Inclusive Mathematics Classroom Practices: An Interpretive Inquiry

By

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A Thesis for the Degree of Master of Philosophy in Mathematics Education

Submitted to

Graduate School of Education

Faculty of Education

Tribhuvan University

Kathmandu

April, 2023

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Declaration

I hereby declare that this thesis is my original work and it has not been submitted for any candidature of another degree.

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Muna Bista

April 11, 2023

Recommendation Letter

I have read and recommended to the 'Faculty of Education ', Tribhuvan University for acceptance of the thesis entitled on '**Inclusive Mathematics Classroom Practices: An Interpretive Inquiry'** submitted by Muna Bista in the partial fulfilment of MASTER OF PHILOSOPHY IN EDUCATION WITH SPECIALISATION IN MATHEMATICS EDUCATION.

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Approval Letter

The undersigned clarify that we have read, approved and recommended to Faculty of Education Graduate School of Education, Tribhuvan University for acceptance entitled on '**Inclusive Mathematics Classroom Practices: An Interpretive Inquiry**' submitted by **Muna Bista** in the partial fulfilment for the **MASTER OF PHILOSOPHY IN EDUCATION WITH SPECIALISATION IN MATHEMATICS EDUCATION.**

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Acknowledgement

I would like to thank all the people who contributed to me in completing this thesis. First and foremost, I thank my supervisor and director of Graduate School of Education Prof. Dr. Bed Raj Acharya, for guiding me in completing this thesis. At any time, he was ready to guide me from the period of proposal to thesis completion by giving me good moral support. Further, I feel gratitude to the Dean of the Faculty of Education Prof. Dr. Chitra Bahadur Budhathoki who gave me valuable suggestions at the time of final defence of thesis. Likewise, I would like to thank external evaluators Prof. Dr..Hari Prasad Upadhaya and Associate Prof. Dr. Bishnu Khanal (Assistant Dean) for giving me suggestions, comments and feedback to improve my thesis. Similarly, I am thankful to research committee member Prof. Dr. Peshal Khanal who provided me feedback from the time of proposal to thesis completion. Likewise, I would like to thank internal evaluators Dr. Babu Ram Dhungana, Dr. Bed Prasad Dhakal and Dr. J.B. Pradhan for giving me suggestions, comments and feedback to improve my thesis. Furthermore, I would like to give thanks to my family members, friends and other teachers who provided me moral support for completing this thesis. Also, I am thankful to the participants who helped me in my research work.

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Muna Bista

Abstract

The main concern of my study was on '**Inclusive Mathematics Classroom Practices: An Interpretive Inquiry'.** The objectives were to explore the experiences of teachers and students in the practice of inclusive mathematics education, explore the challenges faced by them, and investigate the coping strategies to address the challenges faced by mathematics teachers and students in inclusive practices. The study employed a qualitative ethnographic research approach. I used the interpretive inquiry of ethnographic design. I used a purposive sampling technique and conducted an in-depth interview with four mathematics teachers, including two head teachers. Observation was carried out in the mathematics teachers' classes, and a focus group was formed with ten students from different ethnic backgrounds. I used data analysis procedures by Braun & Clarke (2006). At first I comprehended the data and generated initial codes. Then I extended and reviewed it with a side-by-side definition and development of the theme. At last I finalised the report on those themes. It was concluded that mathematics teachers are practising teacher-centred teaching methods with less collaborative teaching-learning activities. Moreover, from the administrative side, they employ poor or insufficient motivation and support for inclusive practices in mathematics classrooms. Similarly, there are other challenges like discrimination among students, time allocation for course completion, insufficient teacher training, teachers with minimum and lower-level academic degrees, irregularity of students in class, migration, and dropout. However, alternative strategic adaptations like student-centred teaching methods, students' motivation, appropriate teaching materials, a logical teacher-student ratio, trained teachers, necessary physical facilities, and supports have

been practised to overcome challenges faced by teachers and students in an inclusive mathematics classroom.

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ABBREVIATIONS AND SYMBOLS

CDC:	Curriculum Development Centre
EFA:	Education for All
FGD:	Focus Group Discussion
i.e.:	That is
MoEST:	Ministry of Education, Science and Technology
NCERRI:	National Centre on Inclusive Education and Restructuring
SESP:	School Education Sector Plan
SPEED:	Social Pact for Empowered Economic Development
SSDP:	School Sector Development Plan
UN:	United Nations
UNESCO:	United Nations Educational, Scientific and Cultural Organisation
UNICEF:	United Nations Children Fund
ZAD:	Zone of Actual Development
ZPD:	Zone of Proximal Development

Chapter I

INTRODUCTION

Background of the Study

I am a mathematics teacher and student. From student to teacher phase, I have experienced that teachers mostly focus on talented students with the main motto to finish the course book with more concentration on scores. Student need-based teaching is not imposed in the classroom. So, most students lose interest in mathematics and drop out from school and moreover, marks of students decrease with the increase of class. Majority of students achieved only 50% of the curriculum (NASA,2020) which eventually affected mathematics performance. So, we need Inclusive education in mathematics. Inclusive education welcomes, values and supports the diversity learning needs of all the students (Faragher, 2015; Thousand & Villa, 2000). Education is the right of every child which helps them to fulfil all potentials of children's life (UNESCO, 1994). Education enlightens the lives of children. Children receive education in a variety of ways. Formal education, such as school education, is one of the ways to obtain education. Children from various cultures attend school. Though we are honouring cultural diversity on one side but on the other side students drop out from school due to different reasons. So, students are excluded from school. So, to favour diversity and to include excluded students in the mainstream of education we should practise inclusive education. Inclusive education welcomes, values and supports the diversity learning needs of all the students (Faragher, 2015; Thousand & Villa, 2000). An active and efficient mathematics teacher addresses diversity and abolishes all forms of discrimination in a society. Inclusive education increases access and participation of diverse individuals by providing equal opportunities in learning. Inclusive education is more essential in mathematics

which makes the educational system strong by covering all the learners' needs (UNESCO, 2009).

