, developed based on mathematical content areas. For this study, students' content preferences were measured based on their satisfaction level on mathematical content areas and importance level on contents of mathematical content areas for their future life. The same tools of content preferences were also distributed to teacher participants for further verification. I tested overall students' satisfaction level on the difficulty of mathematics and found no statistically significant differences between boys' and girls' satisfaction level ($p = .090 > 0.05$) whereas the mean score was slightly in favor of girls. Moreover, among the eight-content areas, when I measured each content area individually and perceived both boy and girl participants were satisfied or enjoyed with content areas: Set, Algebra, Statistics, and Probability. But both of them did not enjoy and did not prefer the content areas: Geometry and Trigonometry. Boys were not very satisfied with Mensuration, whereas girls were comparatively more satisfied.

In addition, I also compared the perspectives of teachers and students regarding students' satisfaction in mathematics and found that only in Geometry area students reported a higher mean value. In the remaining content areas, teachers reported higher mean value than students. Teachers thought that their students were satisfied in Mathematics more often than students. Nonetheless, both teachers and students' versions were the same, both reported that students were dissatisfied with the content area Geometry at secondary level. In addition, students (both boy and girl) were also dissatisfied on the content area Trigonometry and boys were also dissatisfied on Mensuration area. Whereas, opposite findings were of teachers, they thought their students were satisfied with these contents: Trigonometry and Mensuration. While applying statistical test, analysis revealed a statistically significant difference in mean satisfaction scores between boys and girls in three mathematical content areas: Set ($P = .050 = 0.05$), Arithmetic ($P = .010 < 0.05$), and Statistics ($P = .002 < 0.05$). The results revealed differences in satisfaction levels between boys and girls in three content areas of Set, Arithmetic, and Statistics. But in remaining content areas, their mean difference in satisfaction level was not statistically significant. Hence, in maximum content areas students' mathematical content preferences on the basis of their satisfaction level had seemed similar, not more differences have been found on the basis of gender.

These findings concerning the mathematical content preferences based on of students' satisfaction level in Nepalese community schools appear to align with "gender equality" of liberal feminist theory (Lorber, 1997; Thompson, 2003). This theory posits that both male and female are equal in all aspects and should be treated them equally. The differences between them were not rooted in biology, hence girls should be given the same rights and have equal access to professional and work opportunities (Lorber, 1997). Within this context, one key findings of this study were that "boys' least satisfied content area was Geometry, while girls were Trigonometry, but the mean differences were minimal that means both of them were not enjoyed the content areas Geometry and Trigonometry" an indication of "gender equality" in mathematical content preferences. Both teachers and students' perspective on the basis of students' least preferable mathematical content areas (Trigonometry and Geometry) had seemed same that helped teachers to implement and practice GRP in mathematics classroom. GRP assists teachers in avoiding gender stereotypes, enhancing skills, and boosting classroom participation, which can aid in empowering both boys and girls and for improving overall quality of education (Nabbuye, 2018).

The statements that students and teachers made during semi-structured interviews helped to identify why students enjoyed or not enjoyed on specific mathematical content areas. Likewise, the quantitative data, maximum interviewed of students and teachers, both boy and girl students reported they were dissatisfied and felt difficult in Geometry area, in compared to remaining content areas. Interview responses revealed that both boys and girls low satisfied content areas was Geometry. However, in gender wise comparison, boys were observed more satisfied in this area than girls because of various reasons. As expressed by the boy participant, Geometry contains logical contents that they felt enjoyable as well as it's logical nature. On the other hand, girls not preferred Geometry and felt difficult due to feeling difficult in proving theorem. Whereas, both boys and girls liked Algebra; boys liked it due to its logical nature, but girls liked it because of its easy for solving problems. Teachers also support this finding both quantitatively and qualitatively. Teachers expressed that boys were better in Geometry than girls but both of them felt Geometry difficult due to lack of basic geometrical concepts and they have misconception as Geometry is difficult from previous classes at secondary level. Moreover, students did not understand Geometrical contents from previous classes and their main difficulty was on proving theorem. Moreover, gender difference was not found on Trigonometry content area in quantitatively and qualitatively. Both boys and girls also felt difficult in solving Trigonometrical problems due to its' deductive nature. They realize Trigonometry needed a maximum number of formulae. These results are discussed and handled respectively below.

These findings are also supported by previous studies conducted by Uwineza et al. (2018) and Gallagher et al. (2002) that boys mostly preferred Geometry and girls preferred Algebra content area. Likewise, oldest research by Cheung (1989), Bulut et al. (2010), and Okan and Arican (2020) also supports the finding that boys performed better in Geometry than girls. Likewise, the NASA results of Grade VIII of Nepal also reached the result parallel to the findings of the study as students average score in Geometry (37%) was weaker in compared to others area of mathematics (ERO, 2013) and in Geometry (34%) below than national mean (35%) (ERO, 2015b). In addition, boys preferred mathematical contents that require reasoning and girls preferred contents that require the application of formulas (Uwineza et al., 2018) that supports the findings of this study. Since boys enjoy studying Geometry and Algebra due to its' logical nature that requires reasoning ability whereas girls like Algebra by solving it step by step by using formula. The findings of this study revealed that students' most preferable and enjoyable content area was Set but NASA result of Grade VIII of Nepal did not support that students' average learning outcomes in Set (38) was weaker below the national average (43) (ERO, 2013).

According to the students' preferences and also teachers support on different mathematical content area, it was supported by their achievement obtained in NASA results of Grade VIII of Nepal. Since students perform better on basic calculations, but perform weaker in theorem proofs, reasoning, problem solving, and constructing figures (ERO, 2015b). One reason for this may be stereotype thought on both teachers and students that 'Geometry is difficult content area' and another reason may be teachers did not think about alternative pedagogy for teaching Geometry like as digital technology for motivating students from upper basic level. The NASA results of Nepal also justified the findings of my study. In comparison with TIMSS the result of Grade VIII of NASA 2013 revealed that Nepali students were not able to meet the international standards in mathematics. In lower basic level, student's performance in Geometry was better in comparison to Algebra but reverse result found in upper basic level, student's performance was worst in Geometry (Education Review Office, 2015b).

In addition, quantitative data revealed that both students (boys and girls) and teachers thought all eight mathematical content areas would be important for students' future life; overall mean value and individual mean value of each content areas, of both teachers and students were greater than scale mean 3. When I tested the overall boys' and girls' students mean differences about the content important for their future life and found that the mean difference was statistically significant ($P = .007 < 0.05$) in favor of girls. In addition, I tested each content area's importance for future life individually and found that the mean differences between boy and girl students were statistically significant in three content areas: Arithmetic ($P = .000 < 0.05$), Algebra ($P = .034 < 0.05$), and Geometry ($P = .000 < 0.05$), in favor of girls. For all other remaining content areas, no statistically significant differences were found between boy and girl students' regarding to content important for their future lives. The results of both quantitative and qualitative data revealed that among all mathematical content areas, both boy and girl students felt that Arithmetic area would be more important firstly and secondly Mensuration area for their future life. The reason, they expressed that both of these contents are applicable for their day-to-day life. As students, teachers thought that Arithmetic area in comparison to others would be most important for students in their future life.

In survey results, it has been shown that girls mean value greater than boys in maximum content area of mathematics. This result indicates that girls have more positive feelings than boys towards mathematics and its importance for their future life. But different previous studies revealed boys' performance in mathematics was better than girls (Asante, 2010; ERO, 2016; 2019, 2022; Golsteyn & Schils, 2014;

Gurria, 2016). This may be the cause of the environment that girls receive at homes and schools. Girls have more responsibility at home rather than boys; hence they have limited time for practicing mathematics. On the other hand, teachers may not practice GRP by paying attention towards their specific learning. That's why, girls have a positive attitude towards mathematics, though they are still weaker than boys in mathematics.

Analyzing the findings, from the perspectives of the feminist theory, girls and boys are not biologically different and they could perform equally if they granted equal opportunity (Thompson, 2003). But the research result from the field found different status of the boys and girls, research result revealed different status of girls and boys regarding satisfaction level. Based on both data results, girls were more satisfied or enjoyed with the contents regarding calculation part and problems solving using formulas in mathematics like Mensuration. But boys enjoyed the contents of mathematics regarding logical parts like Geometry.

***Teachers' Awareness Towards GRP***

Teacher's awareness towards GRP in mathematics would be discussed on RQ2 as follows:

**RQ2: What is the Status of Teachers' Awareness Towards GRP in Mathematics?** This study found only 35.1% of mathematics teachers (33.7% male and 45.8% female) were able to understand and choose the actual meaning of GRP. So, the findings of the study indicate that secondary level mathematics teachers have partial awareness towards GRP in the context of Nepal. Although the awareness was in favor of female mathematics teachers, they showed high level awareness towards GRP in compared to the male mathematics teachers. moreover, survey result also showed 8.8% of all mathematics teachers (9.4% male and 4.2% female) chose the option 'I did not know what GRP is all about'. The findings indicated that a large number of mathematics teachers had been lacking of GRP awareness. That was also justified by my classroom observation that they were unable to apply GRP in their classroom practices. They were unable to focus on students' specific learning needs while teaching mathematics.

This finding was supported by Kahamba et al. (2017) that teachers have a partial awareness towards GRP and large number of female teachers were more aware towards GRP in comparison to male teachers. Likewise, the findings are consistent with the findings (Dorji, 2020; Yuden et al., 2020) that teachers were not aware with GRP and challenge to understand gender. Contrast result had been found in North Wollo Zone, Ethiopia, that science educators were following the GRP guidelines while teaching that means they were aware towards GRP (Abraha et al., 2019). Since GRP awareness might be necessary for teachers to practice GRP in mathematics classroom. This finding may arise the question 'if teachers have limited knowledge towards GRP, then how do they practice in classroom?'. In this sense, teachers need to be aware of their vital roles in fostering a gender sensitive future generation (Ifegbesan, 2010). Likewise, teachers' lack of knowledge about girls' sexuality and inherent biases can negatively affect girls' access to education. Therefore, it is crucial for teachers to be aware of and understand gender responsiveness to address these issues effectively (Timothy, 2022). Therefore, it is necessary for mathematics teachers to know of gender and GRP for equally respond for both boys and girls, address gender stereotyping, and to develop gender friendly learning environment in the classroom (UNESCO, 2017).

***Teachers' GRP Practices***

Teachers GRP practices in mathematics classroom would be discussed based on RQ3 as follows:

**RQ3: How do Teachers Practice GRP in Mathematics Classroom?** The findings for mixed research Question 3 focused on teachers' GRP practices as measured by teacher surveys, classroom observations and their semi-structured interviews. First of all, I conducted a survey with mathematics teachers and found quantitative data as a whole then in the second stage, face-to-face interview and classroom observation were conducted for richness of the quantitative data.

Analysis of quantitative data obtained through mathematics teachers' surveys of GRP practices, the mean score on overall GRP practices ($M = 3.69$) revealed that teachers had good GRP practices while teaching mathematics at secondary level. As a whole, in outer appearance, both male and female teachers' thought that they have good GRP practice at secondary level mathematics classroom. These findings support the findings of previous study of similar type that science teachers were practicing GRP properly (Abraha et al., 2019). Whereas the findings of numerous studies did not support the findings of this study. The outcome finds very low uses of GRP in classroom (Kahamba et al., 2017). Likewise, in mathematics instruction, teachers' GRP usage was decreases (Obasi, 2017). Similar studies conducted in Bhutan also demonstrated less attention on GRP practice (Dorji, 2020). Likewise, teachers were not gender sensitive for GRP practice at secondary education (Yuden et al., 2020).

In this study, gender wise comparison was also measured, on which as a whole (overall), there was no significant differences between male teachers' and female teachers' GRP practices ($P = 0.408 > 0.05$) with a small effect size ($g = .12$), mean value was in favor of female teachers. Female teachers felt they are practicing GRP more properly than male teachers, but this finding was not satisfied statistically. Both gender groups were practicing GRP in a similar manner in mathematics classroom at secondary level. The liberal feminist theory also conveyed that men and women were not biologically different, they can do equally, if they get equal environment. But these quantitative findings were not totally supported by qualitative data. In inner aspect, their classroom practices did not align with these stated beliefs in quantitative data, that I have discussed in later in component wise discussion.

In this study, teachers' GRP practice was also measured based on five distinct components: teacher-student interaction, language used, teaching materials, teachers' classroom activities, and assessment and feedback. In all components, teachers agreed that they were practicing GRP as their mean value greater than scale value 3. Among them the mean score value of language used ($M = 3.90$) components was greatest and the lowest mean value was of the component teacher-student interaction ($M = 3.54$) in compare to others components. This descriptive quantitative result indicated that maximum mathematics teachers felt that they have good GRP practices while language used and less GRP practice in teacher and student interaction in teaching mathematics. This finding supports the findings of previous study conducted by Abraha et al. (2019) that teaching practices were successful in language use and classroom interaction. But converse results have been found by the study conducted by Dorji (2020) that teacher paid less attention on language uses, classroom interaction, and classroom set up. In component wise comparison, statistically significant differences between male teachers and female teachers had found in only one component as teachers' classroom activities ($P = 0.014 < 0.05$). The findings revealed that the GRP practices of male teachers and female teachers differ from each other in their classroom activities. In addition, the descriptive result also revealed that except teacher-student interaction all other remaining component, female teachers mean value greater than male teacher, noted that female teachers felt that they were applying gender responsive language, classroom activities, materials, and assessment feedback more often than male teachers in mathematics classroom.

I also explored these quantitative data through qualitative data with the help of classroom observation and face-to-face interviews. I would like to discuss the result of both quantitative and qualitative data based on different themes involved in quantitative analysis. I analyzed quantitative data in five different components such as Teacher-Students interaction, Language used, Teaching materials, Teachers' classroom activities, and assessment and feedback. Likewise, I analyzed qualitative data under the six different themes like classroom organization, gender stereotype in thinking, pedagogical practices, learner's diversity, providing individualized instruction, and ability assessment. Now, I have blended both data to reveal the situation.

***GRP Practices on Teacher-Student Interaction.*** The quantitative results revealed that teachers' lowest level of GRP practices was found on teacher-student interaction in comparison to the remaining four components; though they believed they have good GRP practices in regards this component. In addition, mean score of male teachers was greater than female teachers, but there were no statistically significant differences between them in this component. This indicates male mathematics teachers had good interaction practices than female mathematics teachers, which was not significant.

The findings of interview and observation revealed that teachers have less gender responsive interaction practices in mathematics classroom. The surveyed data revealed that teachers were agreed on the statements "More girls ask questions to me first than boys do during a lesson" with M = 3.10 but this result was not justified by interviewed and observed data, boys asked more questions frequently, give answers frequently, and more logical than girls in mathematics. This finding is aligned with Fennema et al. (1990) assertion that boys are logical and ask and answer mathematical questions more frequently than girls in classroom. The reason for this finding is also justified quantitatively and qualitatively by the findings that girls are more ashamed, shy, less talkative, and naturally afraid to ask questions and give answers than boys with teachers. These findings support the findings of previous studies. In a study conducted by Bista (2004), it was observed that Nepalese teachers believed that girls are lazy, submissive, less intelligent, and incompetent than boys in mathematics. Likewise, in many studies including Nabbuye (2018), Frenzel et al. (2007), Schleicher (2008), and FAWE (2015) reached the results consistent with the findings of this study. These studies reported that teachers hold assumptions about girls being shy, ashamed, hesitant and afraid to answer, having low self -esteem, and feeling less empowered than boys in mathematics.

Although, the majority of teachers in this study believed that most of the students, especially lower or average performing girl and boy students, also did not speak in mathematics classroom if they did not understand. These findings are consistent with the results of the study conducted by Chionidou-Moskofoglou and Chatzivasiliadou-Lekka (2008) that girls need more explanations than boys in mathematics and they feel hesitation in asking questions if they did not understand anything. Likewise, the result reached with the finding of the study by Ganley (2018), lower gender differences found on lower or average performing students.

The result of this study also indicated that girls need more encouragement and support from their respective teachers than boys while solving mathematical problems. But both quantitative and observed data justified that teachers have not devoted more time for encouraging girls than boys in mathematics classroom. Even though, the majority of teachers agreed that if a teacher encourages, supports, and shows good behavior, then girls mostly do better in mathematics. Girls reported in interview that they needed more individual support and encouragement from their teachers in mathematics The result supports the claims by Anthony and Walshaw (2009) that teachers' positive attitude and behavior helps to increase students' confidence in their capacity to learn and for making sense of mathematics. In a similar manner, another study indicates that teachers' positive attitude towards mathematics plays a crucial role in developing students' positive attitude towards mathematics (Mensah et al., 2013). Likewise, ZPD theory of Vygotsky also suggested assisted instruction for learners who have low level of mathematical ability and performance (Vygotsky, 1978). This means mathematics teachers have to show gender responsive behavior in classroom; valuing, motivating, encouraging, and empowering each student who have specific learning needs. They always took positive thinking towards mathematics, that automatically made students positive towards the subjects and students did better on it.

The qualitative data of this study found that not only male teachers and boy student, but also female teachers and girls were suffering from gendering stigma; almost all the teachers and students of this study have stereotypical thought that boys have higher logical mathematical thinking abilities whereas girls have only bookish knowledge. They also reported that boys have creativity in mind, but girls might have to make more effort in solving mathematical problems. This result align with the findings of previous research (e.g., Dickhauser & Meyer, 2006; Perez-Felkner et al., 2017; Robinson et al., 2011; Stoehr et al., 2017) that teachers assumed and evaluated boys' mathematical ability to be stronger than girls. Moreover, the findings also aligned with numerous prior studies (e. g., Dickhauser & Meyer, 2006; Espinoza et al., 2014; Ghosh, 2004; Halai, 2010; Swinton et al., 2011; Tiedemann, 2002), teachers, parents, and even students thought that boys' success in mathematics due to their ability, whereas girls' success due to their effort and hard working.

The findings of this study were also justified by the finding of the study by Goodell and Parker (2001) that teachers underestimate mathematical potential of girls and overestimate mathematical potential of boys. Likewise, a very strong evidence of the teacher gender-stereotype was shared by Chemaly (2015) that girls often score higher than boys on name blind test, but when teachers know the names of girls and boys on the same tests, teachers award higher score to boys than girls. These research findings revealed that students (both boy and girl) learning behavior depends upon teachers' behavior. In mathematics classroom, when teachers realized boys are critical, logical, and stronger than girl students, then they would treat and interact differently, since they have low expectations towards girls (Stoehr et al., 2017). These factors elucidate low or no interaction between teacher and student.

The social cognitive theory also illuminates the consequences of low interaction due to teachers' stereotype and behavior in mathematics classroom. The central to this theory is that teachers in classroom promote the social sanctions that sharpen gender discriminations for boys than for girls. Such types of social sanctions can enhance the perceived self-efficacy of boys and undermine the self-efficacy of girls (Bussey & Bandura, 1999).

Moreover, the logicality and creativity of boy and girl students are connected to the opportunity they obtained at homes and in schools. A primary factor contributing to this circumstance was justified by the teachers and students view that girls have to do household chores more often at homes than boys; they got limited time at home for study. According to these responsibilities, girls' absentee's ratio was higher than boys in school at secondary level. This finding is supported by Mathema and Bista (2006) that girls have to spend most hours in household chores and do not do well in schools. This aligns with Iwu and Azoro (2017) research indicating that different barriers towards girls such as domestic issues and responsibilities, stereotypical thought, and culture emphasized low participation of girls in SMT subjects. That's why the overall ecosystem and cultural stigma affect girls' learning in mathematics.

In quantitative survey data, teachers reported that they were not given more time to boys than girls to solve mathematical problems on the board. But it was observed that boys got maximum chance to do problems on the board in comparison to girls. In the context of Nepal, gender discrimination still remains, girls learning also impacted by their home environment, then after teachers' behavior at school. Liberal feminist theory elucidates that boys and girls should treat equally and give them equal rights and responsibilities (Thompson, 2003), then girls can do equally as boys. Girls' absentees at school create low interaction in home and school and girls became backward in learning.

The finding of the study offer additional evidence for the claims provided by the previous research studies (e.g. Chionidou-Moskofoglou & Chatzivasiliadou-Lekka, 2008; Halai, 2010; Mathema & Bista, 2006) that boys are inherently talented, brighter, and better than girls in mathematics. Almost all the teachers and students of this study reported that boys are better in mathematics than girls. Female teachers and girl students are also suffering from cultural stigma, since they also believed that 'mathematics is a male dominated subject'. Teachers' beliefs inherently impacted girls' beliefs as boys are better in mathematics. The previous research findings also support the findings of this study that girls are less mathematically capable than boys and stereotype thought by the society that girls can't do math (Bulut et al., 2010).

Indeed, previous studies also indicate that teachers' positive attitude developed students' confidence that causes positive attitudes with students towards learning mathematics (Mensah et al., 2013). Similarly, the findings are consistent with the findings by Sarouphim and Chartouny (2017) teachers viewed mathematics is a male domain subject and boys' success is due to their high ability and motivation. Teachers interview and classroom observation revealed that they were unable to provide sufficient individualized instruction as per the specific learning needs of the boys and girls. In Nepalese classrooms, the greatest number of teachers have to teach in classes with a large number of students, where tracking or tracing individual boys' and girls' specific needs might be challenging.

The classroom observation and interview data indicated that most of the teachers heard the voice of talent, and active students either boys or girls, but no or low interaction happened with fellow students. The majority of teachers and boy students and even girl students themselves believed that girls often have less confidence with their mathematical ability and keep silence in classroom and less interact with teachers and peers. This finding resonates with numerous prior studies (e.g., FAWE, 2015; Ghosh, 2004; Heaverlo et al., 2013) that girls themselves did not believe in their capabilities and have lower self-confidence regarding mathematical abilities. Likewise, some other studies of social cognitive theory, reached the result parallel to the findings of the study by DeBacker and Nelson (1999) and Smist et al. (1997), middle school girls have lower confidence in their own mathematical capabilities than boys to excel in mathematics. Then they viewed less valuable of their lives, lower self-efficacy is related to lower academic performance.

The different findings regarding interaction for GRP practices, there was low or no interaction remains in mathematics classroom. Teachers have stereotypical thought still exist as mathematics is male domain subject and boys have logical mind. Though, they did not pay attention to specific learning needs of each individual girl and boy students. Thew were not done any activities for empowering and encouraging students especially girls who is shy, less active, and less interact in mathematics classroom. The analysis supports the theories as in social cognitive theory of Bussey and Bandura (1999), who stated that each individuals' self-efficacy beliefs determined their level of motivation; the stronger the sense of self-efficacy the more motivation exists with individual. This theory also stated that girls underestimate their own mathematical efficacy and lack of confidence in their own capabilities, despite performing equally well in mathematics as boys. Such a situation for girls might be the opportunities they obtained at home and fostering in schools.

Vygotsky's sociocultural theory elucidates the adverse repercussions of minimal or no interaction on learning mathematics. Social interaction plays a central role in students' cognitive development, where MKOs would foster a higher level of interaction, and learning occurs within the ZPD (Vygotsky, 1978). Likewise, the social constructivist theory also stated that students learning occurs through social interaction and collaboration with teachers, peers, and others and developed higher order thinking skills, and learning occurs within the ZPD.

***Gender Responsive Language Used.*** The quantitative data of this study revealed that the mean value of this component was greater in compared to the remaining four components. This data indicated that mathematics teachers (both male and female) have better GRP practices on gender responsive language uses while teaching mathematics. It was also suggested that in gender wise comparison on mean value, female teachers felt that they have better practices on gender responsive language uses in comparison to male teachers in mathematics classroom. But such mean difference was not statistically significant. This version indicated, maximum number of teachers thought and presented that they were using gender responsive language while teaching mathematics with all survey statements.

In the outer layer, qualitative data also supports the findings of quantitative data. Mathematics teachers were observed employing gender responsive language to deliver contents in classrooms. Both male and female mathematics teachers mostly employing gender-neutral language while they were solving problems on the board and explaining the subject matter. But at the time, while they are asking questions, observing students' individual work, and visiting classroom up and down, they generally used gender sensitive language focusing on students' ability and gender. Teachers observed that they were observing students' ability on the basis of their questioning and interacting in the classroom. However, some teachers needed more effort and time, they are slow to change their behavior. One of the female teachers used the word "girls can also do mathematics"; this word suggested discrimination still remains with her. Even though, in other cases, I observed that she was friendly in classroom.