Mathematics is essential for all subjects whether it is for science, arts, education. Inclusive education values diversity (Kunc, 1992). In my perspective while teaching, students are unmotivated in mathematics learning, so they belong to poor grader in mathematics. Although the students are being upgraded, their progress is declining. Barton (1997), Inclusive education is all about developing an inclusive society based upon social justice, equity and participation of every individual combating every form of discrimination. Inclusive education solves the problems of students who are excluded from mathematics by providing them equity.

Practice of Inclusive Education in International Perspectives

The philosophy of inclusion is brought into practice by the UNESCO Declaration on Education for All (UNESCO, 1990), the Dakar Framework (UNESCO, 2000), the Salamanca Declaration on Inclusive Education (UNESCO, 1994), the Child Rights Convention (UNICEF, 1989) and the Convention on the Rights of Persons with Disabilities (UN, 2006). Both rich and developing countries have issues implementing inclusive education programs, with a substantial proportion of students dropping out. As a result, developing nations have a lower literacy rate than developed nations. According to Groce (2004), disabled girls in poor nations rarely attend school. The problems of inclusive education in South Africa are lack of trained teachers, inflexible teaching methods and inadequate classroom support, there are numerous inequities in the educational system, which are based on factors such as students' socioeconomic level, gender, sexual identity, and ethnicity (Pastrana, Fernández, Salinas, Gutierrez, & Nuez, 2015). Many countries have developed educational strategies for implementing an

inclusive education system (Ainscow, 2003). In 2008, Chile ratified the Convention on the Rights of Persons with Disabilities, which states that people with disabilities should attend schools that are accessible to them (Abadie, 2013).

There are many obstacles faced by different countries in the transformation of inclusive education. The barriers of inclusive education in Bangladesh are negative attitude of people, invisibility in the community, cost, physical access, class size, lack of trained teachers, gender discrimination, identification problems (Kibria, 2005). Armenian education reform began in 2003, with the goal of developing new approaches and promoting quality education, primarily by changing the classroom learning environment and focusing on student-centred approaches, particularly cooperative learning which all support inclusive education (Duda & Clifford-Amos, 2011). Thus, there are different practices of inclusion in mathematics which were used in Nepal.

Practice of Inclusive Education in Nepal

Nepal has ratified and signed various regional and international conventions for implementation of inclusive education (UNICEF, 2003). According to the United Nations Educational, Scientific, and Cultural Organization (UNESCO, 2003), inclusion is a process that considers and reacts to the diversity of the needs of all people, and it should be the foundation of all educational policies and practices. The United Nations Salamanca Declaration, ratified by 92 member nations in 1994, is often regarded as the most important international indication of commitment to inclusive education (Ainscow & César, 2006; Kraska & Boyle, 2014; Messiou, 2017). The constitution also ensured the right of education for all without any discrimination. Another Ministry of Education strategy, the Consolidate Equity Strategy, 2014, aims to improve equity in Nepal's school education sector at all levels and subsectors. It is understood that inclusive education

helps people reach a higher quality of life and contributes to the creation of a more just and inclusive society that values diversity (Ministry of Education, 2014). Inclusive education is a key technique for ensuring high-quality, equitable education. It has made specific provisions for the marginalised and disadvantaged (National Planning Commission, 2016). Inclusive education was the main policy in the School Sector Development Program (2016–2023), which aims to strengthen education for children with disabilities and special needs, as well as establish partnerships with non-state actors and other relevant line ministries to respond to the needs of children with complex or severe disabilities (Ministry of Education, 2015). SSDP strived to collect statistics on the types, prevalence, and severity of disabilities, as well as to update teacher training to incorporate special education and to remove the societal stigma associated with disability. With the goal of equipping teachers with adequate knowledge and skills, SSDP aimed to introduce a mandatory inclusive education module in pre-service programs to provide basic knowledge and skills on: i) the needs and abilities of children with special needs; ii) child-centred pedagogical methods; and iii) active and participatory learning techniques, with the goal of equipping teachers with adequate knowledge and skills and instructional accommodation and activity differentiation. SSDP endorsed a policy to increase the development of skills related to inclusive education and children with special needs at the national level for DOE, NCED, and CDC, as well as at the district level for DEOs and assessment centre coordinators, with the support of relevant academic institutions. Regular schools with an inclusive reduced partiality by establishing, encouraging and sympathetic communities. Now, Nepal is ongoing with SESP, a ten year plan whose main objectives are: all citizens should become literate through receiving life skills education, ensuring access and participation, improving the relevance and quality of the educational

experience, and improving the governance and management of school education. It has embraced diversity, equity, integrity, student-centeredness, good governance, and educational innovation, which are its main principles. (MoEST,2022). Inclusion is linked to social justice, which promotes respect, care, acknowledgment, and empathy while challenging attitudes and actions that perpetuate marginalisation and exclusion (Theoharris, 2009). An inclusive school is one in which everyone is embraced and supported by their classmates and other members of the school community while having their educational needs met (Stainback & Stainback, 1990). An inclusive education is one that educates all students in the mainstream; every student is in normal education and regular classrooms, providing all students within the mainstream with suitable educational opportunities. The most important agent that practises inclusion is the teacher. Inclusive education entails recognizing and respecting learner diversity, acknowledging and respecting that all learners can learn and require support, and equipping teachers to address a wide range of learning needs by focusing on teaching and learning activities that will benefit all students who face learning barriers (Oswald, 2007). Inclusive education in mathematics eliminates all types of discrimination. International and national policies, legislatives, and laws are major forces that influence inclusive education. According to Dyson (2000), inclusive education strategies are the heart of both developed and developing countries. The main obstacle of inclusive education is in the implementation process. According to Booth (2003), Inclusion is a continuous process found in every sector. Inclusion is a human right that occurs in a society (Barton, 1998). Nepal is targeting to be a literate country, so various programmes are imposed. In the school where I teach, the Ministry of Education (MOE) is implementing various

programmes, of which the main aim is,' No Child will be left from the facility of getting education.' All the above efforts activate inclusive education in Nepal.