In interviews with teachers, they have discriminating version as 'boys are better in mathematics than girls', but in classroom practices teachers were observed that they were not used any gender discriminatory language in classroom. The results might suggest that mathematics teachers' gender responsive language uses in classroom practice is in progress. The results supported by Abraha et al. (2019)

science teachers were practicing gender responsive language use properly in the teaching process. Likewise, school level teachers have gained a clearer understanding of their language and can negatively affect student's mental health and academic performance, resulting in noticeable improvements (Chea et al., 2023). But contrast results found by Dorji (2020) that teacher paid less attention on language use while teaching in classroom. However, based on the findings of similar studies, a more plausible explanation is gender responsive language used that treat boys and girls as equal partners and provides a conducive environment for learning to both (Mlama et al., 2005). Use of gender inclusive language enhances silence verse speech with students in classroom (Solar, 1995). Moreover, focusing and encouraging gender responsive language use promotes learning interaction, that creates motivational learning environment for learners (Polly et al., 2018). On the other hand, if teachers frequently employ inappropriate language (harsh, abusive, or threatening language), that creates fear in students, minimizing communication, and diminishing interaction and hence hinders the learning process (Dorji, 2020; Mlama et al., 2005). Likewise, social cognitive theory revealed that gender discriminatory language makes feel of gender difference and different human being (Bussey & Bandura, 1999). Gender responsive language employ in classroom, enhances students especially minimal speaking girl's classroom participation and interaction with peers and teachers.

***Teaching Materials.*** The quantitative data posited that the mean value of these components is greater than test value 3 that indicates teachers believed they were using gender responsive teaching materials in mathematics classroom. Whereas its mean value was second lowest among the five components, this finding indicates that teachers GRP practice in teaching materials was minimal in mathematics classroom. In gender wise comparison, female teachers mean value greater than male teachers, indicates female teachers believed that they were implementing gender responsive teaching material slightly more often than male teachers. However, no significant differences were found in male and female teachers' practice of gender responsive teaching materials ($P = .863 > 0.05$), that means both male and female teachers practice of teaching materials are in similar manner. Moreover, most teachers believed they were using gender responsive teaching materials while teaching mathematics, agreeing with seven out of nine survey statements, with one statement receiving a neutral response. Quantitative result reveals teachers had good practice of applying gender responsive teaching materials even though some differences have been found through qualitative data.

However, the findings suggest that teachers' opinions on textbook, illustrations, and examples in mathematics textbooks were inconclusive, as the quantitative and qualitative data presented somewhat different perspectives. In qualitative data, teacher respondents reported that in older mathematics textbooks, gender stereotypes words or names were included but now these gender stereotypes are no longer in mathematics textbook. Both male and female names were included fairly in examples and illustrations in balanced manner, but actually maximum survey teachers have a neutral belief that "There are gender biased illustrations and examples in mathematics textbooks and other resources" with $M = 3.00$. The result of this study supports the prior findings of Terry and Thapa (2012) that in Nepal, large number of school textbooks were free from gender stereotype and gender bias. Likewise, this finding aligns with Chea et al. (2023), who reported that gender stereotypes are no longer a significant issue and that girls are now fairly represented in educational materials. Likewise, the results reached parallel to the findings of the study Halai (2010) that in previous years, gender stereotypes reinforce in mathematics textbook, but now gender balance is going to be progressed in mathematics textbook and curriculum. Moreover, the findings of this study were unfavorable with the studies by (Blumberg, 2008) indicating that throughout the world, gender biased images are presented in school level textbooks. Likewise, this finding adverse as gender bias still adverse in name, pronoun, image, and professions, revealing a male dominance in all aspects (Karama, 2020), and boys named character was mostly used in illustrations of textbooks (Mlama et al., 2005).

Though, still construction of teaching and learning materials and applying it do not go as expected. However, the findings regarding materials on which majority of mathematics teacher reported in survey data that they always use gender non stereotypical materials like as picture and examples in classroom, but through observed classroom and majority of students' view reported, none of the teachers used any teaching materials and new technology while teaching mathematics, used only whiteboard. In all schools, there were not any mathematics labs and projectors for teaching and learning mathematics. Students reported that teachers only used protractors while teaching Geometry as teaching materials in mathematics classroom. Likewise, different pictures emerged through quantitative and qualitative data about 'explaining students the construction of materials and their use in society'. While I observed the classroom and collected views of majority of students, teachers did not use any teaching materials while teaching and also not asked for their students to construct materials, hence might not explain its' implications. The majority of survey teachers (M = 4.09) believed, they explain students the construction of mathematical materials and their use in society.

Solar's inclusive pedagogy in mathematics theory elucidates the adverse consequences of no or low construction of non-stereotypical teaching materials on student learning in mathematics. Solar (2000) gave guidelines for nondiscriminatory classroom practices and for an inclusive pedagogy in mathematics education, it is better to use non-stereotypical materials and to explain the construction of teaching materials and their use in society. Likewise, critical pedagogy, as advocated by Freire, challenges gender stereotypes and biases in the curriculum development and hence in teaching materials construction. It develops students' critical thinking by providing opportunities and engaging them in different classroom activities by themselves (Stinson & Bullock, 2012).

The findings revealed that Nepalese textbooks have some progress to remove gender stereotypes in mathematics textbooks, despite the progress in examples and illustrations in textbook to be gender responsive, teachers seem passive for constructing and applying different teaching and learning materials. At that situation, preparation of gender responsive teaching materials still became backward in Nepalese classroom. This might be one of the causes of students' backward to know basic mathematical concept and taken mathematics as a difficult subject. Consequently, the traditional teaching culture emerged in teachers' mind in Nepalese context, reducing constructing and applying teaching materials in classroom. Likewise, teachers have limited knowledge about new technological tools that are applicable in effective mathematics teaching, leaving them struggling to deliver content using only textbooks.

***Teachers' Classroom Activities.*** The quantitative data showed that the mean value of this component is the second highest value among the five components. Likewise, female teachers mean value greater than male teachers' mean value; this difference is statistically significant ($P = .014 < 0.05$). The result indicates the teachers' thought that they were conducting gender responsive classroom activities in mathematics classroom. On which, female teachers thought they have better GRP practices on their classroom activities than male teachers and classroom activities they conduct was differ from one gender group to another. Moreover, most of the teachers believed and stated that they were conducting gender responsive classroom activities while teaching mathematics with nineteen survey statements among twenty-one survey statements. Quantitative result revealed that teachers felt they have better GRP practices on classroom activities, even though some differences have been found through qualitative data.

The findings regarding classroom set up revealed slightly different picture through quantitative and qualitative data. Survey teachers reported that they use mixed sitting arrangements of both boys and girls in mathematics classroom with mean value M = 3.42, but in face-to-face interview of all teachers and students and my classroom observation revealed that there were not any practices of mixed seating arrangement in all of the mathematics teachers' classroom. In these classrooms, the most common arrangement consisted of rows of desks seating three or four students, typically organized into two columns with boys and girls seated separately in a traditional manner. Interview data revealed that maximum teacher respondents reported that they had practiced mixed seating arrangement in the past, mixing boys and girls in same benches was problematic. In addition, they are still unable to use mixed seating arrangement due to other different reasons such as: over crowed classroom, student's age group, lack of infrastructure, biological, social and cultural problems with students in classroom. Teachers were not applying mixed seating arrangements in classroom, but they reported that such arrangement would be better for students' equal participation and interaction.

The finding of the study does not support the maximum number of prior studies conducted in other countries. The findings of this study are not consistent with the findings of similar study done in Bhutan, most of the classrooms, students were seated in mix groups of boys and girls based on their ability (Yuden et al., 2020). Similar previous study done in Africa on awareness and practice by Kahamba et al. (2017) also found that most of the teachers were practicing mixed sitting arrangements by mixing boys and girls student. The finding is also not aligned with Chea et al. (2023) that gradual movement happens towards GRP in component classroom set up. Gender audit of Nepal also reported that every girl student seated only in the back row on the classroom (Terry & Thapa, 2012) in previous years. But now girls can also seat in any positions not only backward. A classroom set up by mixing girls and boys responds to the specific needs of both girls and boys and enhances active participation (Mlama et al., 2005).

In the context of this study, mathematics teachers are somehow gender-responsive for mixed seating arrangements, they have knowledge it is better for students' equal participation in mathematics classroom. Though, none of the teacher respondents are practicing mixed seating arrangement in mathematics classroom. Some teachers who applied this seating arrangement did not succeed, it is the reason that social and cultural stigma still inherent in Nepalese school with teachers and students that creates problem in classroom. Nepal is one of the developing countries, where peoples of different caste, religions, culture, ethnic groups are seated. The culture and traditions might be different from western countries. That's why mixed seating arrangement as one of the gender responsive classroom practices, developed by western countries might not be fitted in Nepalese classrooms, without reformation in some instances of culture and society.

However, the findings regarding teachers' and students' view about group work in mathematics classroom emerged slightly different picture through qualitative and quantitative data. The quantitative data showed that teachers believed they enhanced group dynamics by forming heterogeneous groups based on ability, motivation, sex, and other factors, with mean score M = 4.04, that means they believed that they were properly practicing group work in the classroom. While I interviewed teachers and students' respondents and observed their classroom in natural setting, I found that teachers were not created any group work while solving mathematical problems. That's' why they had not done any practice of group work mixing students according to their ability and sex. However, teachers who participated in interview were sensitive that group work would be better for students' cooperative learning, that enhanced students learning but they reported congested classroom and heavy course structure did not help them to conduct group work. The findings of this study are not consistent with the findings of previous studies by Mlama et al. (2005) that for encouraging student active participation in group work, group discussion, explorations, case studies etc. methods would be very effective.

In students' classroom activity, when I observed the classroom, it was found maximum interaction occurred within same gender group, only rare interaction happened between boys and girls. But in quantitative data maximum teachers believed "there is cooperative interaction between boys and girls in the classroom" with mean value M = 4.11. The majority of students also suggested that teachers in mathematics classroom have minimal or deficient practice to create collaborative and cooperative environment among students of both gender groups. Solar's inclusive pedagogy in mathematics education, Vygotsky's sociocultural theory, and Bussey and Bandura's social cognitive theory elucidate the inauspicious consequences of minimal practice of collaborative and cooperative practice on mathematics classroom with boys and girls. This theory revealed that learning should be conducted cooperatively for inclusive mathematics education (Solar, 1995). Likewise, Vygotsky socio-cultural theory emphasized the collaborative and cooperative environment for students' active participation in learning (Vygotsky, 1978). Moreover, social cognitive theory suggested that teachers should promote collaborative, cooperative or individualized learning and discourage comparative assessment of student's abilities (Eccles, 1989).

Moreover, the findings related that teaching approaches conducted by teachers emerged different picture in quantitative and qualitative data. Quantitative survey data of teachers explicitly mentioned that they are gender responsive in applying teaching approaches; they reported "I apply different teaching methods like as group work, group discussions, role plays, debates, pair work, explorations and practical conduct in classroom" with M = 4.14. Whereas the interviewed and observed data revealed that teachers dominating teaching approach in classroom was traditional teacher centered lecture methods, they were also practicing discussion, question-answer, demonstration, and somehow problem-solving approach in very minimum quantity. Hence, majority of teachers were not practicing gender responsive teaching methods for GRP practices in the context of Nepal. The findings of this study support the claim of study by Yuden et al. (2020) that the popular teaching approaches used by teachers were traditional lecture methods. The results aligned with Nabbuye (2018), indicating that most teachers favored traditional teacher-centered teaching methods over student-centered approaches.

For gender responsive pedagogical practices, educational technology allows time to teacher for individualized instruction to students who need help in specific area accordingly as each student have learning diversity. But in the context of Nepal, at Government school, there was less implementation of technology in classroom teaching; teachers have not sufficient knowledge of technology for teaching mathematics.

The quantitative data indicated that teachers believed they allocated sufficient time for girl students and those with limited speaking abilities to develop their responses and their empowerment. In another context, both quantitative and qualitative findings of this study indicated that teachers in their classroom activity did not give extra effort and time to encourage quiet and backward students especially girls. Majority of students reported and I observed that teachers mostly focused active and talent students (both boys and girls) who frequently ask clarifying questions, raise hands and show their classwork but students who were silent, did not show their work, and did not solve problems especially did not get any teachers' attention; some attention was observed only for formality. Teachers did not use any strategies for GRP practices for encouraging students, especially girls, to speak out and active participation. However, the major hindrance to participation of girls in STEM subjects is the lack of gender responsiveness in pedagogy applied by teachers in school (FAWE, 2008). The findings of the study indicate that girls would do better in mathematics if they were valued, motivated, and given sufficient basic mathematical concepts, then they improved their learning equally as boys. This analysis supports the liberal feminist theory that girls do equally as boys if both boys and girls get equal treatment in education; boys and girls were not different based on biology (Thompson, 2003).

***Practice on Assessment and Feedback.*** The quantitative data showed that the overall mean value for this component was (M = 3.68), which is greater than the test value of 3, yet ranked as the third lowest among the five components. Although, female teachers had a higher mean score than male teachers, whereas the mean difference was not significant statistically (P = .606 > 0.05) in the assessment and feedback of gender responsive classroom practices. A large number of teachers stated and believed that they were practicing gender responsive assessment and feedback with nine survey statements among ten survey statements. Some differences have been found through qualitative data through interviewed and observed data.

Qualitative data revealed that formative assessment is useful for teacher-student interaction, but in the context of government school of Nepal, participants in interview revealed that there was not any provision followed by mathematics teachers to improve performance and conduct motivational work for fellow or weak students either boys or girls after terminal assessment. Internal assessment was done just for formality and just like summative assessment. At that situation, teachers seem low or no sensitive for evaluating students' performance applying various assessment on the basis of gender competence. But in survey data teachers were not agreed on the statement "I do bother evaluating students' performance on various assessment based on gender competence" with mean value M = 3.57. These conditions concluded that in mathematics, teachers implemented gender-neutral assessment approaches rather than gender responsive assessment in classroom. This aligns with Götzmann and Bainton (2021) research indicating that gender-neutral approaches that impact assessment can create a new form of gender discrimination in classrooms. Different prior research studies (e.g., Chapin & Warne, 2020; Mlama et al., 2005; Njuguna, 2016) emphasize gender responsive assessment and feedback for GRP.

Majority of teacher participants (both male and female) reported that they were unable to provide sufficient feedback for each individual boy and girl students according to their specific learning needs and their own pace while solving mathematical problems. My observation also justified their view that teachers simply give some feedback and response for the students who asked with teachers, gender become no matter. Whereas in survey, maximum teachers reported that "I give equally intensive and constructive feedback to both boys and girls in learning mathematics" with mean value M = 4.31.

Likewise, the maximum interviewed teacher revealed that they were not practicing of taking and accepting feedback from students to improve their teaching in and out of classroom; they understood themselves through students' response in classroom activity. These results indicate that while teaching mathematics at secondary level, there is absence of providing adequate feedback at the time of teaching and after internal assessment for both boy and girl students to ensure each student's learning ability, learning pace, and to motivate and encourage towards mathematics. This finding resonates with the findings of Dorji (2020), there was also absence of adequate feedback for students both gender groups to ensure that they also understood the lesson and the activity.

**Students' Realization Towards GRP**

Student's realization towards teacher's behavior on GRP practices is discussed based on RQ4 as follows:

***RQ4: To What Extent Students Realize the Teachers' Behavior Towards GRP in Mathematics Classroom?*** Research question four involves researching a students' realization about teachers' GRP practices in mathematics classroom. It was mixed research questions; in the first step quantitative data were measured through survey questionnaire while as in second step qualitative data were measured through interview and classroom observation. In quantitative data, the overall mean value (M = 3.63) related to students' realization towards teachers' behavior about GRP practice was greater than average value 3. Explicitly students realize that their teachers have positive behavior and practice GRP well in mathematics classroom. Students thought their teachers' behavior in classroom is gender friendly.

Gender wise students' realization was also calculated to compare girls' and boys' realization towards teachers' behavior on the basis of GRP practices. The results showed that both boys and girls mean value was greater than average mean value 3 whereas, girls mean value was greater than boys, this difference was statistically significant ($P = .000 < 0.05$) with a small effect size ($g = .28$). This result indicates that boy and girl students' realization towards their teachers' behavior regarding GRP practices in mathematics classes was differed by gender. A large number of girls mostly believed that their teachers' behavior, is more gender responsive in comparison to boys. Even though, quantitative data indicates students have positive feelings and thought with their teachers' behavior but not total gender responsive behavior was found through qualitative data of this study; some gender lapses have been found through interview and observation.

Interestingly, only one statement (item) that describes about mixed sitting arrangement between boys and girls among 32 statements of survey data, the mean value was less than scale mean 3. The finding indicates there was no mixed sitting arrangement happens in classroom, similar results were also found through qualitative data, boys and girls were seated separately in different rows. Students reported there was no practice of mixed sitting arrangement happened in mathematics classroom looking at boys' and girls' specific needs, ability etc. Generally, their first school day determine their fixed seating place on which talent students, either boys or girls' seat always in first second benches. Both boy and girl students realized the absence of mixed seating arrangement in any classes after upper basic classes. Teachers were not paying attention for students' seating arrangement for the gender related quality interaction in mathematics classroom in Nepal. In this sense, Dorji (2020) reported that an overcrowded classroom seating arrangement may affect the quality interaction in classrooms with students.

Moreover, in another item (item 2) of survey data, they expressed that they were doing mathematical problems in mixed way between boys and girls but my observed data and maximum boys and girls students interviewed data revealed that their teachers did not conduct any group work mixing boys and girls together or in a single sex group in mathematics classroom. Likewise, students did not realize gender responsive mixed sitting arrangement and mixed group work in mathematics classroom for the cooperative learning. This resonates with prior studies by Terry and Thapa (2012), that girl students were seated only at back rows in the classroom. In such arrangement, girls are less participating in classroom activity unless teachers' special effort have been done (Mlama et al., 2005). Likewise, subject teachers has to arrange the seat so that both girls and boys equally participate and get equal opportunities in classroom interaction (Kahamba et al., 2017).

The findings of this study indicate that girl students mostly want to learn mathematics cooperatively in group, but boys want to learn mathematics individually. This aligns with Eccles (1989) research indicating that when teachers encourage cooperative learning over competition, and minimize the social comparisons of ability, girls have a stronger sense of efficacy and appreciation of mathematics. Likewise, Bussey and Bandura (1999) reached the results parallel to the findings of this study. They reported that girl students can perform better in cooperative learning environments rather than competitive. If a competitive environment happens in classroom that discourage girls' performance (Alkhadrawi, 2015). But what might be the underlying fact that both boy and girl students did not realize such environment through their mathematics teacher in classroom. The one of the reasons for this may be the teachers have lack of knowledge about girls and boys specific learning needs and absence of practicing GRP in classroom.

The qualitative data also revealed that mathematics teachers were not focused on teacher-student and student-student interaction and group work activities in mathematics classroom. But Vygotsky social constructivist learning theory was adverse in these consequences. This theory emphasized the collaboration and interaction for increasing students' learning (Vygotsky, 1978). In the same line, the critical theory also emphasized the group interaction, reported that after engaging in the dialectical process that increased the awareness and changes occurs (Turner, 1999). Since mathematics is a critical subject, that demanded group work and interaction but most of the teachers taught mathematics using traditional teacher centered approaches on which students did not get sufficient interaction opportunities.

In conversations with boy and girl students, they revealed that little bit interaction happened with different sex group mostly among high achiever boys and girls. Mostly in mathematics classroom, interaction happened within single sex group, girls with girls and boys with boys. They realized that if the teacher insisted on the mixed seating arrangements, then interaction between boys and girls would be increased.

Furthermore, gender stereotype also remains with students both male and female, they expressed that boys are mostly forward in questioning and answering, whereas only talent girls are involved in questioning and answering. Findings of this study also revealed that most of the weak or medium students did not realize that their mathematics teachers treat them according to their specific learning needs. Especially teacher valued the problem of talented students and motivated those students to choose optional mathematics. They demotivated and demoralized weak girls not to take optional mathematics, because they are weak in mathematics in the previous classes. This aligns with Chionidou-Moskofoglou and Chatzivasiliadou-Lekka (2008) research findings that girls are less involved in questioning since they have more hesitation. Likewise, teachers have higher expectations with high performing boys and girls rather than low performers. In line with the findings, Mensah et al. (2013) reported that teachers' positive attitude with mathematics impacts the positive attitude with students to study mathematics.

This finding of this study was not supporting the liberal feminist theory that reveals that both male and female should be treated equally, do not discriminate under the law because they were not differed biologically (Thompson, 2003). In a similar line, critical theory promotes gender justice, equity, and equality (Kincheloe & McLaren, 2011). The mathematics teacher has to teach mathematics by providing access to the mainstream, those who have marginalized or excluded in classroom (Stinson & Bullock, 2012). Likewise, for non-discriminatory classroom practices, teachers should use pedagogical practices that encourage equal participation (Solar, 1995, 2000) in mathematics classroom. In the context of Nepal, explicitly mathematics teachers taught mathematics by following gender equality in some manner while solving problems on the board. Unknowingly they mostly heard the voice of outspoken and dominant students (both boys and girls), submissive, shy, and backward students were ignored. Teachers paying less attention towards each students specific learning needs and does not promote students' autonomy, because of overcrowded classroom and heavy loaded course of mathematics in school mathematics of Nepal.

The interviewed and observed data of students revealed that they realized that their teachers were not aware regarding GRP in classroom. Not only girl students but also boy students reported that their teachers only focused and heard the voice of talent and outspoken students, they never heard the voice of weak and shy students and less valued them, they were ignored. Due to teachers' discriminatory behavior, weak girl students feel inferior, dominated and did not speak. Mostly girls were shy and submissive in classroom. Teachers practicing in classroom seem to focus on gender equality; not focusing on students' specific learning needs. They less focused on gender equity and justice. That's' why how teachers teach, interact, behave, and believe with their students would be more important in teaching rather than what they teach (Odiri, 2011).

Findings from this study also indicate that students both boys and girls had also gender stereotypical thought like as teacher that they perceive boys are active, talented, logical, and have better mathematical ability rather than girls. Boys reported that girls are first second position in class, but they are not talented in mathematics like boys. Likewise, girls themselves had less confidence with their mathematical ability that they were unable to solve problems as boys. The result supports the claim of Perez-Felkner et al. (2017) that boys perceives their mathematical ability to be stronger than girls whereas girls themselves underestimate their ability in mathematics learning. Social cognitive theory demonstrated that initially in perceived mathematical mind both boy and girl are not different but when girls started to lose confidence in their math ability then difference increasingly from boys at the time they reach at high school (Bussey & Bandura, 1999). Both boys and girls thought boys are better in mathematics due to their higher mathematical ability and creativity and girls succeed with their effort and memorization ability for solving mathematics. The results of the study aligned with the findings of previous studies (Samuelsson & Samuelsson, 2016; Sarouphim & Chartouny, 2017) that boy's success mostly due to high ability and girls success due to their effort in mathematics. Such gender stereotype thought is transformed through teachers to students, on which cultural stigma and gender stigma works.

Criticality between boys and girls might dependent upon the opportunity that obtained in family and schools. There is no doubt, both boys and girl students reported their realization that girls did not get sufficient time at home for practicing mathematics, due to the reason that girls are overloaded with household work. Moreover, they also reported that girls became more absent in school and hence, they become backward in mathematics. This finding was adverse with the liberal feminist theory that if girls have got same educational opportunities and are treated equally like as boys then they can do equally as boys (Enyew & Mihrete, 2018).

Students thought mathematics subject is difficult subject. One of the reasons might be that they did not have sufficient basic knowledge of mathematics. Another reason is that their teachers and seniors told mathematics is a difficult subject and teachers taught the lesson focusing on the contents of the textbook, but less prioritized the basic concepts. Frieire emphasized that mathematical concepts and problems should be connected in students' real life and real-world situations then students can relate to and make mathematical contents more relevant and engaging (Coben, 1997). Students also realize that their teachers taught them by traditional teaching approach mostly with the help of chalk and talk method. Teachers had limited practice of group work, but students had expectations if teacher taught them by forming group, then weak, shy, and submissive students would participate and interact more often.

Students reported that teachers were unable to teach by understanding their specific learning ability.

Medium or low performer students reported that teachers judged students through score and behave accordingly through their fixed mindset as first and second students are always talent in mathematics. Students were not assessing according to their ability; teachers were unable to assess diverse students by identifying their problems with the help of appropriate feedback.

Students interview also indicate that teachers never practice receiving feedback through students to improve their teaching process and they were unable to provide sufficient individual feedback for students while solving problems. Students also reported their teachers had not used any technology and teaching materials while teaching for the gender responsiveness. Students also reported that their teachers were unable to provide appropriate feedback after formative test, only asked weak students to learn more but they never show their mistake and improvement area. Interestingly, boys reported that their mathematics teachers have a fixed mindset that first second students are always talent and behave discriminatory behavior accordingly hence ranking system should be changed.