Historical Development of Inclusive Education

The Salamanca Statement on Principles, Policy, and Practice in Special Education (1994) is considered the beginning of a worldwide movement for inclusive education (Oliver, 1996). Education is one of the basic rights of every child and they must be provided with the chance to achieve and maintain an admissible level of learning. Every child is distinctive with his/her characteristics, interests, capacities, and learning needs. Educational systems should be planned and educational programs should be put into action considering the wide variety of these characteristics and needs. The children with "special" educational needs must be accessible to regular schools assisting them within child centred pedagogy capable of meeting all these needs. Regular schools with an inclusive orientation, according to the statement, can reduce partiality, establish encouraging and sympathetic communities, and build inclusive societies in the most brilliant way and provide education to all.

In addition to this, a constructive education must be provided to the children and young people, and the efficiency and ultimately the cost-effectiveness of the entire educational system should also be improved (UNESCO, 1994). The Salamanca Statement (1994) has been a powerful means to invigorating educational change (Dyson, 2000).

Inclusive education has been defined by the National Centre on Inclusive Education and Restructuring (NCERRI) in the National Study on Inclusive Education (1995) as: "providing equitable opportunities for all students, including those with significant disabilities, to receive effective educational services in age-appropriate classes in their neighbourhood schools, with the necessary supplemental aids and support

services, in order to prepare students for productive lives as full members of society" .Wilson (2000) has suggested the characteristics of Inclusive Education: it is based on a community which is barrier-free and open to all. It also encourages collaborating with other schools rather than competing with them for an inclusive participation of all the students equally in learning.

Education for All (EFA) (UNESCO, 2001), the Convention on the Rights of Persons with Disabilities (United Nations, 2006), the Right to Education for Persons with Disabilities: Towards Inclusion (UNESCO, 2004), The United Nations Convention on the Rights of the Child (United Nations, 1989) and the United Nations Standard Rules on the Equalization of Opportunities for Persons with Disabilities (United Nations, 1994) create the international landscape which is supposed to guide the world's nations towards adopting more inclusive school systems. The United Nations (UN, 1948) established inclusion in education as a human right in Article 26 of the Universal Declaration of Human Rights (UN, 1948).

A number of international agreements have been published to promote inclusion, including some of the most notable international agreements signed since 1989 that have aided in the advancement of inclusive education. This does not imply that inclusion began for the first time in the world in 1989. The evolution of inclusion are : Convention on the Rights of the Child (UN,1989), World Conference on Education for All (UNESCO,1990), Standard Rules on the Equalization of Opportunities for Person with Disabilities (UN,1993), Salamanca Statement and Framework for Action (UNESCO, 1994), Dakar Framework for Action (UNESCO, 2000), The Millennium Development Goals (UN, 2000), Convention on the Rights of Persons with Disabilities (UN, 2006), Universal Declaration of Human Rights(UN,1948), Declaration of Rights of the Child

(UN, 1959), Convention on the Rights of the Child (UN, 1975) and UNESCO's Salamanca Statement and Framework for Action (UNESCO, 1994). All the above international organisations aim to establish inclusive education.

Diversity

All the students are treated fairly in inclusive education by facilitating diversity, variety and celebrating difference not as a social construct, but as a spectrum. (Ainscow, Thomas et al. 1988, 1991, 1994, 1995). Giddens (1999) has suggested that exclusion and inequality are synonymous. A school invites pupils from a variety of cultural and economic backgrounds (Booth & Ainscow, 2002), which provides resource materials to support inclusive development in schools, emphasises the importance of diversity to promote inclusion, for example, by "valuing all students and staff equally", "restructuring the cultures, policies, and practices in schools so that they respond to the diversity of students in the locality," and "viewing the difference between students and staff as a source of strength rather than a source of weakness," among other things . (Benjamin, 2002) describes diversity as "suggests that everyone is diverse, unique, and valuable". Because of the heterogeneity and diversity of students, teachers must be adaptable and use a variety of techniques in the classroom, one of which is inclusion (Avramidis, Bayliss, & Burden, 2000). Artiles, Kozleski, & Waitoller (2011) defined inclusive education as "a means to provide students with educational access and opportunities to participate in a society", so that all the students will be included in the mainstream of the school.

Equity

UNESCO Handbook on Education Policy, Analysis and Programming (2013) highlighted equity as an important aspect of education policy and the level of equity in

the provision of education affects access to education and participation in education. Equity is an ideology which is difficult to achieve. One of the fundamental purposes of education, according to the social model, is to remove educational barriers so that everyone can acquire a good education (Allan, 2008; Ferguson, 2008; UNESCO, 2004, 2005). Numerous characteristics, such as socioeconomic level, gender, sexual identity, and ethnicity of pupils, indicate significant inequities in the educational system (Pastrana, Fernández, Salinas, Gutierrez, & Nuez, 2015). So, we need equity in the classroom. Inclusion can be defined as the adaptation of the local learning environment to match the unique needs of each student and, as a result, ensuring that all students are considered members of the community (Boyle et al., 2012; Bradshaw & Mundia, 2006). Inclusive education is based on the concept that education is a basic human right and the foundation for a more equitable society (Ainscow & César, 2006; UNESCO, 1994). As a result, inclusion refers to equal access to high-quality education, and a lack of it can lead to oppression, educational and social disadvantage, and prejudice (Avramidis & Norwich, 2002; Boyle et al., 2012). In a nutshell, inclusion encourages people to participate more. Only ‘certain’ children were allowed to seek education, i.e., boys. Girls from poor families were excluded from the main stream of school as she had to look after her siblings and do household work.

Socio-cultural and Economical Diversity

Students drop out from school due to economic and social problems. Students drop out from school due to economic and social problems. In my experience, students who study in public schools were mostly from poor economic backgrounds with girls doing more household work, so they could not get more time to study. Poor social and economic conditions created a gap in knowledge, so students get low marks in

mathematics. A school invites pupils from a variety of cultural and economic backgrounds (Booth & Ainscow, 2002), which provides resource material to support inclusive developments in schools, emphasises the importance of diversity to promote inclusion. Diversity must be observed and equal opportunity be promoted by this culture (Thomas, 1997).

Linguistic Diversity

Nepal is a multilingual country. It's really difficult to provide education in the mother language in a heterogeneous linguistic class. Linguistic diversity in the classroom affects classroom outcomes in mathematical learning; moreover, school and parents' environment also affect learning. A classroom climate also has a diverse effect in learning. It is a challenging and critical step to use monolingual language in the classroom. Most schools of Nepal are using Nepali language as a medium of instruction and nowadays most schools are using English as a medium of instruction or use bilingual instruction. In my experience it has become difficult for old maths's teachers to teach mathematics as they are less aware of this medium of instruction because they are using Nepali for instruction. It is really challenging for a teacher to use a particular language in the classroom as the child's mother or home language is different from the school language. The result of private school is double that of public school as their medium of instruction is English. (NASA,2020). A Brahmin or Chhetri teacher doesn't know Janajati language, so it is hard for some to use one particular medium of instruction. A child who speaks with his parents at home or answers a question asked by his teacher is not in the same linguistic context as when he is playing with his classmates. It is quite obvious that a teacher cannot use all the languages to teach the pupils speaking different languages. Inclusive education addresses all the children in the class, with no one being excluded

from the group irrespective of diversity. So, the linguistic factor is a key factor to be considered in the classroom by which rapport can be built up between the teacher and the students with efficient learning.

Ethnic Diversity

Ethnicity is the combination of common customs, languages and values. Ethnic diversity signifies the diversity of (mother) languages, religions, races, and cultures among people (Alesina & La Ferrara, 2005). Nepal is a multilingual and multicultural country. The diversity is often seen in the classroom. If I see my journey of life from study period to teaching period, most people think that Brahmin, Chhetri and especially the people from the terai region take mathematics but other castes like Janajati and others will take other subjects as their choice of study. Also, parents encourage their sons to study mathematics but discourage their daughters to do so. Furthermore, students who are economically strong study mathematics as their key subject as compared to low economic students. So, a good mathematics teacher should understand all ethnic groups and incorporate students with teaching.

Gender Diversity

"Gender is defined as a network of ideas, personality traits, values, behaviours, and activities that distinguishes women and men through a social construction process with a number of distinguishing features" (UNDP, 2006). Our society is a patriarchal society where there is a difference between boys and girls in terms of opportunities, roles, status, positions, responsibilities, and relationships. Despite the reality, there is discrimination but there are many plans launched to make them equal. Gender discrimination is raised as an issue in every field and in mathematics learning also it is

found. Socio-cultural norms determine the role of girls in society (Thapa, 2012). There are different gender issues seen in school mathematics.

In my journey from school to college, the number of students studying mathematics is in a declining position. Parents encourage their sons to study mathematics and daughters to study literature subjects as we have to give more time to study mathematics. The participation of women in social, political, economic sectors in the world is very less as compared to men because less emphasis is given to female education. In my experiences most of the students felt difficulty in learning mathematics as compared to other subjects. NASA (2020) showed that the performance of girls in mathematics is less as compared to boys.

When I was studying in school, I found only a few girls interested in studying mathematics and girls took compulsory mathematics as a boring subject. In my Bachelor's level, I was the only girl to study mathematics and so is in MPhil level. So, I am concerned with the subject: why do girls have difficulty in studying mathematics? What are their problems? There are gender issues in the classroom, so I was motivated to study ' Inclusive Mathematics Classroom Practices: An Interpretive Inquiry.'

Inclusive Pedagogy

The act of teaching, as well as the ideas, values, and beliefs that guide, support, and justify that act, are all included in pedagogy (Alexander, 2013). In educational literature, the term pedagogy is used to describe the various and complex situations that teachers face. A good mathematics teacher should know all learning theories and apply them according to the needs of students. Teachers should employ a student-centred learning strategy instead of teacher-centred. The teacher creates learning space for the students. The ability to distinguish among learners, settings, techniques, materials,

resources, and outcomes is developed by putting pedagogical knowledge, understanding, and skills into practice while building a curriculum for all the pupils. Pedagogical qualities of the responsive professional teacher understand child development and individual differences. They are committed to the education of all the deserving pupils. Thus, from the above description, I am motivated to carry out the research entitled' Inclusive Mathematics Classroom Practices: An Interpretive Inquiry'.

Statement of the Problem

I have been teaching mathematics in schools for more than twenty years in private and public schools and have observed a wide range of students. School is a mini-society. Nepal's Basic and Secondary School Curriculum contain mathematics as a compulsory subject. Basic education is free, compulsory and given in mother tongue (Nepal Constitution 2072). In my experiences in teaching our mathematics class is carried out in a conventional way. A conventional method of teaching could not satisfy heterogenous students. So, the equity principle is not practised in mathematics learning. In my experience, a mathematics teacher's effort is more as compared to other subjects but many students fail in mathematics. Also, a teacher looks after high scores getting students and low scores getting behind. So, students are disengaged in mathematics classrooms and failure in mathematics increases. Interactive teaching, peer group teaching and broad tests are carried out only for students who can solve mathematical problems. All of the above activities increase failing students in mathematics. Due to failure in mathematics, the student's achievement is not satisfying. Only a small percentage of students enjoy mathematics. So, me being a mathematics teacher, my concern is always to get good scores in mathematics and need to understand the diversity of the students in terms of socio-cultural and economic background and perform teaching

mathematics in the language which students feel comfortable with. Furthermore, the teacher can invoke curriculum developers to change and revise curriculum relevant to time.