**Limitations of the Study**

The study employed a sequential explanatory mixed methods design. It holds the objectives for gathering quantitative and qualitative information to present the deeper understanding of mathematics teachers' GRP practices and students' realization towards teachers' behavior regarding GRP practices in secondary level community schools. Though considerable effort was made to minimize potentials limitations throughout the study, few limitations still remains. One of the limitations that exist regarding the population selection whereas teachers and students invited to participate in this study were from only one province of Nepal. As a result, the study's findings cannot be generalized to the entire country of Nepal.

Another limitation of this study was the selection of teacher and student respondent for qualitative parts of the study. Since for interview and classroom observation, I had selected a restricted number of respondents only from Kathmandu district, based on purposive sampling approach. Hence, I was unable to compare the view of respondents of different locations like rural and urban settings and one district to another district, that were selected in quantitative phase.

Another limitation was the significant disruption to data collection caused by the COVID-19 pandemic during the 2019-2020 and 2020-2021 academic years. Due to such unforeseen circumstances, the timeline of this research is expanded rather than its initial projection. The government of Nepal done pervasive lockdowns and all of the school shuttering their doors that automatically hindered the process of data collection and accumulation and hence of the dissertation’s submission.

Another limitation of this study was that I was unable to conduct case study design for the second qualitative part of this study for in-depth understanding of the participants. Only mathematics teachers and students’ voices and their classroom observation were limited in this study. Even though teachers and students themselves were able to report their feelings about their GRP practices but there was limited option of responses to elaborate on the validity and rationality of the study. But this study would have benefited if data were collected through focus group discussion of teachers and students and interviews with head teacher, parents and other stake holders. The views of these people would add more insights and value for the study.

Another limitation of this study was that data were collected solely from community secondary schools, whereas majority of students in Nepal attend at institutional (private) schools. That's why, this study did not cover the voices of mathematics teachers and students who were teaching and learning at institutional school in Nepal and hence generalization was also limited.

# Chapter VII

## Conclusion, Implications, and Future Directions

This chapter presents conclusion of the dissertation, drawing on the findings detailed in Chapters IV and V. It highlights the implications derived from these findings, overall reflections of my study, and outlines potential directions for further research in a concise manner. The discussion integrates results from both quantitative and qualitative data, as well as insights informed by my own personal experience.

### Conclusion of the Study

Although secondary level mathematics teachers in Nepalese classroom have partial awareness about GRP; majority of them were unable to choose actual meaning of GRP. Eventually, in physical appearance, in outer layer, teacher's GRP practices and student's realization towards teachers' behavior regarding GRP practices has existed and is good in classroom environment, but exhibition of their GRP ingredients in classroom and learning support are not perfectly utilized. The actual practice of GRP in mathematics instruction remains inconsistent and limited. In inner layer, there are ample issues such as gender stereotype, cultural stigma, gender stigma, masculinity and femininity prevalent with teachers, even in female teachers, students even in girl students, and even in the community that could implicitly impact in implementing GRP in classroom teaching and keeping high expectation from the girl students.

Explicitly, many mathematics teachers acknowledge the need of gender responsive practices to address gender disparities and improve learning outcomes in mathematics subject. However, the practical application of these principles is often hindered by different factors such as insufficient professional development opportunities regarding gender, lack of supportive resources, traditional classroom set up, and deeply ingrained gender biases in schools and in social and cultural norms.

The key findings of this study reveal that, at present, mathematics teachers are not implementing mixed seating arrangements. Although such arrangements were used in the past, they were found to be unsuitable for Nepalese classrooms due to cultural, social, and biological challenges among students. Nevertheless, both teachers and students expressed positive feelings towards mixed seating classroom set up and demanded such classroom set up to promote gender responsive classroom practices. Such type of traditional classroom organization in community schools may not adequately address the gender specific needs of students, particularly girls, which in turn hampers the classroom interaction among students of both gender groups. There is a vast gap found between the practices of classroom organization in Nepalese secondary school and the theory of gender responsive classroom organization developed in international countries. At that situation, there is need an alternative seat like as chairs-tables instead of desk-bench arrangements in schools' classroom in Nepal.

Moreover, among eight mathematical content areas Geometry and Trigonometry are perceived as the most challenging and least satisfying content areas of secondary mathematics by both gender groups, with no significant gender differences in levels of dissatisfaction. While conceptual understanding and difficulties with theorem proofs were commonly identified challenges, boys generally exhibited a more positive attitudes toward Geometry due to its logical nature. These insights underscore the imperative for instructional interventions aimed at strengthening foundational geometric understanding and facilitate the accessibility of abstract reasoning to all students. Likewise, GRP strategies are essential to promote equitable engagement and reduce perceived difficulty on Geometry, particularly among girls, therby advancing gender responsive mathematics education.

Gender sensitivity consciousness seems high in all teachers and students, but creating favorable environment for gender equality and equity is difficult to see in their classroom practices. For that, different gender stereotypes, stigma, and beliefs inherent in practice, in hidden aspects among teachers and students as ‘boys have creative and logical mathematical mind, but girls have bookish knowledge. Likewise, girls do better in mathematics due to effort, but they are backward in logical mathematical mind. One of the reasons behind that might be the fixed mindset with teacher and student as boys are always better in mathematics than girls. Another reason might be the stereotypical, cultural, and social thought that girls only had to do household work, that impact girls for practicing the problem of mathematics. Logicality and creativity might be connected to opportunity obtained by either boys or girls. Moreover, it is needed to empower girls from previous classes by reinforcing the belief and their ability that they can do mathematics equally and efficiently as boys. Likewise, individualized instruction is necessary based on boy and girl students' specific learning needs to enhance learning in mathematics.

Although teachers are often viewed as gender responsive, but actual classroom practices and social contexts reveal a discrepancy between perception and reality. In this manner, students realize and report a lack of gender responsive strategies like mixed seating arrangements, mixed gender-collaboration, group works, with learning environments favoring high-performing students, disproportionately affecting girls who have lack of confidence and receive less support and encouragement. Additionally, external gender bises, especially within the home, girls get comparatively less time to study, they are overloaded due to household chores. Hence, there is a need to encourage, support, give value, motivate, and provide more time for those girls for learning mathematics based on their specific gender needs. Unhealthy biasedness among talent and weak students needed to be discouraged while teaching mathematics in classroom. It concludes that achieving gender responsiveness in mathematics education requires addressing not only perceived equality but also address practical classroom dynamics, differentiated support, and social barriers outside of school, that enhances gender equity.

The research highlights that the integration of GRP in mathematics can significantly enhance students' engagement, performance, and educational outcomes particularly for girls, who have traditionally been under-represented and marginalized in this field by fostering an inclusive and equitable learning environment. Teachers who are trained in gender responsive approaches report improved classroom dynamics and more equitable interactions with students. Nonetheless, there remains a substantial gap in the widespread implementation of these practices, largely due to a lack of consistent GRP policy support and institutional commitment.

Despites these benefits, numerous challenges persist, existing policies and interventions developed by Nepalese government are predominantly prioritized girls, but still lack of GRP policy development. This study found no systematic and comprehensive teacher training programs specifically focused on gender responsiveness in mathematics, and a need for stronger policy support to institutionalize these practices. Hence, to advance GRP in Nepal, it is crucial to focus on comprehension awareness and teacher training programs, invest in targeted professional development for educators, develop and disseminate gender sensitive teaching materials, develop strategic framework, and develop and foster a GRP policy framework that promotes gender equity in mathematics education. In such case, there is need to arrange community awareness training about the importance of GRP and gender equality and equity in education.

This study concludes that while mathematics teachers in Nepal demonstrate a basic level awareness and self-reported implementation of GRP, their actual classroom practices frequently do not reflect this understanding. A significant gap exists between their perceived understanding and the consistent, meaningful application of GRP strategies in actual classroom practices. Strengthening both teachers' conceptual grasp of GRP and their practical skills is crucial to fostering genuinely gender responsive mathematics education in Nepalese classrooms. Ultimately, the potential of GRP to transform mathematics education in Nepal is promising; however, realizing its full impact will require a coordinated effort among policy makers, educators, and educational communities to address existing barriers and implement effective solutions.

**Implications of the Findings**

This study is the first to explore mathematics teacher’s awareness and practices of GRP, as well as students’ realization towards teachers’ GRP related behaviors and mathematical content preferences in Nepal. The findings have the potential to enhance the continued understanding and implementation of GRP in mathematics education across the country. The findings of this study would allow various implications for the policy makers, curriculum designers, school administration, class teachers and students. Likewise, the findings of the study could contribute to implement GRP in teaching mathematics that would empower students who have specific needs in learning mathematics.

The findings of this study could lead to development or strengthening of national policies that support GRP in mathematics in school education. Likewise, policies should be developed to address both boys and girls specific learning needs, students’ involvement in technology, and other cultural and social factors that hindering learning. Educational policies regarding GRP would ensure gender equity, gender equality, and students' empowerment. Effective implementation and monitoring mechanisms would be necessary to ensure that policies promoting gender-responsive practices are adhered to in schools across Nepal.

The government of Nepal may promote GRP across the school curriculum in all subjects. Additionally, for curriculum developers, this study would be helpful to develop gender responsive curriculum to improve students’ involvement and participation and ultimately to improve students’ achievement in mathematics. This study may helpful for curriculum designer for developing curriculum by understanding students’ preferences and enjoyment area of mathematics. Consequently, there exist an urgent need to examine the school level textbooks approved by the government of Nepal, keeping GRP in mind. Additionally, GRP should be integrated into teachers’ guides and training materials to effectively support teachers in implementing GRP strategies in their actual classroom instructions.

The research findings of this study underscore the pressing requirement for trained teachers for practicing GRP in mathematics classroom properly. Hence, the need for comprehensive teacher training programs focused on GRP would be highlighted. Teachers should be trained for developing GRP planning and implementing in mathematics classroom, for this purpose sufficient training programs are needed. Likewise, professional development initiatives should equip teachers with the skills and knowledge to implement gender sensitive teaching strategies effectively. Tutors and mentors of school education should be regularly trained in regard to GRP practices. They might guide and assist their teachers to apply GRP and for students to realize its use in classroom. Continuous support and resources for teachers would be essential to continue and sustain GRP practices. In that situation, mathematics teachers could adopt and incorporate GRP in their teaching learning process and create gender responsive learning environment. That would be benefitable for all students to learn mathematics confidently in a fearless environment. Then they perceived mathematics as an enjoyable subject.

To reduce gender bias and to participate each and every student in mainstream of the mathematics education, each teacher should have the knowledge of GRP practices. Therefore, there is need to understand GRP and implement it while teaching mathematics in the classroom. Teachers need to understand each boy and girl students' specific learning needs and their specific abilities then they would be able to encourage and motivate every student in learning mathematics. Moreover, there might be a need for professional development or training opportunities for teachers to enable them to understand gender and gender responsive pedagogy. Then they may apply GRP in their daily teaching practices that would be beneficial for each student, especially backward students who have problems in learning mathematics. For properly implementing GRP in mathematics classroom teachers, students, schools, and even society should emit stereotypes, stigma inherent in teaching and learning mathematics.

By addressing gender biases in mathematics education, the research study could contribute for narrowing gender gaps in students' achievement and participation in mathematics fields, benefiting both girls and boys. GRP can encourage greater participation of girls in mathematics and other related fields, potentially leading to increased representation of female in mathematics professions. Moreover, students, particularly girls, could experience more equitable and engaging learning environments, which may lead to better academic performance and greater interest in mathematics. GRP could empower students by providing them with role models and a curriculum that reflects their experiences and potential.

The findings of this research contribute school administrations and class teachers for gender responsive classroom organization that play vital role to develop teacher- student and student-student interaction and collaborative learning in friendly environment. Students have realized that mixed sitting arrangements between boys and girls would be helpful for interaction and for implementing group work and for collaborative learning in gender friendly environment. Hence, gender responsive teachers were found to play a vital role in improving teaching by understanding students' specific learning needs. This study would help to improve classroom set up in gender responsive way that enhance each student's active participation in learning.

Another implication related to the findings of this study is the necessity for mathematics teachers to teach mathematics with understanding each student's basic mathematical knowledge to motivate and encourage students, especially weak girls in learning mathematics. The prevailing disparities remain in encouragement and support between boys and girls, most of the girls need encouragement and support through teachers hence teachers had necessity to give equal value of each boy and girl, each weak, medium, and talent students while teaching mathematics. Teachers' lack of or limited knowledge and understanding of the concept of GRP is problematic because there are diverse students found in each classroom in Nepal.

An implication of the findings is the necessity to enhance teachers' gender responsive knowledge and practice ability. Students are the central component of the educational process, for whom gender responsive teaching and learning activities hold paramount importance. If students (either male or female) feel disparity while learning mathematics, the efficacy of these activities' falters. Consequently, teachers require knowledge of GRP that would be enriched through their professional development based on gender. Additionally, teachers can enhance their GRP knowledge and practice by valuing each level students weak or talent, boy or girl, focusing each learner's diversity, remove the stereotypical thought, focusing child centered teaching process. Thus, teachers may be encouraged and motivated to practice GRP properly while teaching. Another implication is to encourage collaboration and collegiality with teachers and students like wise with boy and girl students in promoting GRP in school education for gender equality.

The above implications highlight the potential for GRP to influence various aspects of the educational landscape in Nepal, from policy and practice to community attitudes and student outcomes in mathematics. Implementing and supporting these changes can contribute to a more equitable and effective education system in Nepal.

**Overall Reflections of the Study**

This sub-section gives a brief account of my reflections regarding students' ciontent preferences, teachers' GRP practices, and students' realization towards teachers' behavior.

This study reflects the significance of explanatory sequential mixed research design by integrating both quantitative and qualitative data to gain a comprehensive understanding of teachers' and students' experiences. While statistical analysis provided valuable insights into overall trends, qualitative data — specifically teachers' and students' narratives and classroom observation offered crucial contextual depth regarding GRP.

This study highlights the pivotal role of conceptual understanding in shaping students' attitudes and perceptions towards specific content areas in mathematics. If they do not understand basic concepts of any mathematical content areas, they will not find true joy behind it. In particular, Geometry emerges as a subject that suffers from discontinuities in learning progression, leading to widespread difficulty and challenges across genders. Boys observed its' logicality, it is good, furthermore both of them, especially girls' engagement could be enhanced through instructional strategies that leverage logic-based, visual, and interactive methodologies. This underscores the importance of GRP, not only in addressing performance disparities, but also in fostering equitable and inclusive learning environments in mathematics. A more supportive approach in Geometry could mitigate anxiety, enhance understanding, and foster greater appreciation of its value among all students.

Moreover, this study offers valuable insights into how students and teachers perceive the relevance of different mathematics content areas, with Arithmetic recognized as the most valued for real-life application. The integration of quantitative and qualitative data provides a detailed understanding of gender-based perceptions toward the importance of different mathematics content areas, emphasizing the need for curriculum design and pedagogical approaches that reinforce contents based on real-life connections and practical based.

The research uncovers a critical gap between teachers' perception of gender equity and its practical realization within actual classroom settings. It contributes to understanding that teacher fairness does not automatically result in gender equitable outcomes for all students. Hence, fairness alone is insufficient without deliberate, context-sensitive strategies. Many teachers fail to implement gender responsive strategies, that support both girls and boys equitably, particularly girls and underperforming students who may require more targeted support and more encouragement while studying mathematics. This notion suggests that a GRP practices of teachers in Nepal is at a surface-level; highlights significant gap between teachers' understanding of gender responsive policies and their actual implementation in the classroom. Moreover, deep-rooted gender stereotypes and cultural stigmas continue to shape the classroom participation, particularly disadvantaging girls in mathematics education. By recognizing these implicit biases, highlighting the urgent need for more practical, policy-level interventions, and professional development training for teachers, reflective practice, robust monitoring and support systems that fosters truly gender responsive pedagogical practices and underlying gendered beliefs. This research calls for a more transformative and reflective approaches for implimentig GRP in Nepalese mathematics classroom.

By integrating teachers and students' voices and performance data, this study advocates for structural changes in classroom practices. The study highlights the necessity of implementing gender-responsive strategies such as mixed seating arrangements, collaborative group work, and differentiated teaching approaches that support all students, especially those who are less confident or underperforming in mathematics. The study points out how sociocultural expectations at home such as assigning girls more domestic duties, directly impact on their classroom engagement and academic performance. This realization points to the urgent need for community-level awareness and engagement to address educational inequilities holistically. Likewise, this study calls attention to the empowerment of girls in mathematics by building their confidence through sustained encouragement, equal participation opportunities, and mentorship that helps them overcome internalized stereotypes and external limitations. Finally, the study calls for a shift from surface level perceptions to deeper structural and pedagogical changes to ensure equitable learning opportunities for all students in mathematics.

**Directions for Further Research**

This study was conducted to explore teachers GRP awareness and practice as well as students' realization towards teachers' GRP practices at secondary level in Nepal. This design of the study was sequential explanatory mixed research design and hence data were gathered through questionnaires for survey, whereas, semi-structured interviews, and classroom observation for qualitative phase. This is the investigation on secondary schools within four districts of Bagmati Province of Nepal. In the first instance, a potential area for further research involves a quantitative approach encompassing all Provinces of Nepal within a larger sample size, to extend the applicability of findings, that would add more insights and relevance for a clear picture of this study.

Another direction is to conduct similar study again because gender related matters are changing in a rapid pace. Further, research necessitates a triangulation of GRP awareness and practices including survey with teachers and students, teachers' classroom observations, focus group discussion with teachers and students and interviews with parents, school principals, and policy makers that would add more insights and relevance for clear picture of the study. This study also recommends the other researchers to conduct similar study on GRP practices in a larger scale covering all provinces of Nepal and in other developing countries. Moreover, institutional schools should be incorporated by further researchers in similar studies to compare GRP practice situation of community schools and institutional schools. There is also recommendation to conduct future research on GRP awareness and practice at all levels of school education including higher education at all subjects, not only mathematics, to address gender inequality. Likewise, to evaluate the effects of current education policies regarding gender, it is essential to conduct a comprehension policy analysis study.

The findings of this study demonstrated teachers did discrimination among talented and weak students in mathematics in favor of talent students either boys or girls. That's why, it is needed to conduct such type of study among mathematics teachers why they show such behavior in classroom; it could be the study area. Likewise, the study found that mostly girl students are engaged in household work and they have limited time for practicing mathematics. But mostly girls appeared in first second position in ranking in community school. So, there is need for further study to explore which factors support them being forward in learning mathematics.

Furthermore, the findings of this study indicate different stereotypes and stigmas prevalent with teachers, students, and even community that implicitly impact GRP practices in mathematics classroom. Hence, it suggests the need for conducting further research to identify how such stereotypes and stigmas would be emitting from the side of all teachers, students, and community.

Furthermore, I have recommended prospective researchers to explore the development and impact of gender sensitive mathematics curricula and teaching materials. Further research should evaluate how specific materials and resources contribute to reducing gender discriminations and improving student engagement and performance. Likewise, another recommendation is to examine the role of educational policies in promoting or hindering the adaptation of GRP in mathematics. Further research should focus on gender related policy's effectiveness, gap, and strategies for better policy implementation and supports.

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# Appendices

## Appendix A: Survey Questionnaires for Teachers

*Respected Sir/Madam*,

I am conducting my Ph. D research on the topic 'Gender Responsive Pedagogy in Mathematics: A Practice in Nepal' at The Graduate School of Education, Faculty of Education, T.U. Kirtipur, Kathmandu. I am very much interested to know your opinion towards Gender Responsive Pedagogy (GRP) awareness and practice in your teaching learning process. The truthful information you provide would be of great value to my research. Please be assured that the information you provided will be kept confidential and used only for my research purposes.

### *Part I: About You*

Please tick (√) one appropriate answer or provide written answers.

Name: (optional)……………………………………….

1. Gender:

a) Male b) Female c) Other

2. School's name and District ……………………………………………

3. Qualification:

a) Bachelor's degree b) Master's degree c) M. Phil d) Ph.D. e) Others…

4. Teaching Experiences:

a) Less than 5 years b) 5-9 years c) 10-14 years d) More than 14 years

5.Job Category:

a) Permanent b) Temporary

### *Part II: Content Preferences*

A) How satisfied are your students with the difficulty of content areas in mathematics? (Tick (√) any one options from the following)

| Content (Area) | Extremely Satisfied | Very Satisfied | Moderately Satisfied | Not Very Satisfied | Dissatisfied |
|---|---|---|---|---|---|
| Set | | | | | |
| Arithmetic | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| Mensuration | | | | | |
| Algebra | | | | | |
| Geometry | | | | | |
| Trigonometry | | | | | |
| Statistics | | | | | |
| Probability | | | | | |

B) Rate the following details of contents important for your students in their future life. (Tick (√) any one option)

| Area | Contents | Very Important | Important | Moderate Important | Little Important | Unimportant |
|---|---|---|---|---|---|---|
| Set | Relation of group in Venn diagram | | | | | |
| | Cardinality of sets and solution of words problems | | | | | |
| Arithmetic | Profit and loss related problems | | | | | |
| | Commission, discount, tax, dividend related problems | | | | | |
| | Household related arithmetic | | | | | |
| Mensuration | Area and volume related to cube, cuboid, prism | | | | | |
| | Find area of real field or objects | | | | | |
| | Project work related to real life situation | | | | | |
| Algebra | Factorization / solving equation | | | | | |
| | Exponential equation | | | | | |
| | Ratio and proportion | | | | | |
| Geometry | Geometric construction | | | | | |
| | Experimental equations | | | | | |
| | Theoretical proof | | | | | |
| Trigonometry | Trigonometric relation on triangle | | | | | |
| | Solving trigonometric problems | | | | | |
| Statistics | Central tendency | | | | | |
| | Graphical representation | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Probability | Estimation of empirical probability | | | | | |
| | Probability of an event | | | | | |

*Part III: Gender Responsive Pedagogy in Mathematics*

### A) Teachers' Awareness Towards GRP

| Which is the correct meaning of "Gender Responsive Pedagogy"? (Tick (√) one of the correct answers) | | |
|---|---|---|
| 1. | Consider differences among categories of students | |
| 2. | Teaching that gives opportunities and preferences to women | |
| 3. | Teaching and learning process that pay attention to specific learning needs of boys and girls | |
| 4. | Gender sensitive in classrooms | |
| 5. | Incorporating culture in teaching/learning process | |
| 6. | Gender inclusive teaching | |
| 7. | Don't know about gender responsive pedagogy | |

### B) Practices of GRP in Mathematics Classroom
### [Please tick (√) only one of the right boxes in each of the tables below.]

***I. Teacher-Student Interaction***

| S. N | Statements | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree |
|---|---|---|---|---|---|---|
| 1. | I encourage boys more than girls to improve performance in mathematics since the course mathematics suits boys more than girls. | | | | | |
| 2. | Girls in my classroom remain passive respondents, compared with boys. | | | | | |
| 3. | I devote more time to encouraging girls than boys in mathematics classroom. | | | | | |
| 4. | I give special attention to students especially girls with their special needs (menstruation, disabled, social circumstances etc.). | | | | | |
| 5. | I allow boys more chance than girls to answer questions in my classroom. | | | | | |
| 6. | I allow consultation with girl students in case of a need for further clarification and support in solving mathematical problems. | | | | | |
| 7. | My classroom practices encourage both girls and boys to respect other genders. | | | | | |
| 8. | I demystify mathematics through more than one solution and more than one process to motivate girls in mathematics. | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 9. | Girls are more interactive than boys in my mathematics classroom. | | | | | |
| 10. | Boys draw teachers' attention by calling out more or behaving more conspicuously than girls. | | | | | |
| 11. | Boys get more opportunities than girls to solve mathematical problems on the blackboard/whiteboard in my classroom. | | | | | |
| 12. | Girls are likely to be praised more for the outward appearance of their work. (Examples: neatness, obedience toward teachers' directions, beauty etc.) in my classroom. | | | | | |
| 13. | Boys are more likely to be praised for the intellectual quality of their work. | | | | | |
| 14. | Boys dominate more opportunities for interaction with teachers than do girls in all forms of response. | | | | | |
| 15. | I only encourage boys to choose mathematics for further study. | | | | | |
| 16. | I regularly communicate with class through gender neutral class representation. | | | | | |
| 17. | I ensure that both boys and girls speak out and participate actively during the lesson. | | | | | |
| 18. | I tell the answers to girls directly and more frequently, but I guide boys more so that they can solve mathematical problems on their own. | | | | | |
| 19. | I also ask girls high cognitive-level questions paying attention to all students regardless of sex, race, age, etc. | | | | | |
| 20. | I address boys and girls equally often and with equally stimulating demands. | | | | | |
| 21. | When a girl performs better in mathematics than a boy in my class, it creates problems for me. | | | | | |
| 22. | I allow sufficient time for students to answer or ask questions, especially girls who may be shy or afraid to speak out in classroom activity. | | | | | |
| 23. | Boys have more frequent and academically challenging interactions with me than girls. | | | | | |
| 24. | Boys answer by calling out without being called on by teachers more than girls do during a lesson. | | | | | |
| 25. | Girls appear more ashamed than boys when responding with wrong answers in questions. | | | | | |
| 26. | Girls take a little more time to think about answers and respond than boys when questions are asked in classroom. | | | | | |
| 27. | More girls ask me questions first than boys do during a lesson. | | | | | |
| 28. | I am valuing girl's intuitions and emotions as opposed to rationality and objectivity. | | | | | |

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|---|---|---|---|---|---|---|
| 29. | I ask questions to boys first in the classroom then later on I only ask to girls. | | | | | |

## *II. Language Used*

| S.N | Statements | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree |
|---|---|---|---|---|---|---|
| 1. | I use written and spoken language, which is gender neutral in my classroom. | | | | | |
| 2. | I use both verbal and non-verbal language in the classroom that can discourage and demotivate girls from performing well in mathematics. | | | | | |
| 3. | My harsh language in classroom can cause students, especially girls, to become fearful from mathematics. | | | | | |
| 4. | I express that girls cannot perform similar to boys in mathematics, or that boys should not allow themselves to be outperformed by girls academically. | | | | | |
| 5. | I ensure equal use of the pronouns “he” for boys and “she” for girls in mathematics classroom. | | | | | |
| 6. | I use verbal and written language that respects the experience and diversity of girls that increase their classroom participation in mathematics. | | | | | |
| 7. | I always use encouraging, inclusive, and gender responsive language in mathematics classroom that treats boys and girls as equal partners and provides a conducive learning environment for them. | | | | | |

## *III. Teaching Materials*

| S. N | Statements | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree |
|---|---|---|---|---|---|---|
| 1. | I consider both female and male authors and researchers equally when giving reference to students while teaching. | | | | | |
| 2. | I obtain and use instructional materials (examples, pictures etc.) which are gender neutral in my lessons. | | | | | |
| 3. | There are gender biased illustrations and examples in mathematics textbooks and other resources. | | | | | |
| 4. | Awareness about the gender-stereotyped issues should be incorporated into all school subjects. | | | | | |
| 5. | I do not add any interpretations and examples to capture gender responsiveness whenever there is a gender biased illustrations and examples in textbooks and other resources. | | | | | |
| 6. | In mathematics textbook, mathematical illustrations and examples only include | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | males name and character more than female. | | | | | |
| 7. | I describe mathematicians and scientists as both males and females, valuing their intuition and emotions. | | | | | |
| 8. | I always use gender non-stereotypical materials in my classroom. | | | | | |
| 9. | I explain to students the construction of mathematical materials and their use in society. | | | | | |

### *IV. Teachers' Classroom Activities*

| S. N | Statements | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree |
|---|---|---|---|---|---|---|
| 1. | I take initiatives to establish groups by students themself to ensure gender representation. | | | | | |
| 2. | I use mixed seating arrangements for both boys and girls in mathematics classroom. | | | | | |
| 3. | I do not divide students into different groups for cooperative learning by equal gender representation in my classroom activity. | | | | | |
| 4. | I usually give girls an opportunity to relate volume to capacity through questions and answer techniques. | | | | | |
| 5. | I set up a classroom that mixes girls and boys to enhance participation of both. | | | | | |
| 6. | I arrange the desks that encourage girls to speak out and overcome their shyness and hesitation. | | | | | |
| 7. | I highly include boys in classroom discussion related to mathematical problems rather than girls. | | | | | |
| 8. | I distribute questions to the whole class and ensure that each student participates equally. | | | | | |
| 9. | I ensure the mixed groups in classroom on which boys get more opportunity to talk and to lead the discussion. | | | | | |
| 10. | I initiate girls to become group leader equally as boys in the group work in classroom. | | | | | |
| 11. | I encourage both girls and boys to solve mathematical problems and to present the results they found in the classroom. | | | | | |
| 12. | I follow strategies to make passive students participate and be active more in the group activities by allocating and rotating specific roles in a group. | | | | | |
| 13. | I apply different teaching methods like group work, group discussions, role plays, debates, pair work, explorations and practical conduct in classroom. | | | | | |
| 14. | I provide sufficient time for female students or those students lacking in | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | speaking ability to develop their responses. | | | | | |
| 15. | There is cooperative interaction between boys and girls in the classroom. | | | | | |
| 16. | I enhance group dynamics by composing of group members heterogeneously by ability, motivation, sex, etc. | | | | | |
| 17. | I encourage both girls and boys to carry out the same activities. | | | | | |
| 18. | I try to discourage gender stereotyped behavior in my classes. | | | | | |
| 19. | I give more effort and time to girls to learn mathematics in classroom than boys. | | | | | |
| 20. | I let chance for girls to solve mathematical problems by themselves. | | | | | |
| 21. | I assign exercises of mathematics that encourage girls to speak out. | | | | | |

***v. Assessment and Feedback***

| S. N | Statements | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree |
|---|---|---|---|---|---|---|
| 1. | I do bother evaluating students' performance on various assessments based on gender competence. | | | | | |
| 2. | I give equally intensive and constructive feedback to both boys and girls in learning mathematics. | | | | | |
| 3. | I provide more specific feedback to boys on their responses (Examples: praise, criticism, correction, etc.) than girls. | | | | | |
| 4. | I always praise especially girls for their successes, as well as positive, constructive feedback to improve their performance in mathematics. | | | | | |
| 5. | I rate boys' proficiency in mathematics higher than girls with equal test scores and similar classroom behavior. | | | | | |
| 6. | Boys remain more confident of their mathematical abilities relative to girls with equal test scores. | | | | | |
| 7. | I provide feedback to girls on the quality of performances but to boys on the appearances of performance | | | | | |
| 8. | I am encouraged and willing to accept feedback from the students to improve my teaching process. | | | | | |
| 9. | I follow up on the students with poor performance after assessment results. | | | | | |
| 10. | When individual classwork is assigned to students during a lesson, I check the performance of boys more frequently than that of girls. | | | | | |

**Thank you**

## शिक्षकहरूको लागि सर्वेक्षण प्रश्नावली

*आदरणीय सर/म्याम,*

म ग्रेजुएट स्कूल अफ एजुकेशन, शिक्षाशास्त्र संकाय, त्रि.बी ,.कीर्तिपुर, काठमाडौंमा 'गणितमा लैंगिक उत्तरदायी शिक्षण: नेपालमा एक अभ्यास' (Gender Responsive Pedagogy in Mathematics: A Practice in Nepal) शीर्षकमा पीएचडी अनुसन्धान गर्दैछु। म, शिक्षण/अध्ययन प्रक्रियामा Gender Responsive Pedagogy (GRP) awareness and practice प्रति तपाईंको राय जान्न धेरै इच्छुक छु। तपाईंले प्रदान गर्नुभएको सहि जानकारी मेरो शोध अनुसन्धान को लागि अमूल्य हुनेछ। तपाईंले प्रदान गर्नुभएको जानकारी गोप्य राखिनेछ र मेरो शोध अनुसन्धान उद्देश्यको लागि मात्र प्रयोग गरिने कुरा आश्वस्त पार्न चाहन्छु।

***भाग एक: तपाइँको बारेमा***

कृपया ठिक उत्तर मा रेजा (√) लागाउनु होस वा लिखित उत्तरहरू प्रदान गर्नुहोस्।

१. नाम: (ऐच्छीक) ..............................................

२. लिङ्ग: क.पुरुष ख. महिला ग. अन्य

३. विद्यालयको नाम र जिल्ला:...............................................

४. योग्यता:

क .स्नातक ख. स्नातकोतर ग .एम फिल घ. पीएचडी ङ .अन्य ............

५ . शिक्षण अनुभव:

क .५ वर्ष भन्दा कम ख .५ देखि ९ वर्ष ग .१० देखि १४ वर्ष घ .१४ वर्ष भन्दा माथि

६ .रोजगारीको प्रकृति : क.स्थायी ख .अस्थायी

***भाग दुई: बिषयबस्तुको प्राथमिकता***

क :तपाईंका विद्यार्थीहरू गणितको बिषयवस्तुको कठिनाई स्तर प्रति कतिको सन्तुष्ट छन्? तल दिइएका ५ विकल्पहरु मध्ये कुनै एकमा रेजा (√) लगाउनुहोस्|

| बिषयवस्तु (क्षेत्र) | अत्यन्त सन्तुष्ट | धेरै सन्तुष्ट | मध्यम सन्तुष्ट | धेरै सन्तुष्ट छैन | असन्तुष्ट |
|---|---|---|---|---|---|
| समूह | | | | | |
| अंकगणित | | | | | |
| क्षेत्रमिति | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| बीजगणित | | | | | |
| ज्यामिति | | | | | |
| त्रिकोणमिती | | | | | |
| तथ्याङ्क शास्त्र | | | | | |
| सम्भाब्यता | | | | | |

ख: तपाईंका विद्यार्थीहरूको भबिस्यका लागि पनि महत्त्वपूर्ण हुने बिषयबस्तुहरूको निम्न विवरणहरूलाई स्तरीकरण गर्नुहोस्। कुनै एक विकल्पमा रेजा (√) लगाउनुहोस् |

| क्षेत्र | बिषयवस्तुहरु | धेरै महत्वपूर्ण | महत्त्वपूर्ण | मध्यम महत्वपूर्ण | न्युन महत्त्वपूर्ण | महत्वहीन |
|---|---|---|---|---|---|---|
| समूह | भेन चित्रमा समूहहरुको सम्बन्ध | | | | | |
| | समुहहरूको गणनात्मता र शाब्दिक समस्याको पहिचान र समाधान | | | | | |
| अङ्क गणित | नाफा र नोक्सान सम्बन्धि समस्याहरु | | | | | |
| | कमिसन, छुट, कर, लाभांश सम्बन्धि समस्याहरू | | | | | |
| | घरायसी अंकगणित | | | | | |
| क्षेत्रमिति | घन, षडमुखा, र प्रिज्मसँग सम्बन्धित क्षेत्रफल र आयतन | | | | | |
| | वास्तविक क्षेत्रको वा वस्तुहरूको क्षेत्रफल पत्तालगाउने | | | | | |
| | वास्तविक जीवनका अवस्थाहरुसंग सम्बन्धित परियोजना कार्य | | | | | |
| बीज गणित | खण्डिकरण / समीकरणको हल | | | | | |
| | घाताङ्कयुक्त समीकरण | | | | | |
| | अनुपात र समानुपात | | | | | |
| ज्यामिति | ज्यामितीय रचना | | | | | |
| | प्रयोगात्मक समीकरणहरू | | | | | |
| | सैदान्तिक प्रमाण | | | | | |
| त्रिकोणमिती | त्रिभुजमा त्रिकोणमितीय सम्बन्ध | | | | | |
| | त्रिकोणमितीय समस्याहरूको समाधान | | | | | |
| तथ्याङ्क शास्त्र | केन्द्रीय प्रवृत्ति | | | | | |
| | ग्राफिकल प्रतिनिधित्व | | | | | |
| सम्भाव्यता | प्रयोगाश्रित सम्भाव्यताको अध्ययन | | | | | |
| | घटनाहरुको सम्भाव्यता | | | | | |

**भाग तीन : गणितमा लैंगिक उत्तरदायी शिक्षण (Gender Responsive Pedagogy)**

***क: लैंगिक उत्तरदायी शिक्षण प्रति शिक्षकको सचेतना ( Awareness towards Gender Responsive Pedagogy)***

लैंगिक उत्तरदायी शिक्षा (Gender Responsive Pedagogy) सहि अर्थ के हो? तल दिइएका विकल्पहरु मध्ये एक सही उत्तरमा रेजा(√) लगाउनुहोस्।

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|---|---|
| विद्यार्थीहरुको समुहगत भिन्नतालाई विचार पुर्याउनु , | |
| शिक्षणमा महिलालाई अवसर र प्राथमिकता दिनु , | |

| | |
|---|---|
| शिक्षण सिकाई प्रक्रियामा केटाहरू र केटीहरूको विशिष्ट सिकाई आवश्यकताहरूमा ध्यान दिनु , | |
| कक्षाकोठामा लैंगिक संवेदनशीलतालाई विचार पुर्याउनु, | |
| शिक्षण / सिकाई प्रक्रियामा सांस्कृतिक पक्षलाई समावेश गर्नु , | |
| लैंगिक समावेशी शिक्षा अपनाउनु , | |
| लैंगिक उत्तरदायी शिक्षा (Gender Responsive Pedagogy) को बारेमा थाहा छैन, | |

### *ख :कक्षाकोठामा Gender Responsive Pedagogy को प्रयोग*

कृपया तल तालिकामा दिईएका भनाईहरु प्रति आफ्नो उपयुक्त धारणा ब्यक्त गर्नको लागि दिईएका ५ विकल्पहरु मध्ये कुनै एकमा रेजा (√) लगाउनुहोस्।

***शिक्षक-बिद्यार्थी अन्तरक्रिया***

| | कथनहरु | धेरै सहमत छु | सहमत छु | तटस्थ छु | असहमत छु | धेरै असहमत छु |
|---|---|---|---|---|---|---|
| १ | गणितमा विद्यार्थीहरुको कार्य सम्पादन क्षमता सुधार गर्नको लागी म केटीहरुलाई भन्दा बढी केटाहरूलाई प्रोत्साहित गर्दछु किनकी गणित बिषय केटीहरुलाई भन्दा केटाहरूलाई बढी सुहाउदो हुन्छ। | | | | | |
| २ | मेरो कक्षाकोठामा केटीहरू, केटाहरुको तुलनामा निष्क्रिय उत्तरदाता को भूमिकामा रहन्छन्। | | | | | |
| ३ | म गणित कक्षाकोठामा केटाहरूलाई भन्दा केटीहरूलाई प्रोत्साहित गर्न बढी समय दिन्छु। | | | | | |
| ४ | म बिद्यार्थीहरुका विशेष गरी केटीहरुका विशेष आवश्यकताहरु (महिनावारी,सामाजीक परिबन्ध, असक्षमता, आदि) लाई विशेष ध्यान दिन्छु। | | | | | |
| ५ | म कक्षाकोठामा प्रश्नहरूको जवाफ दिन केटीहरुलाई भन्दा केटाहरूलाई बढी मौका दिन्छु। | | | | | |
| ६ | गणितीय समस्या समाधान गर्नका लागि थप स्पष्टीकरण र सहयोगको आवश्यकता भएको खण्डमा म केटीलाई पनि सम्पर्क गर्न अनुमति दिन्छु। | | | | | |
| ७ | म कक्षाकोठामा, दुबै केटीहरु र केटाहरूलाई भिन्न लिङ्गलाई सम्मान गर्न प्रोत्साहित गर्दछु। | | | | | |
| ८ | गणितमा केटीहरुलाई उत्प्रेरित गर्न म एक भन्दा बढी समाधान र एक भन्दा बढि प्रक्रिया मार्फत गणितलाई सरल बनाउने गर्छु। | | | | | |
| ९ | मेरो गणित कक्षाकोठामा केटीहरू केटाहरू भन्दा धेरै अन्तर्क्रियात्मक हुन्छन्। | | | | | |
| १० | केटीहरुले भन्दा केटाहरूले शिक्षकसँग धेरै नजिक रहि कुरा गरेर र स्पस्ट व्यवहार गरेर शिक्षकको ध्यान आफूप्रति आकर्षित गर्दछन्। | | | | | |
| ११ | मेरो कक्षाकोठामा केटाहरूले कालोपाटी/ सेतोपाटीमा गणितीय समस्याहरू समाधान गर्न केटीहरू भन्दा बढी अवसरहरू पाउँदछन्| | | | | | |
| १२ | मेरो कक्षाकोठामा केटीहरू उनीहरूको पढाइ भन्दा अन्य बाहिरी देखावटी पक्षहरु (उदाहरण: सफासुग्घर, शिक्षकहरूको दिशानिर्देशनहरूको पालना,सुन्दर इत्यादि।) मा बढि प्रशंसित हुन्छन। | | | | | |
| १३ | मेरो कक्षाकोठामा अन्य बाहिरी देखावटी पक्ष भन्दा, केटाहरू बौद्धिक गुणस्तरका लागि बढि प्रशंसित हुन्छन। | | | | | |

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| १४ | कक्षाकोठाको सबै प्रकारको अन्तरक्रियामा केटीहरू भन्दा केटाहरूले नै शिक्षकसँगको प्रतिक्रियामा बढि प्रभुत्व जमाउछन्| | | | | | |
| १५ | केटाहरुलाई मात्र थप अध्ययनको लागि गणित छनौट गर्न म प्रोत्साहित गर्दछु। | | | | | |
| १६ | कक्षाकोठाको अन्तर्क्रियामा, म लैङ्गिक तटस्थता अपनाएर नियमित कुराकानी गर्दछु| | | | | | |
| १७ | म पठनपाठनको बखत दुबै केटाहरु र केटीहरू बोल्ने, सक्रियताका साथ सहभागी हुने कुरा सुनिश्चित गर्दछु। | | | | | |
| १८ | म केटीहरुलाई गणितीय प्रश्नको उत्तर सिधै बताई दिन्छु तर केटाहरूलाई भने सिधै उत्तर बताउन भन्दा आफैँ निकाल्न बारम्बार मार्गदर्शन गर्छु ताकि उनीहरूले आफैं गणितीय समस्याहरू समाधान गर्न सकून्| | | | | | |
| १९ | म केटीहरूलाई पनि विभेद नगरी उच्च संज्ञानात्मक-स्तरका प्रश्नहरू सोध्छु, जुन सबै विद्यार्थीहरूलाई सोध्ने गर्छु| | | | | | |
| २० | केटाहरूरकेटीहरूबाट आएका उत्साहजनक मागहरूलाई म समानरूपमा सम्बोधन गर्छु। | | | | | |
| २१ | कक्षामा जब एक केटीले केटाले भन्दा गणितमा राम्रो प्रदर्शन गर्छिन, यसले मेरो लागि समस्या सिर्जना गर्दछ। | | | | | |
| २२ | विद्यार्थीहरू विशेष गरी केटीहरू जो कक्षा क्रियाकलाप गर्दा बोल्न डराउँछन्, म उनीहरुलाई प्रश्नहरू सोध्न वा जवाफ दिन प्रयाप्त समय उपलब्ध गराउँछु| | | | | | |
| २३ | केटाहरूले, मसँग केटीहरु भन्दा बारम्बार रुपमा शैक्षिक चुनौतीका कुराकानी गर्छन। | | | | | |
| २४ | पठनपाठनको समयमा, शिक्षक द्वारा नबोलाए पनि केटीहरूले भन्दा केटाहरूले आफैँ धेरै जवाफ दिन्छन्| | | | | | |
| २५ | पठनपाठनको बखत, प्रश्नहरूको गलत जवाफ दिएमा केटाहरू भन्दा केटीहरू बढी लज्जित देखिन्छन्। | | | | | |
| २६ | जब कक्षाकोठामा प्रश्नहरू सोधिन्छ, केटीहरूले जवाफको बारेमा सोच्न र प्रतिक्रिया दिन केटाहरुले भन्दा केहि बढी समय लिन्छन् | | | | | |
| २७ | पाठको समयमा मलाई धेरैजसो केटीहरूले केटाहरुले भन्दा पहिला प्रश्नहरू सोध्छन्| | | | | | |
| २८ | म केटीको चेतना र भावनाको मूल्यलाई सम्मान गर्दै तर्कसंगतता र बस्तुगततालाई नकार्छु । | | | | | |
| २९ | म कक्षाकोठामा केटीहरूलाई भन्दा केटाहरूलाई पहिला प्रश्न सोध्छु| | | | | | |

***भाषाको प्रयोग***

| | कथनहरु | धेरै सहमत छु | सहमत छु | तटस्थ छु | असहमत छु | धेरै असहमत छु |
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| १ | मैले कक्षाकोठामा प्रयोग गर्ने लिखित र मौखिक भाषा लैङ्गिक रुपमा तटस्थ हुन्छ। | | | | | |
| २ | मैले कक्षाकोठामा प्रयोग गर्ने दुबै मौखिक र गैर-मौखिक भाषाले केटीहरूलाई गणितमा राम्रो कार्य सम्पादन गर्न निरुत्साहित र अनाकर्षण गर्दछ। | | | | | |
| ३ | कक्षाकोठामा मेरो कठोर भाषाको प्रयोगले विद्यार्थीहरू विशेष गरी केटीहरूलाई गणितदेखि डर पैदा गर्दछ। | | | | | |

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| ४ | केटीहरूले गणितमा केटाहरूले जतिकै प्रदर्शन गर्न सक्दैनन् भन्ने मलाई लाग्दछ र साथै केटाहरूले पनि केटीहरुले गणीतमा उनीहरुलाई उछिन्ने कुरा स्विकार्दैनन् र उछिन्न दिनु हुदैन भन्छन्। | | | | | |
| ५ | गणित कक्षाकोठामा, म केटाहरूको लागि "ऊ" र केटीहरुको लागि "उनी" सर्वनामको  समान प्रयोग सुनिश्चित गर्दछु। | | | | | |
| ६ | म केटीहरूको अनुभव र विविधताको सम्मान गर्ने खालको मौखिक र लिखित भाषा प्रयोग गर्दछु जसले गणितमा उनीहरूको सहभागीता बढाउँदछ। | | | | | |
| ७ | म गणित कक्षाकोठामा सँधै उत्साहजनक, समावेशी, र लैङ्गिक उत्तरदायी भाषा प्रयोग गर्दछु जसले केटा र केटीहरुलाई समान साझेदारको रूपमा व्यवहार गर्दछ र उनीहरूको लागि अनुकूल शैक्षिक वातावरण प्रदान गर्दछ। | | | | | |

***शैक्षिक सामग्री***

| | कथनहरु | धेरै सहमत छु | सहमत छु | तटस्थ छु | असहमत छु | धेरै असहमत छु |
|---|---|---|---|---|---|---|
| १ | विद्यार्थीहरूलाई सिकाउने क्रममा सन्दर्भ सामग्री प्रदान गर्दा महिला र पुरुष लेखकहरू र अन्वेषकहरू दुवैलाई समान रूपमा विचार गर्दछु। | | | | | |
| २ | म पाठहरूमा लैंगिक रुपमा तटस्थ शैक्षणिक सामग्रीहरू (उदाहरणहरु , चित्रहरू आदि) प्राप्त गर्दछु र प्रयोग गर्दछु\| | | | | | |
| ३ | गणित पाठ्यपुस्तकहरु र अन्य स्रोतहरुमा लैंगिक रुपमा पक्षपाती चित्रण र उदाहरणहरु छन्। | | | | | |
| ४ | विद्यालयका सबै विषयहरूमा लैंगिक रुढीवादी मुद्दाको बारेमा सचेतना जगाउने बिषयवस्तु समाहित गरिनु पर्दछ। | | | | | |
| ५ | पाठ्यपुस्तकहरु र अन्य संसाधनहरुमा लैंगिक पक्षपाती चित्रण र उदाहरणहरुको प्रयोग भएको भएता पनि, म लैंगिक समाबेसी हुने कुनै पनि व्याख्या र उदाहरणहरु थप गर्दिन्\| | | | | | |
| ६ | गणित पाठ्यपुस्तकमा गणितिय चित्रण र उदाहरणहरुमा केवल पुरुषको नाम र भूमिका  महिलाको भन्दा बढि समावेश छ। | | | | | |
| ७ | म गणितज्ञहरु र वैज्ञानिकहरुको अन्तर्ज्ञान र भावनाहरुको कदर गर्दै उनीहरुलाई दुबै पुरुष र महिलाको रुपमा वर्णन गर्दछु\| | | | | | |
| ८ | म जहिले पनि कक्षाकोठामा लैंगिक हिसाबबाट non-stereotypical सामग्री प्रयोग गर्दछु। | | | | | |
| ९ | म विद्यार्थीहरुलाई गणितिय सामग्रीको  निर्माण र समाजमा यसको प्रयोगको बारेमा व्याख्या गर्दछु। | | | | | |