Teachers are effective inclusive practitioners who understand and address the needs of all the students, they must be properly equipped to take on this new responsibility (Forlin & et.al,2011). Inclusion as an educational paradigm is supported by teachers. Teachers are the main agents who implement inclusive education in school. There are many researches carried out in making mathematics learning inclusive but there are rare researches that cover the diversity issues. Teachers' attitude acts as a major predictor of classroom behaviour (Brownell & Pajares, 1999). This study portrays how teachers experience, practice toward inclusive education in mathematics learning along with finding their difficulties in teaching and learning and last but not the least gives remedies in making teaching and learning inclusive. Furthermore, a teacher must understand how ethnomathematics is linked to socio-cultural factors so that he/she can easily adapt to the students' habits which ultimately brings enthusiasm in learning. Inclusion as a broader concept of the educational system includes a variety of students and differentiates education to meet their needs (Meijer et al, 1997). According to Flem et al (2004), teachers face obstacles and new opportunities while teaching in a school that practises inclusive education. So, being a teacher, my aim in teaching is to give equitable education to every student without any discrimination. In classroom there are diverse students who have different cultures, languages, gender, economic background and one size fit for all or traditional classroom does not fulfil all learner needs. My effort in teaching mathematics is more than other teachers but most of the students become fail in mathematics. The result decreases with the increase of class. So, from traditional equality

principle does not fulfil diverse students' needs so, I was encourage to carry out this research entitled 'Inclusive Mathematics Classroom Practices'.

Rationale of the Study

Nepal is giving free and compulsory education at the basic level. Every year the Nepalese government gives scholarships to students who are poor and talented. Moreover, our curriculum has given emphasis on the local curriculum and medium of language as mother tongue. Nepal is a multi-lingual, multi-caste country and there is diversity in every student. Moreover, Nepal is also an inclusive country where diversity of people is addressed by our constitution itself. Though the concept of inclusion is also practised in schools but still most of the students are out of school.

Garden with different types of flowers looks beautiful. Just like that, a school with diverse students is more attractive in school so that we can exchange. Though Nepal has taken part in different international conferences and has made policies to make Nepal a literate country but aim will not be fulfilled unless we properly address all the diverse students, especially in mathematics learning. As, from my experiences and observation in different schools among many reasons, students drop out when he/she feel difficulty in any subject and mathematics is one. Being a mathematics teacher, my concern was always on "Why do the students gradually decrease their performance level with their upgrading?", "Why do they drop out from school?", "Why students were disengaged in mathematics learning?", "How was inclusive education is practiced in classroom?", "What were the challenges found in practising inclusive in mathematics classroom?", "What were the strategies followed by mathematics teachers in practising inclusive classroom?" So, my key concern was based on the above issues found in school. This research would help teachers, students, policy makers, principals, curriculum developers

and different stakeholders to make mathematics classrooms inclusive so that we can easily reduce drop out students from school.

Objectives of the Study

The main objectives of the study are:

1. To investigate the experiences of teachers and students in practice of inclusive mathematics education in the classroom.
2. To explore challenges faced by teachers and students in making mathematics classrooms inclusive.
3. To investigate the coping strategies to address the challenges faced by teachers and students in inclusive practices of mathematics class.

Research Questions of Study

I formulated the following research questions based on my objectives which are:

1. How can teachers and students experience inclusive education in a mathematics classroom?
2. How do teachers and students practise inclusive education in mathematics classrooms?
3. How do mathematics teachers and students face challenges while making mathematics classrooms inclusive?
4. How do mathematics teachers and students cope with the challenges faced by mathematics teachers and students while implementing inclusive in mathematics classroom practices?

Delimitations of the Study

The delimitations of the study were as follows:

- My study was focused in Bhaktapur district as I have been teaching on that district from 2072/10/14 to 2079/04/14. I could not manage time to visit in many schools so, I selected purposive sampling from my own school and neighbouring school.
- This study only included mathematics teachers from two public schools Shree Ram Secondary School in Bhaktapur and Mahalaxmi Secondary School in Bhaktapur, all teachers have been teaching mathematics in basic level for those who have been teaching for more than ten years.
- In-depth interview was taken from 4 mathematics teachers and 2 head teachers from those two schools. The participant observation was carried out in the selected mathematics teacher's classroom. Furthermore, focus group discussion was carried with 10 students who were studying in grade-8, from diverse backgrounds (5 girls, 5 boys with Brahmin, Cheetri, Newar, Madhesi and poor economic background).
- The participant observation was carried out until I got saturated data.
- In-depth Interview, participants observation and focus group discussion was used to form the method of study.
- Interview guidelines were used as tool for interview.
- Observation Guidelines were constructed for participant observation and focus group discussion.

Definitions of the Key Terms

Inclusive education. The education given to diverse mathematics students in basic school. The students were taken from two government schools from Bhaktapur district.

Diversity. This includes students who have different cognitive level, ethnic background, socio-economic and cultural classes and linguistic background.

Equity. The education given to students who are studying mathematics in basic level based on their needs.

Obstacles. The hurdles faced by basic level mathematics teachers in making their classrooms inclusive.

Strategies. Different policies, ideas and ways used by mathematics teachers to establish an inclusive classroom.

Chapter Summary

I have been teaching mathematics at school level for more than twenty in both private and public schools. While teaching in classes most of the student's mathematics performance is very low as compared to another subject. So, I am interested in carrying out my thesis on 'Inclusive Mathematics Classroom Practices: An Interpretive Inquiry'. For this purpose, I have formulated three objectives which are: 1) To explore the challenges faced by teachers and students in making mathematics classrooms inclusive and 3) To investigate the coping strategies to address the challenges faced by mathematics teachers and students in inclusive practices. For these four I have formulated four research questions which are: 1) how can teachers and students experience inclusive education in a mathematics classroom? 2)how do teachers and students practise inclusive education in mathematics classrooms? 3) how do mathematics teachers and students face

challenges while making mathematics classrooms inclusive? 4) how do mathematics teachers and students cope with the challenges faced by mathematics teachers and students while implementing inclusive in mathematics classroom practices?

The delimitations of my study are in two public schools in Bhaktapur district. I have selected four mathematics teachers, two head teachers for an in-depth interview. Similarly, I carried out observations in those mathematics teacher's classes. Furthermore, FGD was carried out among ten students who are from different ethnic backgrounds in one public school.

Chapter II

REVIEW OF LITERATURE

Review of the Related Literature

A literature review is a key chapter in thesis writing that offers background and justification for the research conducted (Bruce, 1994). Literature review contributes to the refinement, concentration, and framing of research topics, as well as the development of theoretical and conceptual frameworks (Coughlan et al., 2007). I studied different theoretical and empirical literature related to my research topic. That literature provided me with a clear path to carry out the research.

At first, I selected the topic which was in my mind and later it was revised by my supervisor. In the next step, I have searched for research papers and thesis related to my topic. The area focused on inclusive education, learning mathematics, gender diversity, ethnic diversity, inclusive pedagogy, and difficulties faced in the implementation of inclusive education by the teachers. Then for theoretical review, I have used cognitive theory, Vygotsky's constructivism, critical theory and transformative theory which solidified my research.

Theoretical Framework of the Study

Students construct their own knowledge as a result of interacting with their environment and mediating their understanding through meaningful cultural and social contexts contained within. Social constructivism is a theoretical approach to learning in which students construct their own knowledge as a result of interacting with them environment and mediating their understanding through meaningful cultural and social contexts contained therein, (Vygotsky, 1978 and Bruner, 1990). Social constructivism asserts that learning and development is a social collaborative activity in which the

community plays a vital role in supporting learners to "create meaning" in developmental zones. Learners may only form a personalised and limited perspective of the world while working inside the Zone of Actual Development (ZAD) (Vygotsky, 1978). As a result, social constructivism promotes a context-based communicative approach to learning and teaching that emphasises two key elements: first, learning through meaningful communication, and second, the necessity for a scaffold environment to aid in co-constructing and negotiating meaning (McLoughlin & Oliver 1998).

Vygotsky's (1978) triangular model includes tool, subject and object, and shows the relationships between these elements. However, this model tended to focus more on individuals. Therefore, socio-cultural theorists used Vygotsky's basic mediated triangle as a framework for the development of activities. Inclusive classrooms can be found all over the world, and it is based on Vygotsky's (1978) "Zone of Proximal Development" theory, which states that pupils work the best when they are given moderately complex but not overly difficult or easy activities. The 'just barely manageable' strategy, as described by Kauffma and Hallahan (2011), involves setting learning assignments at a level that is challenging but not too difficult to handle. Inclusive classrooms can be found all over the world, and it is based on Vygotsky's (1978) "Zone of Proximal Development" theory, which states that kids work the best when given activities that are moderately difficult but not overly difficult or easy.

The theory of inclusion is mainly based on constructivism, cognitive, critical-learning theory and transformative learning.

Cognitive-based Inclusive Education

Cognitive primarily concerns the qualities of one's thinking, memory, self-reflection, and desire to learn. Piaget argued that "At each developmental stage, the ability to learn and the process of learning are different" (Evgeniou & Loizou, 2012). Cognitive theories emphasise the need of making knowledge relevant and assisting learners in becoming more structured and relating new information to previously stored knowledge. Furthermore, cognitive approaches highlight cognitive processes and their role in learning, such as remembering, thinking, reflection, abstraction, and metacognition, which are all necessary for learning (Petersen, 2014). As a result, for cognitive training to be effective, it must "be based on a student's current mental structures or schema" (Ertmer & Newby, 2013). Students are encouraged to share and connect their existing knowledge, learning experiences, and abilities in order to grasp new information.

Constructivism-based Inclusive Education

According to Hulgin and Drake, "inclusive education necessitates a constructivist approach to teaching and learning" (2011). Through observation, treatment, interpretation, and adoption of information on creating a cognitive structure; constructivism entails a person realising the relevance of the social factor during the learning process. The impact on cognitive development through learning and interaction occurs between children and their peers, parents, and teachers. Vygotsky (1962) highlighted the social component of learning. Constructivism is a type of learning that entails building, producing, and inventing in order for people to generate their own knowledge and measure it.

Transformative Learning Theory

The father of transformative learning, Jack Mezirow, defined transformative learning as, "The process of affecting transformation in a frame of reference" (Mezirow, 1997). A student's mental habits as well as a personal point of view are both part of a frame of reference. Previous learning experiences and cultural norms influence the student's mental habits, while personal beliefs and values influence the student's points of view (Mezirow, 1997). Students appreciate their prior potential as well as new perspectives in present learning. In teacher-centred learning, the teacher is a giver and a student is a receiver. Gradually, when we shift to student-centred learning, students begin to seek out new information and can readily apply that information to their behaviour. So, we need to transform students into new learning in the mathematics classroom too. (Mezirow, 1978) identified eight stages for transformative learning that must follow: a) a disorienting dilemma; b) self-examination; c) dissatisfaction; realising others are dissatisfied and have changed; d) evaluation of potential options; e) critical assessment of personal assumptions; f) experimenting with new roles; g) planning a course of action; h) acquiring knowledge and skills to carry out the action plan. We can modify the above-mentioned stages of learning based on students' needs and the classroom environment. Students in higher education will benefit from transformative learning with rich, meaningful, and long-term learning experiences.