***शिक्षक कक्षा क्रियाकलाप***

| | कथनहरु | धेरै सहमत छु | सहमत छु | तटस्थ छु | असहमत छु | धेरै असहमत छु |
|---|---|---|---|---|---|---|
| १ | लैङ्गिक प्रतिनिधित्व सुनिश्चित गर्न विद्यार्थीहरू आफैँले नै समूह स्थापना गरोस्, म पहल गर्दछु। | | | | | |
| २ | गणित कक्षाकोठामा दुबै केटाहरू र केटीहरूको लागि म 'मिश्रित बसाई व्यवस्थापन' को प्रयोग गर्दछु। | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| ३ | म मेरो कक्षाको गतिविधिमा समान लिङ्गको प्रतिनिधित्व गरेर सहयोगात्मक सिकाईको लागि बिभिन्न समूहमा बिद्यार्थीहरूलाई विभाजित गर्दिन। | | | | | |
| ४ | सामान्यतया प्रश्न र उत्तर प्रविधि मार्फत म केटीहरुको क्षमता अभिवृधिसंग सम्बन्धित अवसर प्रदान गर्दछु। | | | | | |
| ५ | दुबैको सहभागिता बृद्धी गर्न, म केटा र केटाहरूलाई मिसाएर कक्षाकोठाको ब्यबस्थापन गर्दछु। | | | | | |
| ६ | म डेस्कहरूको उचित व्यवस्थापन गर्दछु, जसले केटीहरूलाई बोल्न प्रोत्साहित गर्नुको साथै उनीहरूको लजालुपन र हिचकिचाहट कम गर्न सहयोग गर्छ। | | | | | |
| ७ | गणितको समस्याको बारेमा कक्षाकोठा छलफलमा, म केटीहरू भन्दा बढी केटाहरूलाई समावेश गर्दछु। | | | | | |
| ८ | म पूरै कक्षामा प्रश्नहरू वितरण गर्दछु र प्रत्येक विद्यार्थी समान रूपले सहभागी हुने कुरा सुनिश्चित गर्छु । | | | | | |
| ९ | म कक्षाकोठामा मिश्रीत समूहहरूको सुनिश्चित गर्दछु, जसमा केटाहरूले कुरा गर्ने र छलफलको नेतृत्व गर्ने बढी अवसर पाउँछन्। | | | | | |
| १० | कक्षाकोठामा समूह कार्य गर्दा, म केटीहरूलाई केटाहरु जस्तै समान रुपले समूहको नेता बन्न प्रोत्साहित गर्दछु। | | | | | |
| ११ | दुबै केटी र केटाहरूलाई गणितीय समस्याहरू समाधान गर्न र उनीहरूले कक्षामा पत्ता लगाएका नतिजा सबै सामु प्रस्तुत गर्न, म प्रोत्साहित गर्दछु। | | | | | |
| १२ | निष्क्रिय विद्यार्थीहरूलाई सामूहिक क्रियाकलापमा बढी सहभागी र सक्रिय बनाउनको लागि, म समुहका महत्वपूर्ण गतिबिधिमा पालैपालोको रणनीतिहरू अनुसरण गर्दछु। | | | | | |
| १३ | म कक्षाकोठामा समूह कार्य, सामूहिक छलफल, भूमिका खेल, बादविवाद, जोडी कार्य, अन्वेषण र व्यावहारिक आचरण जस्ता विभिन्न शिक्षण विधिहरू लागू गर्दछु। | | | | | |
| १४ | केटी विद्यार्थीहरूको साथै बोल्ने क्षमता कम भएका विद्यार्थीहरूको लागि, उनीहरूको प्रतिक्रिया विकास गर्न पर्याप्त समय प्रदान गर्दछु। | | | | | |
| १५ | मेरो कक्षाकोठामा केटा र केटीहरू बीच सहयोगात्मक अन्तरक्रिया हुन्छ। | | | | | |
| १६ | म क्षमता, प्रेरणा, लिङ्ग आदिका आधारमा मिश्रीत समूह सदस्यहरूको निर्माण गरेर समूहको गतिशीलता बढाउँछु। | | | | | |
| १७ | म दुबै केटीहरु र केटाहरूलाई समान क्रियाकलापहरू गर्न प्रोत्साहित गर्दछु। | | | | | |
| १८ | म मेरो कक्षामा लैङ्गिक रूढीवादी व्यवहार (Gender Stereotyped Behaviour) लाई निरुत्साहित गर्ने प्रयास गर्छु। | | | | | |
| १९ | कक्षाकोठामा गणित सिकाउनको लागि म केटीहरुलाई केटाहरूलाई भन्दा बढी प्रयत्न गर्दै प्रयाप्त समय दिन्छु। | | | | | |
| २० | म केटीहरूलाई गणित सम्बन्धी समस्याहरू आफैले समाधान गर्ने मौका दिन्छु। | | | | | |
| २१ | म केटीहरुलाई बोल्न प्रोत्साहित गर्ने खालको गणितिय अभ्यास गराउदछु। | | | | | |

***मूल्याङ्कन र पृष्ठपोषण***

| | कथनहरु | धेरै सहमत छु | सहमत छु | तटस्थ छु | असहमत छु | धेरै असहमत छु |
|---|---|---|---|---|---|---|
| १ | लैङ्गिक क्षमताको आधारमा बिभिन्न मूल्याङ्कनमा विद्यार्थीहरूको उपलब्धि जाँच गर्न म रमाउदिन्। | | | | | |
| २ | गणित सिक्ने क्रममा म दुबै केटा र केटीहरूलाई समान रुपमा गहन र रचनात्मक प्रतिक्रिया दिन्छु। | | | | | |
| ३ | म केटीहरु भन्दा केटाहरूलाई उनीहरूको प्रतिक्रियाहरू (उदाहरण: प्रशंसा, आलोचना, सुधार, आदि) मा अधिक विशिष्ट प्रतिक्रिया प्रदान गर्दछु। | | | | | |
| ४ | म सँधै विशेष गरी केटीहरूको सफलताको प्रशंसा गर्दछु, साथै गणितमा उनीहरूको प्रदर्शन सुधार गर्न सकारात्मक र रचनात्मक प्रतिक्रिया दिन्छु। | | | | | |
| ५ | गणितमा केटा र केटीले समान अङ्क प्राप्त गर्नुको साथै उस्तै व्यबहार देखाएतापनि, म केटीहरुभन्दा केटाहरूको दक्षताको उच्च मुल्यांकन गर्छु। | | | | | |
| ६ | गणितमा केटा र केटीले बराबर अङ्क प्राप्त गरेतापनि, केटीहरूको तुलनामा केटाहरु आफ्नो गणितीय क्षमतामा बढी विश्वस्त देखिन्छन्। | | | | | |
| ७ | म केटीहरूलाई उनीहरुको गुणस्तरिय कार्यसम्पादन (quality of performance)को आधारमा पृष्ठपोषण प्रदान गर्दछु तर केटाहरुलाई भने कार्य सम्पादनको आकृति (appearence of performance) को आधारमा पृष्ठपोषण प्रदान गर्दछु\| | | | | | |
| ८ | मेरो शिक्षण प्रक्रिया सुधार गर्नका लागि म विद्यार्थीहरूलाई पृष्ठपोषण दिन प्रोत्साहित गर्नुको साथै आएका पृष्ठपोषण लाई स्वीकार गर्दछु। | | | | | |
| ९ | म मूल्यांकन परिणाम पश्चात कमजोर क्षमता प्रदर्शन गर्ने विद्यार्थीहरूलाई बिशेष ध्यान दिन्छु। | | | | | |
| १० | जब पाठको क्रममा विद्यार्थीहरूलाई व्यक्तिगत कक्षाको काम तोकिन्छ, म केटीहरूको कार्यसम्पादनभन्दा केटाहरूको कार्यसम्पादन धेरै जसो जाँच गर्दछु। | | | | | |

**Thank you**

**Appendix B: Survey Questionnaire for Students**

*Dear students,*

I am conducting my Ph. D research on the topic **'Gender Responsive Pedagogy in Mathematics: A Practice in Nepal'** at The Graduate School of Education, Faculty of Education, T. U. Kirtipur, Kathmandu. I am very much interested to know your feeling or realization towards your mathematics teacher's behaviors based on GRP use in their teaching process. Your honest, truthful, and open feedback would be of great value to my research. Please be assured that the information you provide will be kept secure and confidential and used only for my research purposes.

***Part I: About You***

Please tick (√) one appropriate answer or provide answer in written form.

Name: (optional)……………………………………….

Gender: 1. Male 2. Female 3. Other

School's name and District: ………………………………………………

***Part II: Content preferences in Mathematics***

A) How satisfied are you with the difficulty of content area in mathematics? (Tick (√) any one options of the following)

| Content (Area) | Extremely Satisfied | Very Satisfied | Moderately Satisfied | Not Very Satisfied | Dissatisfied |
|---|---|---|---|---|---|
| Set | | | | | |
| Arithmetic | | | | | |
| Mensuration | | | | | |
| Algebra | | | | | |
| Geometry | | | | | |
| Trigonometry | | | | | |
| Statistics | | | | | |
| Probability | | | | | |

B. Rate the following details of contents important for you in your future life.
(Tick (√) any one option)

| Area | Contents | Very Important | Important | Moderate Important | Less Important | Un important |
|---|---|---|---|---|---|---|
| Set | Relation of group in Venn diagram | | | | | |
| | Cardinality of sets and identify and solution of words problems | | | | | |
| Arithmetic | Profit and loss related problems | | | | | |
| | Commission, discount, tax, dividend related problems | | | | | |
| | Household related arithmetic | | | | | |
| Mensuration | Area and volume related to cube, cuboid, prism | | | | | |
| | Find area of real field or objects | | | | | |
| | Project work related to real life situation | | | | | |
| Algebra | Factorization / solving equation | | | | | |
| | Exponential equation | | | | | |
| | Ratio and proportion | | | | | |
| Geometry | Geometric construction | | | | | |
| | Experimental equations | | | | | |
| | Theoretical proof | | | | | |
| Trigonometry | Trigonometric relation on triangle | | | | | |
| | Solving trigonometric problems | | | | | |
| Statistics | Central tendency | | | | | |
| | Graphical representation | | | | | |
| Probability | Estimation of empirical probability | | | | | |
| | Probability of an event | | | | | |

***Part III: Student's Realization of Teacher's Behavior Towards GRP in Mathematics Classroom***

Please tick (√) only one of the right boxes in each of the table below.

| S. N. | Statements | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree |
|---|---|---|---|---|---|---|
| 1. | The teacher investigates students' math skills before starting to teach a new topic. | | | | | |
| 2. | Boys and girls do mathematical problems in mixed groups in mathematics classroom. | | | | | |
| 3. | Teacher encourages boys to share their mathematical knowledge and thinking process with girls' peer. | | | | | |
| 4. | Teacher encourages both boys and girls to share their understanding of mathematics in class and out of the classroom. | | | | | |
| 5. | I want to learn mathematics cooperatively. | | | | | |
| 6. | Mathematics teacher gives more values to boys rather than girls in classroom. | | | | | |
| 7. | Mathematics teachers equally pay attention to both girls and boys in solving mathematical problems. | | | | | |
| 8. | Mathematics teachers use inclusive language in the classroom. | | | | | |
| 9. | Mathematics teachers create appropriate learning environments where competition reduced, and co-operation encouraged in mathematics classroom. | | | | | |
| 10. | Mathematics teacher uses verbal and written language that respects the experience and diversity of girls. | | | | | |
| 11. | Girls receive less instructional and discussion time, less help and less praise than boys from mathematics teachers in classroom. | | | | | |
| 12. | Teachers evaluate girl's ability in lower rate than boy's ability where both have similar test scores in mathematics. | | | | | |
| 13. | In mathematics classroom, boys receive more attention and support from their teachers than do girls. | | | | | |
| 14. | Teachers ask higher ability level questions to boys related to | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | mathematical content rather than girls in classroom. | | | | | |
| 15. | Teachers use a mix group setting for both boys and girls in mathematics classroom. | | | | | |
| 16. | Teachers provide appropriate feedback and instructions in solving mathematical problems for both boys and girls. | | | | | |
| 17. | Teachers demystify mathematics through more than one solution and more than one process equally to boys and girls. | | | | | |
| 18. | Mathematics teachers provide an appropriate environment in which both boys and girls share their knowledge related to mathematics. | | | | | |
| 19. | Teachers encourage girls to solve mathematical problems by themselves by understanding their emotion and intuition. | | | | | |
| 20. | Teachers discuss with boys more frequently than girls on mathematical problems in classroom. | | | | | |
| 21. | Both boys and girls work in groups without any humiliation while solving mathematical problems in the classroom. | | | | | |
| 22. | Teachers provide sufficient time for girls or those students lacking in speaking ability to develop their responses. | | | | | |
| 23. | In mathematics classroom, boys help girls to learn and solve mathematical problems. | | | | | |
| 24. | Teachers viewed and expressed mathematics as a male domain subject in classroom. | | | | | |
| 25. | The teacher attributed boys' success to ability and girls' success to effort in mathematics. | | | | | |
| 26. | Teachers call boys more than girls to solve mathematics problems on the blackboard/whiteboard by thinking boys are capable in mathematics. | | | | | |
| 27. | Teachers give one-on-one instructions in solving problems of mathematics to both boys and girls equally. | | | | | |
| 28. | Teacher gives equally intensive and constructive feedback to both boys and girls in mathematics classroom. | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 29. | Teacher communicates with class regularly through class representative is gender neutral. | | | | | |
| 3o. | I enjoy the class activities in mathematics class because of the encouraging behavior of the teacher. | | | | | |
| 31. | I find it is easy to get good grades in mathematics because of the teacher's motivating behavior to study mathematics. | | | | | |
| 32. | Girls are neglected by teachers while doing mathematics in classroom activities. | | | | | |

Thank You

**विद्यार्थीहरूको लागि सर्वेक्षण प्रश्नावली**

***प्रिय विद्यार्थीहरु,***

म ग्रेजुएट स्कूल अफ एजुकेशन, शिक्षाशास्त्र संकाय, त्रि. वि. कीर्तिपुर, काठमाडौंमा 'गणितमा लैंगिक उत्तरदायी शिक्षण: नेपालमा एक अभ्यास' शीर्षकमा मेरो पीएचडी अनुसन्धान गर्दैछु। म तपाईको गणित शिक्षकले गणित शिक्षण सिकाई प्रक्रियामा अपनाउने लैंगिक उत्तरदायी शिक्षणको बारेमा तपाईको भावना वा अनुभूति जान्न धेरै इच्छुक छु। तपाईंको ईमान्दार, सहि, र खुला प्रतिक्रिया मेरो शोध अनुसन्धानको लागि अमूल्य हुनेछ। तपाईंले उपलब्ध गराउनु भएको सत्य जानकारी गोप्य राखिनेछ र मेरो शोध अनुसन्धानको उद्देश्य प्राप्तिको लागि मात्र प्रयोग गरिने कुरामा आश्वस्त पार्न चाहन्छु।

***भाग एक: तपाईंको बारेमा***

कृपया एउटा उपयुक्त उत्तरमा रेजा (√) लगाउनुहोस् वा लिखित फारममा उत्तर दिनुहोस्।

नाम: (ऐच्छीक) ..........................................।

लिङ्ग: क. पुरुष ख. महिला ग. अन्य

विद्यालयको नाम र जिल्ला: ............................................... ..

***भाग दुई :गणितमा बिषयवस्तु प्राथमिकताहरू***

क) तपाईं गणितको विषयवस्तुको कठिनाईस्तर प्रति कतिको सन्तुष्ट हुनुहुन्छ? तल दिइएका ५ विकल्पहरु मध्ये कुनै एकमा रेजा (√) लगाउनुहोस्|

| बिषयवस्तु (क्षेत्र) | अत्यन्त सन्तुष्ट | धेरै सन्तुष्ट | मध्यम सन्तुष्ट | धेरै सन्तुष्ट छैन | असन्तुष्ट |
|---|---|---|---|---|---|
| समूह(Set) | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| अंकगणित(Arithmetic) | | | | | |
| क्षेत्रमिति(Mensuration) | | | | | |
| बीजगणित(Algebra) | | | | | |
| ज्यामिति(Geometry) | | | | | |
| त्रिकोणमिती(Trigonometry) | | | | | |
| तथ्याङ्क शास्त्र(Statistics) | | | | | |
| सम्भाब्यता(Probability) | | | | | |

ख .भविश्यमा तपाईंका लागि महत्त्वपूर्ण हुने बिषयवस्तुहरूको निम्न विवरणहरूलाई स्तरीकरण गर्नुहोस्। (कुनै एक विकल्पमा रेजा लगाउनुहोस्)

| क्षेत्र | विषयवस्तुहरु | धेरै महत्वपूर्ण | महत्त्वपूर्ण | मध्यम महत्वपूर्ण | न्युन महत्त्वपूर्ण | महत्वहीन |
|---|---|---|---|---|---|---|
| समूह | भेन चित्रमा समूहहरुको सम्बन्ध | | | | | |
| | समुहहरूको गणनात्मता र शाब्दिक समस्याको पहिचान र हल | | | | | |
| अङ्क गणित | नाफा र नोक्सान सम्बन्धि समस्याहरु | | | | | |
| | कमिसन, छुट, कर, लाभांश सम्बन्धि समस्याहरू | | | | | |
| | घरायसी अंकगणित | | | | | |
| क्षेत्रमिति | घन, षडमुखा, र प्रिज्मसँग सम्बन्धित क्षेत्रफल र आयतन | | | | | |
| | वास्तविक क्षेत्र वा वस्तुहरूको क्षेत्रफल पत्तालगाउने | | | | | |
| | वास्तविक जीवनका अवस्थाहरूसँग सम्बन्धित परियोजना कार्य | | | | | |
| बीजगणित | खण्डिकरण / समीकरणको हल | | | | | |
| | घाताङ्कयुक्त (exponential) समीकरण | | | | | |
| | अनुपात र समानुपात | | | | | |
| ज्यामिति | ज्यामितीय रचना | | | | | |
| | प्रयोगात्मक समीकरणहरू | | | | | |
| | सैदान्तिक प्रमाण | | | | | |
| त्रिकोणमिती | त्रिभुजमा त्रिकोणमितीय सम्बन्ध | | | | | |
| | त्रिकोणमितीय समस्याहरूको समाधान | | | | | |
| तथ्याङ्क शास्त्र | केन्द्रीय प्रवृत्ति | | | | | |
| | ग्राफिकल प्रतिनिधित्व | | | | | |
| सम्भाव्यता | अनुमानिकता सम्भाव्यता (empirical probability) को अध्ययन | | | | | |
| | घटनाहरुको सम्भाव्यता | | | | | |

***भाग तीन: गणित कक्षाकोठामा GRP प्रति शिक्षकको व्यवहारप्रति विद्यार्थीको बोध***

कृपया तल तालिकामा दिईएका भनाईहरु प्रति आफ्नो उपयुक्त धारणा ब्यक्त गर्नको लागि दिईएका ५ विकल्पहरु मध्ये कुनै एकमा रेजा (√) लगाउनुहोस्।

| | कथन | धेरै सहमत छु | सहमत छु | तटस्थ छु | असहमत छु | धेरै असहमत छु |
|---|---|---|---|---|---|---|
| १ | शिक्षकले नयाँ पाठ पढाउन सुरु गर्नु पुर्ब विद्यार्थीको गणित सीपको खोजी गर्नुहुन्छ। | | | | | |
| २ | गणित कक्षाकोठामा केटाहरू र केटीहरू मिश्रित समूहमा रही गणितीय समस्याहरू हल गर्छौं। | | | | | |
| ३ | शिक्षकले केटाहरूलाई उनीहरूको गणितीय ज्ञान र बुझाई प्रक्रिया केटी साथीहरूसँग सेयर गर्न प्रोत्साहन गर्नुहुन्छ। | | | | | |
| ४ | शिक्षकले दुबै केटाहरु र केटीहरूलाई उनीहरूको गणितसँग सम्बन्धित ज्ञानलाई कक्षाकोठा भित्र र बाहिर सेयर गर्न प्रोत्साहित गर्नुहुन्छ। | | | | | |
| ५ | म गणित बिषयलाई सहयोगात्मक(cooperative) रुपमा सिक्न चाहन्छु। | | | | | |
| ६ | कक्षाकोठामा गणित शिक्षकले केटाहरूलाई केटीहरुलाई भन्दा बढी मूल्य (value) दिनुहुन्छ। | | | | | |
| ७ | गणित शिक्षकले गणितीय समस्याहरु समाधान गर्दा, दुबै केटी र केटाहरूप्रती समान रुपमा ध्यान केन्द्रित गर्नुहुन्छ। | | | | | |
| ८ | गणित शिक्षकले कक्षाकोठामा समावेशी भाषाको (inclusive language) प्रयोग गर्नुहुन्छ। | | | | | |
| ९ | गणित शिक्षकले कक्षाकोठामा उपयुक्त शिक्षण वातावरण सिर्जना गर्नुहुन्छ जहाँ प्रतिस्पर्धा (competition) लाई कम र सहकार्य (co-operation) लाई प्रोत्साहित गर्नुहुन्छ। | | | | | |
| १० | गणित शिक्षकले प्रयोग गर्ने दुवै मौखिक र लिखित भाषाले केटीहरूको अनुभव र विविधता (diversity) लाई सम्मान गर्दछ। | | | | | |
| ११ | कक्षाकोठामा केटीहरूले गणित शिक्षकबाट केटाहरुभन्दा कम शैक्षणिक र छलफल गर्ने समय पाउनुको साथै कम सहयोग र कम प्रशंसा पाउँदछन्। | | | | | |
| १२ | दुबै केटाहरु र केटीहरुले गणितमा समान अङ्क प्राप्त गरेता पनि, शिक्षकले केटीको क्षमतालाई केटाको क्षमतालाई भन्दा कम दरमा मूल्यांकन गर्नुहुन्छ। | | | | | |
| १३ | गणित कक्षाकोठामा, शिक्षकबाट केटाहरूले केटीहरुले भन्दा बढी ध्यान र समर्थन (attention and support) प्राप्त गर्दछन। | | | | | |
| १४ | कक्षाकोठामा शिक्षकले गणित विषयवस्तुसँग सम्बन्धित उच्च क्षमताको प्रश्नहरु केटीहरूलाई भन्दा केटाहरूलाई बढी सोध्नुहुन्छ। | | | | | |
| १५ | गणितको कक्षाकोठामा शिक्षकले दुबै केटाहरू र केटीहरूको लागि 'mix group setting'' प्रयोग गर्नुहुन्छ। | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| १६ | शिक्षकले गणितीय समस्याहरू समाधान गर्दा दुबै केटा र केटीहरूलाई उपयुक्त पृष्ठपोषण र निर्देशनहरू प्रदान गर्नुहुन्छ। | | | | | |
| १७ | शिक्षकले एक भन्दा बढि प्रक्रियाहरू र एक भन्दा बढि समाधानहरू मार्फत दुवै केटा र केटीहरूलाई समान रुपमा गणितमा स्पस्ट बनाउनुहुन्छ\| | | | | | |
| १८ | गणित शिक्षकले कक्षामा उपयुक्त वातावरण प्रदान गर्नुहुन्छ जहाँ दुबै केटाहरु र केटीहरूले गणित सम्बन्धी आफ्नो ज्ञान एक अर्काबिच आदानप्रदान गर्दछन्। | | | | | |
| १९ | शिक्षकले केटीहरूलाई उनीहरूको भावना र अन्तर्ज्ञान बुझेर गणितीय समस्याहरू समाधान गर्न प्रोत्साहित गर्नुहुन्छ। | | | | | |
| २० | कक्षाकोठामा शिक्षकले गणितीय समस्यामा केटीहरू भन्दा केटाहरूसँग बारम्बार (frequently) छलफल गर्नुहुन्छ। | | | | | |
| २१ | कक्षाकोठामा गणितीय समस्याहरू समाधान गर्दा दुबै केटाहरू र केटीहरू बिना हिच्किचाहट(कुनै पनि अपमान बिना) समूहमा काम गर्दछौं। | | | | | |
| २२ | शिक्षकले विशेष गरि केटीहरूको साथै बोलाई क्षमतामा कमी हुने विद्यार्थीहरूको उत्तर दिने क्षमता विकास गर्नको लागि पर्याप्त समय प्रदान गर्नुहुन्छ। | | | | | |
| २३ | गणित कक्षाकोठामा केटाहरूले केटीहरूलाई गणितीय समस्याहरू समाधान गर्न मद्दत गर्छन्। | | | | | |
| २४ | कक्षाकोठामा शिक्षकले गणित विषयलाई पुरुष केन्द्रित बिषयवस्तु (male domain subject) को रूपमा प्रतिक्रिया र अभिव्यक्ति दिनुहुन्छ। | | | | | |
| २५ | शिक्षकले गणितमा केटाहरूको सफलतालाई दक्षता (ability) र केटीहरूको सफलतालाई कोशिस (effort) को श्रेय दिनुहुन्छ\| | | | | | |
| २६ | शिक्षकले केटाहरू गणितमा सक्षम छन् भन्ने सोचेर नै कालोपाटी/सेतोपाटीमा गणितिय समस्या समाधान गर्न केटीहरूलाई भन्दा केटाहरूलाई बढि बोलाउनुहुन्छ। | | | | | |
| २७ | शिक्षकले गणितिय समस्याको समाधान गर्न दुबै केटा र केटीहरूलाई समान रूपले एक-एक गर्दै निर्देशन दिनुहुन्छ। | | | | | |
| २८ | गणित कक्षाकोठामा शिक्षकले दुबै केटा केटीहरुलाई समान रुपमा गहन र रचनात्मक प्रतिक्रिया दिनुहुन्छ। | | | | | |
| २९ | शिक्षकले कक्षामा वर्ग प्रतिनिधित्व मार्फत लैंगिक तटस्थता (gender neutral) अपनाई कक्षामा नियमित कुराकानी गर्नुहुन्छ। | | | | | |
| ३० | कक्षाकोठामा शिक्षकको encouraging behavior ले गर्दा मलाई गणितका कक्षाक्रियाकलापहरू गर्दा आनन्द महसुस हुन्छ\| | | | | | |
| ३१ | शिक्षकको motivating behavior को कारणले मलाई गणितमा राम्रो अंक प्राप्त गर्न सजिलो हुन्छ\| | | | | | |
| ३२ | गणित कक्षामा गणितीय कक्षाक्रियाकलाप गर्ने क्रममा केटीहरूलाई शिक्षकले बेवास्ता गर्नुहुन्छ। | | | | | |

**Appendix C: Interview Guideline for Teachers**

Could you please tell me how your students (boys and girls) interact with you in your mathematics classroom?

- What kind of gender specific learning needs of students have you noticed in your class in the teaching and learning process? How did you address them?
- How do you let shy and submissive students in Mathematics classroom participation? Are girls more ashamed while answering wrong answers of the questions?
- In your experience of lesson planning, how are the needs and interests of all students taken into account?
- Have you encountered any differences in the ways in which teachers interact with girls and boys?
- Are girls actively engaged in questioning and answering in your mathematics classroom? How?
- Who needs more encouragement and support (boys or girls) in solving mathematical problems? How do you manage your time?
- Do the curriculum and teaching and learning materials developed promote gender equality? How have you taken a close look at grade IX/ X mathematics textbook to identify possible gender stereotyping or gender-based discrimination?
- Does the selection of topics, examples, or illustrations in mathematics textbook take girls and boys' interest into account equally? or gender biased illustrations and examples in mathematics textbooks and other resources?
- Does the mathematics textbook (TL materials) contain a one-sided presentation or representation of boys or girls?
- Do you add any interpretations and examples to capture gender responsiveness whenever there is a gender biased illustration and example in textbooks and other resources?
- In your experience, what kinds of teaching approaches are commonly used in mathematics classrooms? Have you experienced any classroom practices that discourage the equal participation of boys and girls? Which practices encourage the equal participation of boys and girls?
- How is your classroom arranged? What kind of classroom arrangement could help promote equal participation of boys and girls?

- Do you have any practice to divide students in different groups for cooperative learning by equal gender representation?
- Do you give equally intensive and constructive feedback to both boys and girls in learning mathematics? How?
- Do you have practice to receive encouragement and be willing to accept feedback from the students to improve your teaching process?
- Have you practiced following up on the students with poor performance after assessment results?
- What mechanism do you use to get feedback from your students?
- Do you use different mechanisms for providing feedback for boys? for girls?
- In which mathematical content area do your students enjoy to learn? Why?
- Which mathematical contents do you feel are important for your students' future life? Why?

## Appendix D: Classroom Observation Guideline

***Teacher- Student Interaction***

- Addressing specific needs of students
- Feedback
- Establishing rapport with students
- Gender-based distractions in the classroom
- Anti-social and deviant behavior

***Classroom Set Up***

- Size and shape of desks and chairs
- Arrangement of desks
- Wall space and fixtures
- Height of shelves
- Seating positions in terms of where girls and boys sit
- Height of the stools in the laboratory

***Methodology***

- Question and answer method
- Group discussion
- Demonstration

***Language Used***

- To observe the gender responsiveness of language use in classroom interactions (Positive or Negative)
- Analyze the language used in teaching and learning materials/ methods
- How far does a teacher prefer to use common language rather than gendered discriminative language?

**Appendix E: Interview Guideline for Students**

1. Does your mathematics teacher's behavior in the classroom promote gender equality?
    - Does the teacher direct more questions to either boys or girls?
    - Does the teacher intentionally or unintentionally demonstrate gender stereotyping?
    - Do the activities orchestrated by the teacher engage girls and boys equally?
    - Is gender- related discriminatory interactions between students or between the teacher and students identified and corrected in class by the teachers?
2. Does your teacher explicitly promote equal opportunities for both girls and boys to participate and learn problems in the classroom?
3. Are girls and boys addressed and engaged actively and equally during teaching and learning mathematical problems?
4. Does your teacher monitor interactions between boys' and girls' students for equality? For instance, do girls and boys get an equal chance to speak and answer questions?
5. Are the teacher's expectations for girls' and boys' abilities and performance in mathematics education equally high?
6. Can you please tell me, do your Mathematics teachers equally pay attention to both girls and boys in solving mathematical problems?
7. Does your Mathematics teacher deliberate more effort to motivate and encourage girls to participate in learning mathematics? If so, how do you feel?
8. Do teachers encourage girls to take up mathematics subjects? How?
9. Does the society at large hold any prevailing cultural discriminatory beliefs such as 'Girls are not supposed to…? If yes, do they influence girls' decisions to engage / not engage in Mathematics?
10. How do you want to learn mathematics? Cooperatively or individually? Do you get such an environment from your teachers in classroom?
11. Does your Mathematics teacher demystify mathematics through more than one solution and more than one process equally to you both? How?
12. Does your mathematics teacher provide appropriate feedback and instructions in solving mathematical problems? How does he/she do?

13. Do teachers use mix group settings for both boys and girls in mathematics classroom? How do they construct group formation? How do they conduct group work?
14. In which mathematical content area do you feel enjoy in learning? Why?
15. Which mathematical contents do you feel are important for your future life? Why?

**Appendix F: Informed Consent Statement**

*Research Title: Gender Responsive Pedagogy in Mathematics: A Practice in Nepal*

My name is Hom Kumari Adhikari, and I am a doctoral student at the Graduate School of Education, Tribhuvan University, Kathmandu where I am working under the direction of Dr. Hari Prasad Upadhyay. This letter is to invite you to participate in my research study. The purpose of this study is to examine GRP awareness and practices of mathematics teachers at community schools as well as students' content preferences and their realization towards teachers' behavior on GRP practices.

This study conducted in two phases; in the first phase you have to fill in a survey form. Based on the results of the survey, you may be asked to participate in an interview and classroom observation. The interview may be face-to-face and classroom observation may be non-participatory as your usual classes. During the interview, the researcher may take notes, and audio recorded the interview to ensure accuracy when transcribing the data. Audio devices will be stored in a locked safe, after finishing the work audio recordings will be erased, and any written documents and data collected will be shredded.

To ensure minimal risk, I will adhere to the highest standard of care and all information will be held in strict confidence by assigning a participant ID number along with a pseudonym that will substitute your name on all of your materials. Hence, all information you provide will be kept confidential. Your participation in this study is voluntary, and you are free to withdraw from participation on any time. If you agree to participate, please sign this consent form. Identity will also be protected in any publication resulting from the research. If you have any questions related to this study, you can contact me at Cell: 984213311 or

Email: homaadhikari1@gmail.com

The data collected will be used for the doctoral thesis and may also be used for publication, conference presentation or seminars. If you have any further questions, please contact the researcher. Thank you for reading this information sheet.

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I agree to participate in the research study entitled: Gender Responsive Pedagogy in Mathematics: A Practice in Nepal. You have explained the purpose of the study and the procedures to be followed. I acknowledge that I have had the opportunity to obtain additional information regarding the study and all questions I have were answered to my satisfaction. I also understand that I am free to withdraw from the study at any time and discontinue participation in the study without prejudice. Finally, I acknowledged that I have read and fully understand this form. I voluntarily signed this form.

………………………

Signature of participant

Name:

Date:

**Appendix G: Sample Size Determination**

Slovin's formula is applicable while estimating a population using confidence cofficient of 95%.

The Slovin's formula for determination of sample size is

n = $\frac{N}{1+Ne^2}$

Where,

N = Sample size

N = Population size (461 teachers)

e = Margin of error (5%)

Hence, the sample size was

$$n = \frac{461}{1+461(0.05)^2}$$

$$= 214.169 \approx 215$$

For 10% non-response rate, sample size (n) = 215 + 22 = 237

The sample size for each district

$$= \text{Total sample size} \times \frac{\text{Population of each district}}{Total\ population}$$

Sapmle size for Sindhuli district

$$= 237 \times \frac{111}{461}$$

$$= 57.065 \approx 57$$

Sample size for Dolakha district

$$= 237 \times \frac{83}{461}$$

$$= 42.67 \approx 43$$

Sample size for Chitwan district

$$= 237 \times \frac{103}{461}$$

$$= 52.95 \approx 53$$

Sample size for Kathmandu district

$$= 237 \times \frac{164}{461}$$

$$= 84.31 \approx 84$$

**Appendix H: Details of Student Participants for Interview**

| S.N | Students | Gender | Ethnicity | performance in class | School | Teacher |
|---|---|---|---|---|---|---|
| 1 | G1 | Female | Chhetri | Medium | S1 | T1-F |
| 2 | B1 | Male | Brahmin | High | S1 | T1-F |
| 3 | G2 | Female | Madhesi | Low | S2 | T2-M |
| 4 | B2 | Male | Muslim | Medium | S2 | T2-M |
| 5 | G3 | Female | Muslim | High | S3 | T3-F |
| 6 | B3 | Male | Tamang | Medium | S3 | T3-F |
| 7 | G4 | Female | Chhetri | High | S4 | T4-M |
| 8 | B4 | Male | Muslim | Medium | S4 | T4-M |
| 9 | G5 | Female | Newar | High | S5 | T5-M |
| 10 | B5 | Male | Brahmin | High | S5 | T5-M |
| 11 | G6 | Female | Tamang | Medium | S6 | T6-M |
| 12 | B6 | Male | Brahmin | Low | S6 | T6-M |

**Note:** G = Girl Student, B = Boy Student, S = School,

T-F = Female Teacher, T-M = Male Teacher

**Appendix I: Details of Teacher Participants for Intervew and Classroom Observation**

| S.N | Teacher | Gender | Ethnicity | Experience | Qualification | School | Purpose |
|---|---|---|---|---|---|---|---|
| 1 | T1-F | Female | Brahmin | 8 years | M.Ed | S1 | I & CO |
| 2 | T2-M | Male | Chhetri | 16 years | M.Ed | S2 | I & CO |
| 3 | T3-F | Female | Chhetri | 14 years | M.Ed | S3 | I & CO |
| 4 | T4-M | Male | Madhesi | 32 years | M.Ed | S4 | I & CO |
| 5 | T5-M | Male | Brahmin | 5 years | B.Ed | S5 | I & CO |
| 6 | T6-M | Male | Newar | 25 years | M.Sc | S6 | CO |

**Note:** S = School , I = Interview , CO = Classroom Obseravtion, T-F = Female Teacher, T-M = Male Teacher

**Appendix J: Initial Codes (Coded on and reported by ATLAS.ti)**

Code Report (193 codes)

○ Absentees' ratio of girls is higher in classroom
○ Algebra easy but geometry difficult
○ Anxiety pressure with mathematics teacher
○ Application of mathematics
○ Arithmetic area important for future life
○ Asking questions not known
○ Awareness program helps active participation
○ Both boys and girls questioning equally
○ Both genders get equal chance on the board
○ Both gender names are included in mathematics textbook
○ Boys are better in mathematics
○ Boys are better on logical content
○ Boys are creative: social construct
○ Boys are good in mathematics but not paying attention
○ Boys are more creative than girls
○ Boys are more interactive than girls
○ Boys are not overloaded at home
○ Boys are wider than girls in mathematics
○ Boys asked more logical questions
○ Boys do harder problem by themselves
○ Boys -girls interaction
○ Boys like to learn mathematics individually
○ Boys' teasing girls
○ Boys use technology to learn mathematics
○ Boys want to learn mathematics by understanding
○ Choose mathematics to study science in future
○ Chosen mathematics subject
○ Coaching classes for good marks
○ Competition vs. collaboration
○ Conception mathematics teacher is strict
○ Constructing group in extra class according to ability
○ Daily planning on the mind
○ Demystifying mathematics: Not used different strategy
○ Difficult due to less practice
○ Difficult to construct group work
○ Difficulties in diversity
○ Difficulties of content area
○ Discrimination in backward family
○ Each student does not get value
○ Embarrassing to ask questions
○ Enhance shy students for participation
○ Equal chance in question answer
○ Everyone got equal treatment from teacher.
○ Expected cooperative learning

- Expected mixed sitting arrangement
- Expecting encouragement and support
- Family problem impact girls' study
- Feedback after internal assessment
- Feel hesitation to ask
- Female teacher is familiar with students
- Few exercises in Government mathematics textbook
- First second...ranking system creates discrimination
- Focused child. centered teaching method
- Focusing on talent student
- Focusing talent students while questioning
- Gender balance is in progress
- Gender discrimination at home of terai belt family
- Gender discrimination remains in rural area
- Gender discrimination started from family
- Gender discrimination still remains in urban area
- Gender discrimination while punishing
- Gender equality exists at school
- Geometry is difficult
- Girl's absenteeism high
- Girls are getting lost without basic concept
- Girls are more interacting
- Girls are overloaded
- Girls can memorize but boys have creativity
- Girls demand cooperative learning
- Girl's empowerment
- Girl's enrollment higher in government school
- Girls feel dominance
- Girls get equal opportunity to participate
- Girls have lack of confidence in questioning
- Girls have less confident
- Girls have more effort but boys have more brains
- Girls naturally afraid
- Girls' speech depends upon teacher's behavior
- Grading system declines quality education
- Group work is not familiar
- Important content for future
- Individual feedback is not possible
- Individual feedback taken by teacher
- Individual treat according to specific learning needs
- Individual treatment for non-speakers
- Individual treatment is not possible
- Individualized instruction
- Interesting mathematical content
- Internal assessment is no matter for weak students
- Join mathematics with real life
- Know individually rather than group
- Knowledge of student's family and home background

○ Lack of basic mathematical concept
○ Lack of focusing gender
○ Lack of self confidence
○ Lacking of basic mathematical concept
○ Large number of students are problem
○ Learn mathematics cooperatively
○ Less motivation towards mathematics
○ Less score in see due to government mathematics textbook
○ Less valued in mathematics
○ Logic depends upon family background
○ Logical content and geometrical formula are interesting
○ Logical mind in mathematics
○ Logical thinking
○ Low academic capability
○ Mathematics is confusing
○ Mathematics is difficult
○ Mathematics is hard subject
○ Mathematics is interesting
○ Mathematics required in our entire life
○ Mathematics should be kept optional
○ Mathematics should be practical
○ Mathematics teachers are strict
○ Menstruation caused absenteeism
○ Mixed sitting arrangement caused problem
○ Mode of teaching affect
○ Motivation towards government secondary school
○ Motivation towards mathematics
○ Motivation, scholarship and family background
○ New content is difficult...due to teacher
○ No collaboration with opposite sex
○ No gender discrimination
○ No gender discrimination in mathematics textbook
○ No gender discrimination in village school
○ No practice of group work
○ No sufficient time with teacher for student's individual work
○ Not encouraging for taking OPT mathematics
○ Not favorable education system
○ Not focusing students specific learning needs
v Not gender wise mixed sitting arrangement
○ Not girls only, boys are also ashamed
○ Not give a value to non-speaking students
○ Not giving feedback
○ Not understand not speak
○ Not use of teaching materials
○ Number of students are declining in mathematics
○ Paying attention to talent girls
○ Practically done problems are important
○ Practice of group work

○ Pre knowledge is important
○ Problem solving
○ Provide same kind of knowledge is difficult
○ Questioning from only talent girls and boys
○ Questioning in classroom
○ Real objects help in understanding mathematical concept
○ Receiving feedback from students
○ Remedial class to improve performance
○ Result system
○ School environment
○ Selection criteria for opt mathematics
○ Shyness
○ Shyness due to not known answer
○ Sitting arrangement
○ Sitting arrangement matters in learning
○ Societal stereotyping
○ Student's involvement equally
○ Students from low family background
○ Student's level is not fit with curriculum
○ Students like content useful in real life
○ Students' question get value
○ Talent boys are also silent in classroom
○ Talent boys get chance to do problem on the board
○ Talent peers not paying attention towards weak ones
○ Talent students insult weak girls
○ Talent students speak weak silent
○ Teacher and talent peer insult weak ones
○ Teacher focusing only talent student
○ Teachers have low knowledge of technology
○ Teacher is not familiar with technology
○ Teacher not given value to the weak students
○ Teacher not motivates to learn mathematics
○ Teacher not motivated to study mathematics
○ Teacher's behavior affects learning
○ Teachers have not favorable condition in teaching
○ Teachers limited content knowledge impact students learning
○ Teachers' teaching approaches
○ Teacher's teaching strategies
○ Teacher's value enhances girls' learning
○ Teaching approaches in mathematics
○ Teaching materials
○ Teaching materials is demanded in geometry
○ Teaching materials used to give new mathematical concept
○ Teasing the poor learner
○ Traditional teaching strategies
○ Trigonometry is a difficult subject
○ Understanding of grp
○ Unknown about the application of mathematical content

○ Use of mathematics
○ Use of teaching materials
○ Weak student copy other's notebook
○ Weak students do not ask questions
○ Weak students, shame and expose

**Appendix K: Final Codes (Merged and Reported by ATLAS.ti)**

Code Report (70 codes)

○ Absentees ratio of girls is higher in classroom

○ Algebra easy but Geometry difficult

○ Arithmetic area important for future life

○ Boys are better in logical questioning in mathematical content

○ Boys are wider than girls in mathematics

○ Boys -girls interaction

○ Boys use technology to learn mathematics

○ Chosen mathematics subject

○ Daily planning on the mind

○ Demystifying mathematics: Not used different strategy

○ Difficulties in diversity

○ Embarrassing to ask questions

○ Equal chance in question answer

○ Expected mixed sitting arrangement

○ Expecting encouragement and support

○ Feedback after internal assessment do not matter with student's ability

○ Few exercises in Government mathematics textbook

○ First second ..ranking system creates discrimination

○ Focusing on talent student

○ Gender balance is in progress in mathematics textbook and curriculum

○ Gender discrimination starts from home: gets differences from terai, rural and urban

○ Gender discrimination while punishing

○ Get chance to do problem on the board

○ Girls are overloaded

○ Girls can memorize but boys have creativity

○ Girls demand individual vs cooperative learning

○ Girl’s empowerment

○ Girls feel dominance: not understand not speak

○ Individual feedback is not possible

○ Individual treat according to specific learning needs

○ Individualized instruction
○ Interesting mathematical content
○ Join mathematics with real life
○ Knowledge of student's family and home background
○ Lack of basic mathematical concept
○ Lack of self confidence
○ Logic depends upon family background
○ Low academic capability
○ Mathematics is hard subject
○ Mathematics should be kept optional
○ Mathematics should be practical
○ Mathematics teachers are strict
○ Mixed sitting arrangement caused problem
○ Motivation towards government secondary school
○ Motivation towards mathematics
○ No gender discrimination
○ Not favorable education system
○ Not girls only, boys are also ashamed
○ Number of students are declining in mathematics
○ Practically done problems are important
○ Practice of group work
○ Questioning in classroom
○ Real objects help in understanding mathematical concept
○ Receiving feedback from students
○ Remedial class like coaching class to improve performance
○ School environment
○ Sitting arrangement
○ Societal stereotyping
○ Student's involvement equally
○ Students' feelings: Not focusing specific learning needs
○ Student's level is not fit with curriculum
○ Talent students speak weak silent, feel insult
○ Teacher is less familiar with technology

- Teacher's behavior affects learning
- Teachers limited content knowledge impact students learning
- Teachers' teaching approaches
- Teachers' teaching strategies
- Teaching materials
- Trigonometry is a difficult subject
- Understanding of GRP

## Appendix L: Creating Global Themes from Merging Codes

| **Initial code (basic theme)** | **Merged code (organizing theme)** | **Grouping code (Global theme)** |
|---|---|---|
| Algebra is easy but geometry difficult | Algebra is easy but geometry difficult | Mathematical content preferences |
| Geometry is difficult | | |
| Arithmetic Area Important for Future Life | Arithmetic area important for future life | |
| Important content for future | | |
| Logical content and Geometrical formula are interesting | Interesting Mathematical Content | |
| Difficulties of Content Area | | |
| Interesting Mathematical Content | | |
| Mathematics is interesting | | |
| Join Mathematics with Real Life | Join Mathematics with Real Life | |
| Students like content useful in real life | | |
| Practically done problems are Important | Practically done problems are Important | |
| Unknown about the application of Mathematical content | | |
| Use of Mathematics | | |
| Real Objects Helps in Understanding Mathematical Concept | Real Objects Helps in Understanding Mathematical Concept | |
| Trigonometry is a difficult subject | Trigonometry is a difficult subject | |
| Not Gender wise Mixed Sitting Arrangement | Mixed sitting Arrangement caused Problem | Gender responsive classroom organization |
| Mixed sitting Arrangement caused Problem | | |
| Expected Mixed Sitting Arrangement | Expected Mixed Sitting Arrangement | |
| Sitting Arrangement Matters in Learning | Sitting arrangement | |
| Collaboration while mixed setting | | |
| Sitting Arrangement | | |
| Girls' absenteeism high | Absentees Ratio of Girls is Higher in Classroom | Gender stereotype in thinking |
| Menstruation Caused Absenteeism | | |
| Absentees Ratio of Girls is Higher in Classroom | | |
| Boys Asked More Logical Questions | Boys are Better on Logical Content | |
| Boys are Better on Logical Content | | |
| Boys are better in Mathematics | Boys are wider than girls in Mathematics | |
| Boys are Good in Mathematics but not Paying Attention | | |

| | | |
|---|---|---|
| Problem Solving | | |
| Boys are wider than girls in Mathematics | | |
| Boys Use Technology to Learn Mathematics | Boys Use Technology to Learn Mathematics | |
| Asking questions not known | Embarrassing to Ask Questions | |
| Embarrassing to Ask Questions | | |
| Feel Hesitation to Ask | | |
| Focusing on Talent Student | | |
| Focusing Talent Students while Questioning | | |
| Boys' Teasing Girls | | |
| Expecting Encouragement and Support | Expecting Encouragement and Support | |
| Girls get equal opportunity to participate | Gender Balance is in Progress in mathematics textbook and curriculum | |
| Gender Balance is in Progress | | |
| Both Gender Names are included in Mathematics Textbook | | |
| No gender discrimination in math textbook | | |
| Gender Discrimination at home of Terai Belt Family | Gender discrimination starts from home: Gets difference from Terai, Rural, and Urban | |
| Gender Discrimination remains in Rural area | | |
| Gender Discrimination still remains in Urban area | | |
| Discrimination in Backward Family | | |
| Gender discrimination started from family | | |
| Gender Discrimination while Punishing | Gender Discrimination while Punishing | |
| Boys are not overloaded at home | Girls are Overloaded | |
| Family Problem Impact Girls Study | | |
| Girls are Overloaded | | |
| Girls have more effort, but boys have more brains | Girls can Memorize but Boys have Creativity | |
| Girls can Memorize but Boys have Creativity | | |
| Boys are More Creative than Girls | | |
| Logical Mind in Mathematics | | |
| Boys want to learn Math by understanding | | |
| Boys are Creative: Social Construct | | |
| Not Understand Not Speak | Girls Feel Dominance: not understand not speak | |
| Girls naturally Afraid | | |
| Girls' speech depends upon teacher's behavior | | |