Critical -learning Theory

A founding father of critical theory, (Habermas 1984), used his idea of "communicative rationality" as a tool to "cope with the emergence of issues within a setting of intersubjectivity". To put it another way, communication and collaboration, as mentioned above, can be used to investigate and clarify topics connected to the

difficulties at hand. In critical theory, a learner can think practically. Dialogue must lead to action that "liberates human beings from their enslaving conditions" (Horkheimer, 1982). Critical theorists, according to Horkheimer (1993), contribute to the struggle for emancipation in three ways: explanatory, practical, and normative. Each of these critical theory methods encourages us to see change in our contemporary social reality. To address inequality, it must first be explained and acknowledged. Practical improvements must also be implemented to stop the process of social reproduction, or the reproduction of existing inequities over time. Finally, the work must be normative, emphasising that it accepts certain conditions. We employ communication and collaboration techniques to examine and explain topics connected to the challenges. Critical theory provides solutions to our obstacles from interactions.

Thematic and Empirical Review of Literature

Teacher Perception in Inclusive Education

Mngo and Mngo (2018) carried out research on "Teachers' Perceptions of Inclusion in a Pilot Inclusive Education Program." The research was a quantitative non-experimental descriptive survey. The main objective was to link between instructors' gender, age, education level, years of teaching experience, experience in teaching in an inclusive classroom. For this, she selected 346 full-time state-licensed general education teachers from 7 secondary bilingual schools in Cameroon's Northwest Region where the SPEED pilot inclusive education program was implemented. The research findings showed that most teachers favoured separate special education institutions for inclusive ones. They believed in the creation of integrated classrooms. The teachers teaching students with disabilities experienced that more experienced and well-educated teachers were more supportive for inclusive education rather than novice ones.

Elina (2017) carried out research entitled ‘To explore Chilean teachers' attitudes towards inclusive education and their self-efficacy in putting inclusive practices in place.” In carrying out this research, 108 Chilean and in-service teachers filled out a questionnaire based on their feelings, attitudes, and concerns about inclusive education. The findings showed that teachers were positive about engaging with disabled people, where they were more concerned about including students with special educational needs in their own classrooms. Teachers showed a high level of overall self-efficacy in implementing inclusive practices and had a positive attitude towards implementing inclusive classrooms.

Chhetri (2015) carried out research entitled ‘To investigate teachers’ concerns and experiences in teaching children with special educational needs in Bhutan”. In carrying out this research seventy-eight instructors from eleven institutions were sampled as participants in a mixed research study that included an online survey to evaluate their level of concern about helping children with Special Education Needs in their classes. The result showed that, Bhutanese teachers were highly concerned about the acceptance of children with special educational needs. In schools, there was also a lack of resources, as well as concerns about academic standards and teacher development. Even though most instructors are aware of inclusive education, there are fewer effective approaches which support inclusive practices in the classroom. This research promotes and improves for children with special needs in Bhutan.

Mngo and Mngo(2018), Elina (2017) and Chhetri (2015) have emphasised on teacher's perception on inclusive education.

Culturally Diverse Mathematics Classroom

Ukpokodu (2011) wrote an article entitled “How Do I Teach Mathematics in a Culturally Responsive Way?” The research design was qualitative. The researcher selected two research questions which are: i) Why are teachers not engaged in culturally responsive mathematics teaching practices? ii) What are specific culturally responsive mathematics teaching practices in mathematics? In carrying out this research he selected pre-service and in-service teachers who were enrolled in the researcher’s graduate course on ‘Teaching and Learning in the Urban Classroom’ at a university in a large urban community. In this study the sample size was of 45 people including 36 females and 9 males. The selected teachers were 25 from primary and 20 from secondary schools. In data collection, class activities, internet chats, and field notes were used. ‘Culture of Power' encourages pupils to take personal responsibility for their actions, allowing them to break free from the oppressive and victimising loops which they are practising. The findings of this study were focused on educating and empowering students by equipping them with excellent mathematical skills.

Raisinghani (2020) carried out an article on 'Teaching Perspectives on Culturally Diverse Classrooms and Responsive Science and Mathematics Teaching.' This research was a qualitative case study. The researcher chose individual teacher interviews including informal observations of science and mathematics classes. The research questions of this study were i) What are k-12 teachers' thoughts on the impact of ethnic diversity on their science and mathematics teaching? ii) How do teachers perceive culturally responsive teaching as a realistic technique for teaching science and mathematics in their culturally diverse classrooms? The findings of this study described students’ cultural diversity as a mosaic as well as a strength and a challenge, and the level

of English language competency as one of the key systemic factors compounding the challenges associated with the students' cultural diversity. Furthermore, lack of culturally relevant resources, support, and training serve as impediments to teachers' successful integration of indigenous knowledge into their science and mathematics, cultural diversity, and Canadian culture were full of contradictions; and teachers' understandings of culturally responsive teaching and its manifestations in their classroom were diverse and full of conundrums'.