| | | |
|---|---|---|
| Girls Feel Dominance | | |
| Mathematics is difficult | Mathematics is Hard Subject | |
| Mathematics is Confusing | | |
| New Content is Difficult...Due to teacher | | |
| Difficult Due to Less Practice | | |
| Less Valued in Mathematics | | |
| Mathematics is Hard Subject | | |
| Conception Mathematics Teacher is Strict | Mathematics teachers are strict | |
| Mathematics Teacher are Strict | | |
| Societal stereotyping | Societal stereotyping | |
| Choose Mathematics to Study Science in Future | Chosen mathematics subject | Learners' diversity |
| Chosen Mathematics subject | | |
| Less motivation towards Mathematics | | |
| Not Encouraging for Taking OPT mathematics | | |
| Selection Criteria for OPT Mathematics | | |
| Teacher not motivated to study mathematics | | |
| Teacher not Motivate to learn Mathematics | | |
| Know Individually rather than group | Girls Demand individual vs Cooperative Learning | |
| Learn Mathematics Cooperatively | | |
| Boys Likes to Learn mathematics Individually | | |
| Boys do harder problem by themselves | | |
| Girls Demand Cooperative Learning | | |
| Difficulties in diversity | Difficulties in diversity | |
| Knowledge of student's Family and home Background | Knowledge of student's Family and home Background | |
| Logic Depends Logical Thinking upon Family Background | Logic Depends upon Family Background | |
| Mathematics should be Keep Optional | Mathematics should be Keep Optional | |
| Mathematics Should be Practical | Mathematics Should be Practical | |
| Motivation, Scholarship and family Background | Motivation Towards Government Secondary School | |
| Students From Low Family Background | | |
| Motivation Towards Government Secondary School | | |
| Mathematics required in our entire life | Motivation Towards Mathematics | |

| | | | |
|---|---|---|---|
| Motivation Towards Mathematics | | | |
| Shyness due to not known answer | Not Girls Only, Boys are also Ashamed | | |
| Not Girls Only, Boys are also Ashamed | | | |
| Shyness | | | |
| Number of Students are Declining in Mathematics | Number of Students are Declining in Mathematics | | |
| Questioning from only talent girls and boys | Questioning in Classroom | | |
| Questioning in classroom | | | |
| Both Boys girls questioning equally | | | |
| Weak student copy other's notebook | | | |
| Weak students do not ask questions | | | |
| Student's involvement equally | Student's involvement equally | | |
| Gender equality exists at school | | | |
| Talent students insult weak girls | Talent students speak, weak silent, feel insult | | |
| Talent boys are also silent in classroom | | | |
| Talent students speak weak silent | | | |
| Weak Students, Shame and Expose | | | |
| Boys -Girls Interaction | Boys -girls interaction | Pedagogical practice | |
| Boys are more Interactive than Girls | | | |
| Girls are more Interacting | | | |
| No Collaboration with Opposite Sex | | | |
| Competition Vs. Collaboration | | | |
| Daily Planning on the Mind | Daily planning on the mind | | |
| Demystifying Mathematics: Not Used Different Strategy | Demystifying mathematics: Not used different strategy | | |
| Both genders get equal chance on the board | Get chance to do problem on the board | | |
| Talent boys get chance to do problem on the board | | | |
| Lacking of basic mathematical concept | Lack of basic mathematical concept | | |
| Girls are getting lost without basic concept | | | |
| Mode of Teaching Affect | | | |
| Lack of basic mathematical concept | | | |
| No Gender Discrimination | No Gender Discrimination | | |
| Difficult to construct group work | Practice of Group Work | | |
| No Practice of Group Work | | | |

| | | | |
|---|---|---|---|
| Group Work is not Familiar | | | |
| Constructing Group in Extra Class according to Ability | | | |
| Expected Cooperative Learning | | | |
| Practice of Group Work | | | |
| Receiving feedback from students | Receiving feedback from students | | |
| Individual feedback taken by teacher | | | |
| Teachers have low knowledge of Technology | Teachers is less familiar with technology | | |
| Teacher is not familiar with Technology | | | |
| Teacher's value enhances girls' learning | Teacher's Behavior Affect Learning | | |
| Teacher's behavior affects learning | | | |
| Focused Child. Centered Teaching Method | Teachers' teaching approaches | | |
| Teachers' teaching approaches | | | |
| Teaching Approaches in Mathematics | | | |
| Teacher's Teaching Strategies | Teacher's Teaching Strategies | | |
| Students' Question get Value | | | |
| Traditional Teaching Strategies | | | |
| Lack of focusing gender | | | |
| Application of Mathematics | | | |
| Enhance shy students for participation | | | |
| Teaching materials | Teaching materials | | |
| Teaching Materials is demanded in Geometry | | | |
| Teaching Materials Used to Give New Mathematical Concept | | | |
| Not Use of Teaching Materials | | | |
| Use of Teaching Materials | | | |
| Large number of students are problem | Individual Feedback is not Possible | Providing Individual instruction | |
| Not Giving Feedback | | | |
| Individual Feedback is not Possible | | | |
| Individual Treatment for Non-Speakers | Individual Treat According to Specific Learning Needs | | |
| Individual Treatment is not Possible | | | |
| Individual Treat According to Specific Learning Needs | | | |
| Each Student do not Get Value | | | |
| Not give a value to non-speaking students | | | |

| | | |
|---|---|---|
| Provide same kind of Knowledge is Difficult | | |
| Female Teacher is Familiar with Students | Individualized Instruction | |
| Individualized Instruction | | |
| No Sufficient Time with Teacher for Student's Individual Work | | |
| Anxiety Pressure with Mathematics Teacher | | |
| Not Focusing Students Specific Learning Needs | Students' feelings: not focusing Specific Learning Needs | |
| Understanding of GRP | Understanding of GRP | |
| Everyone got equal treatment from teacher | Equal chance in question answer | Ability assessment |
| Equal chance in question answer | | |
| Internal Assessment is no Matter for Weak Students | Feedback after Internal Assessment do not matter with student ability | |
| Feedback after Internal Assessment | | |
| Less score in SEE Due to Government Mathematics Textbook | Few exercises in Government Mathematics Textbook | |
| Few exercises in Government Mathematics Textbook | | |
| First Second ..ranking system creates discrimination | First Second ..ranking system creates discrimination | |
| Teacher Focusing only Talent Student | Focusing on talent student | |
| Paying Attention to Talent Girls | | |
| Talent Peers not Paying Attention towards Weak Ones | | |
| Teacher and Talent Peer Insult Weak Ones | | |
| Teacher not given value to the weak Students | | |
| Teasing the poor learner | | |
| Girls' enrolment higher in Government school | Girls' empowerment | |
| Awareness program helps active participation | | |
| Girls Empowerment | | |
| Girls have less confident | Lack of self confidence | |
| Girls have lack of confidence in questioning | | |
| Lack of self confidence | | |
| Pre Knowledge is Important | Low Academic Capability | |
| Low Academic Capability | | |
| Result System | Not favorable Education system | |

| | | |
|---|---|---|
| Grading System Decline Quality Education | | |
| Not favorable Education system | | |
| Coaching Classes for Good Marks | Remedial class like coaching class to improve performance | |
| Remedial class to improve performance | | |
| Student's level is not fit with curriculum | Student's level is not fit with curriculum | |
| Teachers limited content knowledge impact students learning | Teachers' limited content knowledge impact students learning | |
| Teachers have not favorable condition in teaching | School environment | |
| School environment | | |

## Appendix M: Sampling Frame (School List)

| Kathmandu District | | | |
|---|---|---|---|
| **S.N** | **Name of School** | **Local Level** | **Ward No** |
| 1 | Adarsha Ma Vi* | Kageshwori Manahara Nagarpalika | 3 |
| 2 | Amar Jyoti Ma V* | Nagarjun Nagarpalika | 10 |
| 3 | Anand Bhairab Ma V* | Kageshwori Manahara Nagarpalika | 7 |
| 4 | Arunodaya Ma V | Dakshinkali Nagarpalika | 5 |
| 5 | Bagh Bhairab Ma V* | Kirtipur Nagarpalika | 4 |
| 6 | Bal Bikash Ma V | Kageshwori Manahara Nagarpalika | 2 |
| 7 | Bal Bikasha Ma V | Nagarjun Nagarpalika | 1 |
| 8 | Bal Byabasahi Secondary School* | Kathmandu Mahanagarpalika | 7 |
| 9 | Bal Kumari Ma V | Kirtipur Nagarpalika | 5 |
| 10 | Bal Sansar Secondary School* | Gokarneshwor Nagarpalika | 7 |
| 11 | Bal Sudhar Secondary School | Gokarneshwor Nagarpalika | 2 |
| 12 | Bal Uddhar Ma V | Kageshwori Manahara Nagarpalika | 1 |
| 13 | Bal Uddhar Secondary School* | Budhanilkantha Nagarpalika | 10 |
| 14 | Balambu Secondary School* | Chandragiri Nagarpalika | 12 |
| 15 | Balbodh Ma V | Nagarjun Nagarpalika | 8 |
| 16 | Balseva Secondary School | Kathmandu Mahanagarpalika | 23 |
| 17 | Bansbari Secondary School* | Kathmandu Mahanagarpalika | 4 |
| 18 | Bhagawati Ma V* | Shankharapur Nagarpalika | 6 |
| 19 | Bhagyodaya Ma V | Shankharapur Nagarpalika | 6 |
| 20 | Bhakta Vidyashram Secondary School | Kathmandu Mahanagarpalika | 18 |
| 21 | Bhanu Secondary School* | Kathmandu Mahanagarpalika | 27 |
| 22 | Bheem Secondary School | Chandragiri Nagarpalika | 2 |
| 23 | Bhimsengola Secondary School* | Kathmandu Mahanagarpalika | 31 |
| 24 | Bishnu Devi Ma V* | Chandragiri Nagarpalika | 15 |
| 25 | Biswo Rastriya Ma V | Kirtipur Nagarpalika | 3 |
| 26 | Boudeshwor Secondary School* | Tokha Nagarpalika | 1 |
| 27 | Budanilkantha Ma V | Budhanilkantha Nagarpalika | 3 |
| 28 | Champa Devi Ma V* | Dakshinkali Nagarpalika | 1 |
| 29 | Chamunda Secondary School | Gokarneshwor Nagarpalika | 6 |
| 30 | Chandeshowari Ma V | Tokha Nagarpalika | 5 |
| 31 | Chandi Bhairab Ma V* | Chandragiri Nagarpalika | 2 |
| 32 | Chandika Devi Ma V | Chandragiri Nagarpalika | 2 |
| 33 | Chunadavi Ma V | Tokha Nagarpalika | 9 |
| 34 | Chundevi Ma V | Chandragiri Nagarpalika | 4 |
| 35 | Dalekhi Madhyamik Vidyalaya* | Budhanilkantha Nagarpalika | 5 |
| 36 | Devi Bal Sudhar Ma V* | Gokarneshwor Nagarpalika | 3 |
| 37 | Dhapasi Secondary School* | Tokha Nagarpalika | 4 |
| 38 | Dhumrabarah Secondary School* | Kathmandu Mahanagarpalika | 4 |
| 39 | Futung Ma V* | Tarkeshwor Nagarpalika | 7 |
| 40 | Gandhi Adarsha Secondary School** | Kageshwori Manahara Nagarpalika | 9 |
| 41 | Ganesh Ma V* | Budhanilkantha Nagarpalika | 2 |

| | | | |
|---|---|---|---|
| 42 | Geetamata Secondary School* | Kathmandu Mahanagarpalika | 15 |
| 43 | Gokarna Ma V* | Gokarneshwor Nagarpalika | 4 |
| 44 | Gokarneshwor Mahadev Secondary School | Gokarneshwor Nagarpalika | 4 |
| 45 | Gorakhnath Ma V* | Kirtipur Nagarpalika | 9 |
| 46 | Gram Sewa Ma V | Tarkeshwor Nagarpalika | 6 |
| 47 | Guheshwari Bal Sikshya Secondary School* | Kathmandu Mahanagarpalika | 11 |
| 48 | Guheshwari Secondary School** | Kathmandu Mahanagarpalika | 9 |
| 49 | Gyanodaya Secondary School** | Kathmandu Mahanagarpalika | 13 |
| 50 | Himalaya Secondary School | Kathmandu Mahanagarpalika | 22 |
| 51 | Jagannath Secondary School | Kathmandu Mahanagarpalika | 11 |
| 52 | Jalupa Ma V | Tokha Nagarpalika | 8 |
| 53 | Jan Vikas Ma V ** | Kathmandu Mahanagarpalika | 14 |
| 54 | Jana Bikash Ma V* | Chandragiri Nagarpalika | 8 |
| 55 | Jana Jagriti Ma V* | Budhanilkantha Nagarpalika | 11 |
| 56 | Jana Uddhar Ma V* | Nagarjun Nagarpalika | 5 |
| 57 | Jana Uddhar Secondary School | Budhanilkantha Nagarpalika | 13 |
| 58 | Janajagruti Gnanarashmi Secondary School | Kathmandu Mahanagarpalika | 16 |
| 59 | Janakalyan Ma V | Chandragiri Nagarpalika | 5 |
| 60 | Janakalyana Secondary School* | Kathmandu Mahanagarpalika | 6 |
| 61 | Janaprabhat Secondary School** | Kathmandu Mahanagarpalika | 13 |
| 62 | Janasewa Secondary School | Kirtipur Nagarpalika | 5 |
| 63 | Janpath Secondary School** | Kathmandu Mahanagarpalika | 14 |
| 64 | Jhor Mahankal Ma V | Tokha Nagarpalika | 1 |
| 65 | Jitpur Ma V | Tarkeshwor Nagarpalika | 3 |
| 66 | Judhodaya Secondary School | Kathmandu Mahanagarpalika | 16 |
| 67 | Kabhresthali Ma V* | Tarkeshwor Nagarpalika | 2 |
| 68 | Kali Devi Ma V | Tarkeshwor Nagarpalika | 2 |
| 69 | Kalika Saran Ma V* | Tarkeshwor Nagarpalika | 3 |
| 70 | Kalikasharan Ma V | Shankharapur Nagarpalika | 3 |
| 71 | Kamdhenu Ma V* | Dakshinkali Nagarpalika | 2 |
| 72 | Kankali Ma V | Chandragiri Nagarpalika | 13 |
| 73 | Kanti Bhairab Ma V* | Kageshwori Manahara Nagarpalika | 5 |
| 74 | Kanya Mandir Secondary School | Kathmandu Mahanagarpalika | 25 |
| 75 | Kendriya Bahira Secondary School | Kathmandu Mahanagarpalika | 1 |
| 76 | Khokana Jana Ma V | Dakshinkali Nagarpalika | 2 |
| 77 | Kirtipur Ma V * | Kirtipur Nagarpalika | 9 |
| 78 | Koteshwar Saraswati Secondary School* | Kathmandu Mahanagarpalika | 32 |
| 79 | Krishna Ma V* | Chandragiri Nagarpalika | 1 |
| 80 | Kuleshwar Secondary School* | Kathmandu Mahanagarpalika | 14 |
| 81 | Kunchipwakal M V | Tarkeshwor Nagarpalika | 1 |
| 82 | Mahankal Secondary School* | Kathmandu Mahanagarpalika | 27 |
| 83 | Mahendra Boudha Secondary School* | Kathmandu Mahanagarpalika | 6 |
| 84 | Mahendra Rastriya Secondary School* | Kathmandu Mahanagarpalika | 4 |
| 85 | Mahila Bandhi School | Kathmandu Mahanagarpalika | 11 |
| 86 | Man Singh Dharma Ma V | Tarkeshwor Nagarpalika | 10 |

| | | | |
|---|---|---|---|
| 87 | Manakamana Secondary School* | Gokarneshwor Nagarpalika | 7 |
| 88 | Manamaiju Ma V* | Tarkeshwor Nagarpalika | 9 |
| 89 | Mangal Ma V | Chandragiri Nagarpalika | 14 |
| 90 | Mangal Secondary School* | Kirtipur Nagarpalika | 10 |
| 91 | Mangaladevi Secondary School | Kathmandu Mahanagarpalika | 9 |
| 92 | Mangalodaya Madhyamic Vidhyalaya* | Chandragiri Nagarpalika | 3 |
| 93 | Manohar Ma V* | Tokha Nagarpalika | 10 |
| 94 | Nagarjun Madhyamik Vidhyalaya | Tarkeshwor Nagarpalika | 5 |
| 95 | Namgyal Secondary School | Gokarneshwor Nagarpalika | 4 |
| 96 | Nandhi Ratri Secondary School* | Kathmandu Mahanagarpalika | 1 |
| 97 | Nandhi Secondary School* | Kathmandu Mahanagarpalika | 1 |
| 98 | Narayan Jan Ma V | Chandragiri Nagarpalika | 9 |
| 99 | Naulin Ma V | Budhanilkantha Nagarpalika | 13 |
| 100 | Nava Adarsh Secondary School | Kathmandu Mahanagarpalika | 23 |
| 101 | Navajagriti Secondary School* | Kathmandu Mahanagarpalika | 6 |
| 102 | Navayug Secondary School | Kathmandu Mahanagarpalika | 21 |
| 103 | Neelbarahi Secondary School | Kathmandu Mahanagarpalika | 13 |
| 104 | Nepal Adarsh Secondary School | Kathmandu Mahanagarpalika | 22 |
| 105 | Nepal Rastriya Ma V | Tarkeshwor Nagarpalika | 11 |
| 106 | Nepal Rastriya Nirman Ma V | Kageshwori Manahara Nagarpalika | 6 |
| 107 | Nepal Yubak Secondary School* | Kathmandu Mahanagarpalika | 16 |
| 108 | Okhreni Secondary School* | Gokarneshwor Nagarpalika | 1 |
| 109 | Padmakanya Vidyashram Secondary School | Kathmandu Mahanagarpalika | 29 |
| 110 | Padmodaya Secondary School* | Kathmandu Mahanagarpalika | 28 |
| 111 | Pancha Kanya Ma V* | Budhanilkantha Nagarpalika | 5 |
| 112 | Pancha Kanya Ma V* | Dakshinkali Nagarpalika | 8 |
| 113 | Panchakanya Ma V | Nagarjun Nagarpalika | 7 |
| 114 | Panchkanya Secondary School | Kathmandu Mahanagarpalika | 13 |
| 115 | Paropakar Secondary School | Kathmandu Mahanagarpalika | 20 |
| 116 | Pashupati Mitra Secondary School* | Kathmandu Mahanagarpalika | 7 |
| 117 | Pharping Ma V* | Dakshinkali Nagarpalika | 6 |
| 118 | Prabhat Ma VI | Chandragiri Nagarpalika | 7 |
| 119 | Prabhat Secondary School | Kathmandu Mahanagarpalika | 25 |
| 120 | Prithvi Narayan Ma V* | Tarkeshwor Nagarpalika | 5 |
| 121 | Purano Guheshwori Ma V | Tarkeshwor Nagarpalika | 4 |
| 122 | Rastriya Ma V* | Shankharapur Nagarpalika | 9 |
| 123 | Ratna Rajya Ma V** | Nagarjun Nagarpalika | 7 |
| 124 | Ratnarajya Secondary School* | Kathmandu Mahanagarpalika | 10 |
| 125 | Sahayogi Secondary School* | Gokarneshwor Nagarpalika | 4 |
| 126 | Sangla Bal Kumari Ucha Ma V | Tarkeshwor Nagarpalika | 1 |
| 127 | Sanskrit Secondary School | Kathmandu Mahanagarpalika | 27 |
| 128 | Sarada Ma V | Shankharapur Nagarpalika | 2 |
| 129 | Sarada Secondary School* | Kathmandu Mahanagarpalika | 9 |
| 130 | Saraswati Ma V | Tokha Nagarpalika | 3 |
| 131 | Saraswati Niketan Secondary School | Kathmandu Mahanagarpalika | 12 |
| 132 | Saraswati Secondary School | Gokarneshwor Nagarpalika | 8 |

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| 133 | Seti Devi Ma V* | Dakshinkali Nagarpalika | 9 |
| 134 | Seti Devi Ma V | Dakshinkali Nagarpalika | 3 |
| 135 | Shahidshukra Secondary School* | Kathmandu Mahanagarpalika | 28 |
| 136 | Shanti Adarsha Secondary School | Gokarneshwor Nagarpalika | 5 |
| 137 | Shanti Nikunj Secondary School | Kathmandu Mahanagarpalika | 20 |
| 138 | Shanti Shiksha Mandir Secondary School | Kathmandu Mahanagarpalika | 17 |
| 139 | Shanti Vidyagriha Secondary School | Kathmandu Mahanagarpalika | 26 |
| 140 | Shivpuri Secondary School** | Kathmandu Mahanagarpalika | 3 |
| 141 | Shradha Mahila School | Nagarjun Nagarpalika | 2 |
| 142 | Shram Jyoti Public School* | Gokarneshwor Nagarpalika | 8 |
| 143 | Shram Rastriya Secondary School* | Kathmandu Mahanagarpalika | 7 |
| 144 | Shree Adinath Secondary School | Kirtipur Nagarpalika | 6 |
| 145 | Shree Krishna Ma V* | Dakshinkali Nagarpalika | 8 |
| 146 | Shree Mahankal Janajagrit Secondary School | Budhanilkantha Nagarpalika | 8 |
| 147 | Shree Yagyamati Ma V* | Budhanilkantha Nagarpalika | 11 |
| 148 | Siddheshwar Secondary School* | Kathmandu Mahanagarpalika | 31 |
| 149 | Siddhi Ganesh Ma V | Kageshwori Manahara Nagarpalika | 1 |
| 150 | Siddiganesh Secondary School | Kathmandu Mahanagarpalika | 16 |
| 151 | Sitala Secondary School | Kathmandu Mahanagarpalika | 16 |
| 152 | Sitapaila Ma V* | Nagarjun Nagarpalika | 4 |
| 153 | Sitaram Ma V | Nagarjun Nagarpalika | 6 |
| 154 | Susta Manasthidhi Tatha Pariwarik Sarslaha Kendra | Kathmandu Mahanagarpalika | 31 |
| 155 | Tangal Secondary School* | Kathmandu Mahanagarpalika | 5 |
| 156 | Tarun Secondary School** | Kathmandu Mahanagarpalika | 16 |
| 157 | Taudaha Rastriya Secondary School* | Kirtipur Nagarpalika | 6 |
| 158 | Tej Binayak Ma V* | Kageshwori Manahara Nagarpalika | 8 |
| 159 | Tilingatar Ma V* | Tokha Nagarpalika | 7 |
| 160 | Tyod Secondary School | Kathmandu Mahanagarpalika | 27 |
| 161 | Ugratara Ma V | Shankharapur Nagarpalika | 8 |
| 162 | Vaishanabi Secondary School | Kirtipur Nagarpalika | 7 |
| 163 | Vijay Smarak Secondary School** | Kathmandu Mahanagarpalika | 29 |
| 164 | Viswaniketan Secondary School* | Kathmandu Mahanagarpalika | 11 |
| **Dolakha District** | | | |
| **S.N** | **Name of School** | **Local level** | **Ward no.** |
| 1 | Ajadi Ma V | Melung Gaunpalika | 7 |
| 2 | Amar Ma V* | Tamakoshi Gaunpalika | 2 |
| 3 | Baiteswor Ma V** | Baiteshwor Gaunpalika | 6 |
| 4 | Balodaya Ma V** | Kalinchok Gaunpalika | 1 |
| 5 | Bhagawati Ma V* | Kalinchok Gaunpalika | 3 |
| 6 | Bhangeri Ma V* | Melung Gaunpalika | 1 |
| 7 | Bhim Ma V Dhanuke* | Melung Gaunpalika | 4 |
| 8 | Bhim Ma V* | Bhimeshwor Nagarpalika | 2 |
| 9 | Bhim Ma V* | Melung Gaunpalika | 2 |
| 10 | Bhume Gumba Ma V | Gaurishankar Gaunpalika | 6 |

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| 11 | Bhumesthan Ma V | Melung Gaunpalika | 3 |
| 12 | Birendra Ma V | Sailung Gaunpalika | 5 |
| 13 | Bishnu Ma V* | Baiteshwor Gaunpalika | 1 |
| 14 | Bouddha Bhuwaneshwori Ma V* | Jiri Nagarpalika | 2 |
| 15 | Budha Bhimsen Ma V* | Bhimeshwor Nagarpalika | 5 |
| 16 | Chemawati Ma V* | Bhimeshwor Nagarpalika | 1 |
| 17 | Danda Kharka Ma V | Melung Gaunpalika | 5 |
| 18 | Devi Ma V* | Bhimeshwor Nagarpalika | 8 |
| 19 | Dhungeshwori Ma V* | Jiri Nagarpalika | 5 |
| 20 | Dhungeshwori Pravi* | Bigu Gaunpalika | 4 |
| 21 | Durga Ma V* | Sailung Gaunpalika | 4 |
| 22 | Garjangdhunga Ma V | Jiri Nagarpalika | 1 |
| 23 | Gauri Shankar Ma V | Bigu Gaunpalika | 7 |
| 24 | Gauri Shankar Ma V* | Bigu Gaunpalika | 1 |
| 25 | Golmeshwor Ma V* | Tamakoshi Gaunpalika | 4 |
| 26 | Gupteshwor Ma V | Tamakoshi Gaunpalika | 4 |
| 27 | Haleshwor Ma V* | Gaurishankar Gaunpalika | 5 |
| 28 | Hanumanteshwor Ma V* | Baiteshwor Gaunpalika | 4 |
| 29 | Heem Barti Ma V | Gaurishankar Gaunpalika | 7 |
| 30 | Hilepani Sanskrit Ma V | Kalinchok Gaunpalika | 4 |
| 31 | Himalaya Ma V* | Bigu Gaunpalika | 5 |
| 32 | Himalaya Ma Vi Khopachagu | Bigu Gaunpalika | 8 |
| 33 | Jaladevi Ma V | Baiteshwor Gaunpalika | 5 |
| 34 | Jalpashwori Ma V | Kalinchok Gaunpalika | 2 |
| 35 | Jan Jagriti Ma V* | Tamakoshi Gaunpalika | 5 |
| 36 | Jan Jagriti Pra V* | Baiteshwor Gaunpalika | 1 |
| 37 | Jan Jyoti Ma V | Baiteshwor Gaunpalika | 2 |
| 38 | Janajyoti Ma V* | Kalinchok Gaunpalika | 6 |
| 39 | Janaprabhat Ma V | Tamakoshi Gaunpalika | 2 |
| 40 | Jiri Ma V* | Jiri Nagarpalika | 6 |
| 41 | Juke Ma V | Melung Gaunpalika | 4 |
| 42 | Kalapani Ma V* | Tamakoshi Gaunpalika | 3 |
| 43 | Kali Bhume Ma V | Sailung Gaunpalika | 3 |
| 44 | Kalidevi Ma V | Jiri Nagarpalika | 8 |
| 45 | Kalidhunga Ma V | Baiteshwor Gaunpalika | 7 |
| 46 | Kalika Ma V | Baiteshwor Gaunpalika | 7 |
| 47 | Kalika Ma V | Jiri Nagarpalika | 9 |
| 48 | Kalika Ma V | Sailung Gaunpalika | 7 |
| 49 | Kalika Ma V | Tamakoshi Gaunpalika | 7 |
| 50 | Kalika Ma V* | Kalinchok Gaunpalika | 9 |
| 51 | Kalika uchha uchha M | Melung Gaunpalika | 2 |
| 52 | Kalinag Ma V | Kalinchok Gaunpalika | 3 |
| 53 | Kalinag Ma V | Kalinchok Gaunpalika | 8 |
| 54 | Kalinchowk Ma V* | Bhimeshwor Nagarpalika | 3 |
| 55 | Kalla Bari Ma V | Sailung Gaunpalika | 1 |
| 56 | Khare Ma V* | Gaurishankar Gaunpalika | 8 |

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| 57 | Kshatrawati Ma V | Baiteshwor Gaunpalika | 5 |
| 58 | Kuti Danda Ma V | Bhimeshwor Nagarpalika | 7 |
| 59 | Lapilang Ma V | Kalinchok Gaunpalika | 5 |
| 60 | Laxmi Ma V | Melung Gaunpalika | 3 |
| 61 | Maga Pauwa Ma V* | Sailung Gaunpalika | 4 |
| 62 | Mahendra Ma V | Tamakoshi Gaunpalika | 6 |
| 63 | Mahendrodaya Ma V** | Bhimeshwor Nagarpalika | 5 |
| 64 | Manedanda Ma V | Gaurishankar Gaunpalika | 4 |
| 65 | Narayani Ma V* | Tamakoshi Gaunpalika | 1 |
| 66 | Navin Ma V* | Sailung Gaunpalika | 2 |
| 67 | Nikobhume Ma V* | Kalinchok Gaunpalika | 2 |
| 68 | Nilakantheshwor Ma V* | Gaurishankar Gaunpalika | 2 |
| 69 | Sagute Ma V | Sailung Gaunpalika | 7 |
| 70 | Sankheshwor Ma V | Tamakoshi Gaunpalika | 5 |
| 71 | Sarada Ma V | Bigu Gaunpalika | 4 |
| 72 | Sarada Ma V | Sailung Gaunpalika | 8 |
| 73 | Satyeshwor Ma V** | Melung Gaunpalika | 1 |
| 74 | Shanti Adarsha Ma V* | Bigu Gaunpalika | 4 |
| 75 | Sharba Ma V* | Bhimeshwor Nagarpalika | 4 |
| 76 | Siddheshwor Ma V | Tamakoshi Gaunpalika | 4 |
| 77 | Sitapaila Ma V* | Tamakoshi Gaunpalika | 3 |
| 78 | Sitka Ma V | Kalinchok Gaunpalika | 7 |
| 79 | Surke Ma V* | Bhimeshwor Nagarpalika | 9 |
| 80 | Thampu Ma V* | Bigu Gaunpalika | 6 |
| 81 | Thulo Patal Ma V* | Jiri Nagarpalika | 9 |
| 82 | Tribhuwan Ma V* | Melung Gaunpalika | 6 |
| 83 | Trikuteshwor Ma V* | Tamakoshi Gaunpalika | 5 |
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| **Sindhuli District** | | | |
| **S.N** | **Name of School** | **Local Level** | **Ward No.** |
| 1 | Arunodaya Ma V* | Dudhauli Nagarpalika | 4 |
| 2 | Bal Ma V Sulibhanjyang* | Golanjor Gaupalika | 2 |
| 3 | Barundevi Ma V Khattar* | Kamalamai Nagarpalika | 4 |
| 4 | Baruneshwar Ma V* | Marin Gaunpalika | 3 |
| 5 | Batsala Ma V* | Golanjor Gaupalika | 4 |
| 6 | Bengkateswar Ma V* | Tinpatan Gaunpalika | 8 |
| 7 | Bhanu Ma V Hatpate* | Dudhauli Nagarpalika | 2 |
| 8 | Bhanubhakta Ma v* | Hariharpurgadhi Gaunpalika | 3 |
| 9 | Bhawani Ma V* | Tinpatan Gaunpalika | 2 |
| 10 | Champadevi Ma V* | Tinpatan Gaunpalika | 6 |
| 11 | Chandeshwori Ma V Dadi** | Kamalamai Nagarpalika | 1 |
| 12 | Chandika Ma V* | Phikkal Gaunpalika | 3 |
| 13 | Chandrawati Ma V* | Tinpatan Gaunpalika | 1 |
| 14 | Devisthan Secondary School | Sunkoshi Gaunpalika | 1 |
| 15 | Dirgha Pradip Ma V Khalte* | Sunkoshi Gaunpalika | 6 |

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| 16 | Ganesh Ma V | Sunkoshi Gaunpalika | 5 |
| 17 | Ganesh Ma Vi Majhuwa | Sunkoshi Gaunpalika | 7 |
| 18 | Gaumati Ma V* | Kamalamai Nagarpalika | 6 |
| 19 | Gaurisankar Ma V | Marin Gaunpalika | 7 |
| 20 | Hariharpur Ma V Pipalmadi* | Hariharpurgadhi Gaunpalika | 3 |
| 21 | Hira Thumki Ma V | Tinpatan Gaunpalika | 7 |
| 22 | Jalkanya Ma V Chapauli | Kamalamai Nagarpalika | 3 |
| 23 | Jana Jagaran Ma V | Dudhauli Nagarpalika | 6 |
| 24 | Jana Jagriti Ma V Bhiman* | Kamalamai Nagarpalika | 9 |
| 25 | Jana Jagriti Ma V Dhodeni* | Phikkal Gaunpalika | 1 |
| 26 | Jana Jagriti Ma V Nibuwatar* | Kamalamai Nagarpalika | 2 |
| 27 | Jana Jyoti Ma V Phosretar** | Kamalamai Nagarpalika | 5 |
| 28 | Jana Jyoti Ma V* | Golanjor Gaupalika | 7 |
| 29 | Janahit Ma V Boteni* | Hariharpurgadhi Gaunpalika | 5 |
| 30 | Janajagrati Ma V* | Dudhauli Nagarpalika | 10 |
| 31 | Janajagriti Ma V Tangsar | Kamalamai Nagarpalika | 12 |
| 32 | Janapremi Ma V | Dudhauli Nagarpalika | 9 |
| 33 | Janapremi Ma V Shyangti | Tinpatan Gaunpalika | 11 |
| 34 | Janasewa Ma V Riththe | Tinpatan Gaunpalika | 9 |
| 35 | Janata Ma V Bhakvar* | Hariharpurgadhi Gaunpalika | 2 |
| 36 | Janata Ma V Chandanpur | Kamalamai Nagarpalika | 14 |
| 37 | Janata Ma V Khaniyakharka | Golanjor Gaupalika | 5 |
| 38 | Kalika Ma V | Tinpatan Gaunpalika | 5 |
| 39 | Kalika Ma V Dhamile Jarayotar | Kamalamai Nagarpalika | 11 |
| 40 | Kalika Ma Vi Pallorampur* | Kamalamai Nagarpalika | 7 |
| 41 | Kamada Ma V | Golanjor Gaupalika | 1 |
| 42 | Kamala Janajyoti Ma V Silame* | Kamalamai Nagarpalika | 5 |
| 43 | Kamala Ma V Dhansari | Dudhauli Nagarpalika | 11 |
| 44 | Kamala Ma V Dhungrebas | Kamalamai Nagarpalika | 4 |
| 45 | Kamala Ma V Karkare | Kamalamai Nagarpalika | 8 |
| 46 | Kamala Ma V Maini | Dudhauli Nagarpalika | 11 |
| 47 | Kamala Ma V* | Dudhauli Nagarpalika | 2 |
| 48 | Kamala Ma V* | Tinpatan Gaunpalika | 1 |
| 49 | Kapilakot Ma V* | Marin Gaunpalika | 7 |
| 50 | Kaushika Ma V* | Golanjor Gaupalika | 3 |
| 51 | Kundesori Ma V Ranichuri | Kamalamai Nagarpalika | 12 |
| 52 | Kusheshwar Ma. Vi. Dhapsar | Hariharpurgadhi Gaunpalika | 6 |
| 53 | Kusheswar Ma V | Marin Gaunpalika | 3 |
| 54 | Kyneshwar Ma V Pantale* | Hariharpurgadhi Gaunpalika | 8 |
| 55 | Ma V Amale | Ghanglekh Gaunpalika | 1 |
| 56 | Ma V Ambote | Tinpatan Gaunpalika | 9 |
| 57 | Ma V Bajhe | Kamalamai Nagarpalika | 12 |
| 58 | Ma V Bangring Phedi | Tinpatan Gaunpalika | 10 |
| 59 | Ma V Basbote* | Dudhauli Nagarpalika | 14 |
| 60 | Ma V Batase | Tinpatan Gaunpalika | 9 |
| 61 | Ma V Beltar | Kamalamai Nagarpalika | 1 |

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| 62 | Ma V Chandibhanjyang | Phikkal Gaunpalika | 2 |
| 63 | Ma V Chilaunedanda Bhirgaun* | Kamalamai Nagarpalika | 11 |
| 64 | Ma V Gadauli* | Kamalamai Nagarpalika | 7 |
| 65 | Ma V Gairikhani | Tinpatan Gaunpalika | 6 |
| 66 | Ma V Guthbazar* | Sunkoshi Gaunpalika | 3 |
| 67 | Ma V Halidanda | Tinpatan Gaunpalika | 11 |
| 68 | Ma V Jinakhu | Dudhauli Nagarpalika | 12 |
| 69 | Ma V Kalapani* | Dudhauli Nagarpalika | 3 |
| 70 | Ma V Karmidanda, Chisapani* | Hariharpurgadhi Gaunpalika | 1 |
| 71 | Ma V Kartike | Marin Gaunpalika | 1 |
| 72 | Ma V Khayarsal* | Marin Gaunpalika | 4 |
| 73 | Ma V Ladabhir | Dudhauli Nagarpalika | 9 |
| 74 | Ma V Lampantar | Tinpatan Gaunpalika | 11 |
| 75 | Ma V Lumti Pokhari | Phikkal Gaunpalika | 2 |
| 76 | Ma V Mahavir* | Tinpatan Gaunpalika | 8 |
| 77 | Ma V Majhuwadobhan | Tinpatan Gaunpalika | 5 |
| 78 | Ma V Marin Hayutar* | Ghanglekh Gaunpalika | 2 |
| 79 | Ma V Nayakharka | Golanjor Gaupalika | 5 |
| 80 | Ma V Pachrukhi* | Dudhauli Nagarpalika | 4 |
| 81 | Ma V Panitanki* | Kamalamai Nagarpalika | 6 |
| 82 | Ma V Patlebhanjyang | Dudhauli Nagarpalika | 13 |
| 83 | Ma V Ratmata Kholagau* | Phikkal Gaunpalika | 3 |
| 84 | Ma V Saluke | Phikkal Gaunpalika | 6 |
| 85 | Ma V Sandane Jarayotar | Tinpatan Gaunpalika | 4 |
| 86 | Ma V Sindure Ratamata | Marin Gaunpalika | 2 |
| 87 | Ma V Sirthauli* | Dudhauli Nagarpalika | 5 |
| 88 | Ma V Sisabot | Tinpatan Gaunpalika | 5 |
| 89 | Ma V Sughare | Dudhauli Nagarpalika | 7 |
| 90 | Ma V Tadi* | Dudhauli Nagarpalika | 11 |
| 91 | Ma V Thulidamar | Marin Gaunpalika | 4 |
| 92 | MA.VI. MahendraJhayadi** | Hariharpurgadhi Gaunpalika | 4 |
| 93 | Mahakali Ma V | Phikkal Gaunpalika | 4 |
| 94 | Mangala Ma V Ghoksila** | Golanjor Gaupalika | 6 |
| 95 | Nava Jyoti Ma V Gichihani* | Dudhauli Nagarpalika | 1 |
| 96 | Netra Kali Ma V Aapdanda Rampur | Ghanglekh Gaunpalika | 5 |
| 97 | Netrakali Ma V Tamajor | Ghanglekh Gaunpalika | 3 |
| 98 | Panchakanya Ma V Kudule** | Kamalamai Nagarpalika | 4 |
| 99 | Patandevi Ma V | Tinpatan Gaunpalika | 3 |
| 100 | Phikal Ma V* | Phikkal Gaunpalika | 5 |
| 101 | Prabhat Ma V Ranibas** | Kamalamai Nagarpalika | 13 |
| 102 | Pragatisil Ma V Dhamidumariya** | Kamalamai Nagarpalika | 10 |
| 103 | Pragatisil Ma V* | Sunkoshi Gaunpalika | 3 |
| 104 | Prakasoda Ma V Kholagau | Phikkal Gaunpalika | 3 |
| 105 | Saraswati Ma V | Dudhauli Nagarpalika | 8 |
| 106 | Saraswati Ma V* | Dudhauli Nagarpalika | 4 |
| 107 | Sarswati Ma V Hilepani Sakhajor* | Tinpatan Gaunpalika | 2 |

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| 108 | Sharad Ma V Bekhatadi* | Golanjor Gaupalika | 4 |
| 109 | Shiddha Ma V | Sunkoshi Gaunpalika | 4 |
| 110 | Sunkoshi Ma V | Phikkal Gaunpalika | 4 |
| 111 | Ucha Ma V Mahadevdada* | Phikkal Gaunpalika | 1 |
| | **Chitwan District** | | |
| **S.N** | **Name of School** | **Local Level** | **Ward No.** |
| 1 | Adarsha Ma V** | Bhratpur Mahanagarpalika | 26 |
| 2 | Adikabi Bhanu Bhakta Ma V* | Bhratpur Mahanagarpalika | 1 |
| 3 | Amar Ma V* | Bhratpur Mahanagarpalika | 22 |
| 4 | Annapurna Ma V* | Bhratpur Mahanagarpalika | 21 |
| 5 | Arunodaya Ma V* | Bhratpur Mahanagarpalika | 6 |
| 6 | Bachhouli Ma V* | Ratnangar Nagarpalika | 6 |
| 7 | Bairiya Ma V* | Ratnangar Nagarpalika | 10 |
| 8 | Bal Kumari Kanya Ma V | Bhratpur Mahanagarpalika | 1 |
| 9 | Bal Kumari Ma V* | Bhratpur Mahanagarpalika | 2 |
| 10 | Bhadrakali Secondary School** | Ratnangar Nagarpalika | 16 |
| 11 | Bhandara Ma V* | Rapti Nagarpalika | 6 |
| 12 | Bharatpur Ma V* | Bhratpur Mahanagarpalika | 10 |
| 13 | Bhim Nagar Ma V* | Bhratpur Mahanagarpalika | 20 |
| 14 | Bhimodaya Ma V* | Kalika Nagarpalika Chitwan | 5 |
| 15 | Birendran Adarsha Ma V** | Rapti Nagarpalika | 7 |
| 16 | Bishwa Jyoti Sikshya Sadan* | Bhratpur Mahanagarpalika | 14 |
| 17 | Bishwo Prakash Ma V** | Bhratpur Mahanagarpalika | 15 |
| 18 | Buddha Shanti Ma V* | Rapti Nagarpalika | 2 |
| 19 | Chaturmukhi Ma Vi* | Kalika Nagarpalika Chitwan | 9 |
| 20 | Chitwan Ma V* | Bhratpur Mahanagarpalika | 10 |
| 21 | Dhaddaghari Ma V* | Bhratpur Mahanagarpalika | 16 |
| 22 | Durga Sheshkanta Ma V* | Bhratpur Mahanagarpalika | 16 |
| 23 | Dwarikadas Ma V* | Ratnangar Nagarpalika | 14 |
| 24 | Ganesh Ma V* | Rapti Nagarpalika | 12 |
| 25 | Gawai Ma V* | Khairahani Nagarpalika | 13 |
| 26 | Gunjanagar Ma V* | Bhratpur Mahanagarpalika | 18 |
| 27 | Gurukul Ma V* | Bhratpur Mahanagarpalika | 9 |
| 28 | Himalaya Dandpani Neupane Ma V* | Bhratpur Mahanagarpalika | 7 |
| 29 | Jana Daya Ma V* | Ratnangar Nagarpalika | 13 |
| 30 | Jana Jagriti Ma V* | Ratnangar Nagarpalika | 14 |
| 31 | Jana Jivan Ma V* | Madi Nagarpalika | 8 |
| 32 | Jana Kalyan Ma V* | Madi Nagarpalika | 6 |
| 33 | Jana Priya Ma V* | Ichchhyakamana Gaunpalika | 1 |
| 34 | Janajivan Ma V* | Khairahani Nagarpalika | 2 |
| 35 | Janaki Ma V* | Bhratpur Mahanagarpalika | 27 |
| 36 | Janjyoti Pa Da Ma Ma V* | Bhratpur Mahanagarpalika | 25 |
| 37 | Kabilas Ma V* | Bhratpur Mahanagarpalika | 1 |
| 38 | Kankalini Ma V | Khairahani Nagarpalika | 1 |
| 39 | Kapiya Ma V | Khairahani Nagarpalika | 12 |

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| 40 | Kathara Ma V | Khairahani Nagarpalika | 10 |
| 41 | Khairahani Ma V | Khairahani Nagarpalika | 6 |
| 42 | Kiran Ma V | Bhratpur Mahanagarpalika | 19 |
| 43 | Krishnanagar Ma V | Madi Nagarpalika | 9 |
| 44 | Laxmi Ma V* | Bhratpur Mahanagarpalika | 4 |
| 45 | Laxmi Ma V** | Bhratpur Mahanagarpalika | 23 |
| 46 | Ma V Bakulahar* | Ratnangar Nagarpalika | 1 |
| 47 | Ma V Barghare | Bhratpur Mahanagarpalika | 4 |
| 48 | Ma V Barmanagar | Rapti Nagarpalika | 8 |
| 49 | Ma V Chitrasari | Ratnangar Nagarpalika | 8 |
| 50 | Ma V Ganganagar | Bhratpur Mahanagarpalika | 13 |
| 51 | Ma V Gardas | Ichchhyakamana Gaunpalika | 7 |
| 52 | Ma V Gauriganj | Bhratpur Mahanagarpalika | 8 |
| 53 | Ma V Hatibang | Ichchhyakamana Gaunpalika | 1 |
| 54 | Ma V Indrapuri* | Bhratpur Mahanagarpalika | 6 |
| 55 | Ma V Jamunapur | Kalika Nagarpalika Chitwan | 6 |
| 56 | Ma V Kailashnagar* | Bhratpur Mahanagarpalika | 5 |
| 57 | Ma V Kaparfori* | Ratnangar Nagarpalika | 9 |
| 58 | Ma V Khairahani | Madi Nagarpalika | 4 |
| 59 | Ma V Krishnapur | Bhratpur Mahanagarpalika | 10 |
| 60 | Ma V Mahadevtar | Rapti Nagarpalika | 1 |
| 61 | Ma V Majhawang | Kalika Nagarpalika Chitwan | 10 |
| 62 | Ma V Majhgaun | Ichchhyakamana Gaunpalika | 3 |
| 63 | Ma V Shasinagar | Bhratpur Mahanagarpalika | 18 |
| 64 | Ma V Sosi* | Bhratpur Mahanagarpalika | 25 |
| 65 | Ma V Thakaltar | Rapti Nagarpalika | 11 |
| 66 | Ma V Torikhet* | Bhratpur Mahanagarpalika | 5 |
| 67 | Madi Ma V | Madi Nagarpalika | 5 |
| 68 | Malpur Ma V | Ratnangar Nagarpalika | 7 |
| 69 | Mohan Ma V | Bhratpur Mahanagarpalika | 12 |
| 70 | Mohana Ma V* | Ratnangar Nagarpalika | 9 |
| 71 | Narayani Bidya Mandir | Bhratpur Mahanagarpalika | 16 |
| 72 | Narayani Ma V* | Bhratpur Mahanagarpalika | 10 |
| 73 | Narayani Vidya Mandir Ma V* | Bhratpur Mahanagarpalika | 14 |
| 74 | Naya Kiran Ma Vi | Bhratpur Mahanagarpalika | 11 |
| 75 | Nepal Adarsha Sikshya Sadan | Khairahani Nagarpalika | 6 |
| 76 | Nepal Ma V* | Ratnangar Nagarpalika | 2 |
| 77 | Padampur Sikshya Niketan | Kalika Nagarpalika Chitwan | 4 |
| 78 | Pancha Kanya Ma V* | Ratnangar Nagarpalika | 13 |
| 79 | Prabhat Ma V* | Bhratpur Mahanagarpalika | 25 |
| 80 | Prem Basti Ma V** | Bhratpur Mahanagarpalika | 7 |
| 81 | Prithvi Ma V | Kalika Nagarpalika Chitwan | 7 |
| 82 | Ra Ma V Swamitar | Rapti Nagarpalika | 10 |
| 83 | Ram Baidik Sanskrit Gurukulam | Ratnangar Nagarpalika | 13 |
| 84 | Ram Nagar Ma V | Bhratpur Mahanagarpalika | 1 |
| 85 | Rampur Ma V | Bhratpur Mahanagarpalika | 15 |

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| 86 | Sainik Mahavidyala | Khairahani Nagarpalika | 3 |
| 87 | Saraswati Ma V | Bhratpur Mahanagarpalika | 28 |
| 88 | Saraswati Ma V** | Bhratpur Mahanagarpalika | 23 |
| 89 | Sarba Shanti Ma V | Ichchhyakamana Gaunpalika | 4 |
| 90 | Shahid Smriti Ma V | Bhratpur Mahanagarpalika | 6 |
| 91 | Shajapur Ma V | Bhratpur Mahanagarpalika | 28 |
| 92 | Shakti Siksha Sadan | Kalika Nagarpalika Chitwan | 8 |
| 93 | Sharadpur Ma V* | Bhratpur Mahanagarpalika | 9 |
| 94 | Shree Juwani Madhyamic Vidhyalaya | Ratnangar Nagarpalika | 5 |
| 95 | Shree Secondary School Dhungre* | Ichchhyakamana Gaunpalika | 6 |
| 96 | Shree Sharada Secondary School | Bhratpur Mahanagarpalika | 19 |
| 97 | Siddhartha Ma V | Bhratpur Mahanagarpalika | 24 |
| 98 | Siddhi Binayak Ma V | Bhratpur Mahanagarpalika | 11 |
| 99 | Sitaram Ma V | Bhratpur Mahanagarpalika | 1 |
| 100 | Someshwor Ma V | Madi Nagarpalika | 3 |
| 101 | Sripur Ma V | Bhratpur Mahanagarpalika | 15 |
| 102 | Triveni Baraha Ma V | Ichchhyakamana Gaunpalika | 5 |
| 103 | Yuwa Ma V | Bhratpur Mahanagarpalika | 26 |

**Note:** * /** = Sampled School for Teacher Participants, ** =Refers Sampled School for Student Participants