Xenofontos (2016) carried out an article entitled "Teaching Mathematics in Culturally and Linguistically Diverse Classrooms: Greek-Cypriot Elementary Teachers' Reported Practices and Professional Needs". The narrative qualitative method was used in this study where 16 Greek-Cypriot instructors from three adjacent urban primary schools in the same zone were chosen with each student population of more than 90% immigrants. Two study topics were addressed on the following questions: i) What are teachers' reported practices in facilitating immigrant students' mathematics learning? ii) What professional needs do instructors have in terms of aiding their immigrant students' arithmetic learning? The reported teaching approaches of the teachers aided their students' mathematical comprehension as well as their professional demands. The teachers were entirely concerned on the real-life experiences of teachers who consider themselves to be inclusion champions, teachers who identify as inclusion champions operate as change agents, the perspectives and opinions of instructors who identify as advocates of inclusion about their organisation's culture and the suggestions instructors considered themselves to be inclusion champions for developing and advancing an inclusive corporate culture. The findings of this study suggest were: i) organisations should build and strengthen a culture by supporting them for promoting change through

coaching, educating, networking, and mentoring efforts, and embed and reinforce inclusive values throughout the system, ii) educational organisations must be responsive to norms, values, practices, and policies that both support and work against inclusive or non-inclusive values.

Ukpokodu (2011), Xenofontos (2016) and Raisinghani (2020) all have endorsed culture as an essential element in making inclusive education successful.

Social Justice in Mathematics Classroom

Panthi, Luitel, and Belbase (2018) carried out an article entitled "Teachers' Perception of Social Justice in Mathematics Classrooms". The study was based on a qualitative interpretive method. The purpose of this article was focused on maths teachers and their feelings about social justice in the classroom. The study was taken by secondary school maths teachers who view social justice in their courses. The research was guided by socio-cultural theorists. This study included three secondary level mathematics teachers and three students from Kathmandu's public high schools. In data collection interviews, thematic analysis and interpretation of the tales was used. These concepts were linked to equity, equality, fairness, the social process. Teachers' perceptions of social justice in the mathematics classroom were linked into macro elements of social justice like social, economic, cultural, and political factors, as well as micro elements of school and teachers' awareness and actions to promote equality, equity, fairness, social processing, and caring for students and their needs in this study.

To provide social justice in mathematics education we need to look after micro and macro elements which are found in teaching mathematics.

Inclusion Practice in Mathematics Classroom

Hadjiyiannakou (2006) carried out an article entitled “Exploration of Special and Inclusive Education Practice in Cyprus”. The research was designed on a mixed interpretative approach. In this the research questions were i) How do the head teachers observe and evaluate the application of inclusion in the Cypriot Educational System? ii) How do the ‘special’ teachers work to promote a programme for inclusion? iii) How do the contemporary "special" education laws help, or conversely interrupt the application of inclusion? Data for this research were collected from interviews, observations, and anecdotes. The majority of participants were the members of two schools in Cyprus; teaching staff, administrators, and students. Observation was carried out six times and two teachers were interviewed. The findings of this study suggested that parents of disabled students need help, furthermore, educators need support from the school and training for proper understanding of their role and their duties and also ‘The Parents Association’ needed to be restructured to meet the needs of a changing society and provide education for all children.

Regmi (2017) carried out an article entitled "Inclusive Education in Nepal from Theory to Practice". The paradigm was based on Pragmatism where data were collected and combined simultaneously in both quantitative and qualitative methods with a mixed method study based on convergence design. The research goals were to: i) uncover the current theoretical orientation and practices of inclusive education in Nepal; ii) identify the major roadblocks to successful implementation of inclusive education in Nepal; and iii) develop inclusive education strategies based on Nepal's socio-psychological context. The research questions for this study were: i) Are there challenges in adopting inclusive education in schools? ii) If so, what are the root reasons for the problems? iii) What

measures are required to guarantee that inclusive education is successfully implemented in Nepal? Information was gathered from documents, questionnaires, observations, and interviews. Inclusionary education was based on the belief that education is a human right and that social justice should be promoted in the classroom. The findings of this study were: The Nepalese government was dedicated to ensuring that all children have access to education with inclusion education necessitates a shift in the educational system. The government has offered a variety of scholarships for specific categories, such as people with impairments and the impoverished. In schools, a support system was employed to transform the educational system. Insufficient understanding, finance, and ongoing reliance on foreign financial institutions are all issues with inclusive education (Armstrong et al., 2011). Language barriers with children, a lack of access to disabilities, a lack of disability-friendly infrastructure, and a high rate of school dropouts are all issues that teachers face while implementing inclusive education. Other issues included child irregularity, large class sizes, and family ignorance.

Roos (2018) carried out an article on ‘Inclusion in mathematics education: an ideology, a way of teaching or both?’ In order to foster the discipline's long-term growth, this review of the literature focuses on the definitions and roles of inclusiveness in mathematics education. The research questions were as follows: i) What are various meanings assigned to the concept of inclusion in mathematics education research? ii) In mathematics research, how is the concept of inclusion operationalized and used? In this research discourse analysis was used to analyse 76 studies which were published between 2010 and 2016. Inclusion is a teaching approach as well as a concept, and the two are typically taught independently. According to the literature review, in order to promote the long-term development of inclusion in mathematics education, academics must connect

and interrelate the operationalization and meaning of inclusion in both society and mathematics classrooms, as well as consider students' voices in research.

Adrian (2017) carried out research entitled "Creating an Inclusive Classroom". The cases of Japan and Singapore were the focus of this dissertation. A sequential mixed design technique and a semi-structured interview were used in this study. The purpose of the study was to explore mainstream school instructors' attitudes and teaching efficacy. It included kids with special needs in traditional Japanese and Singapore schools to figure out what factors influence to shape their attitudes and self-efficacy. That entry was posted on July 8, 2010. The research questions were i) What are the significant variables which were related with child, teacher and environment that affect their teaching efficacy and attitudes toward their students and ii) Why do these particular elements create the outcomes? Furthermore, this study aimed to investigate the link between instructors' instructional efficacy and their favourable attitudes toward students with special needs. The study looked into how different factors affect the outcomes of implementing inclusive education. The researcher devised a survey of 189 Japanese and 183 Singaporean mainstream teachers and semi-structured interviews with 38 Japanese and 15 Singaporean previously selected instructors for questionnaire respondent and interviews. The purpose of this narrative study was to expand on the quantitative findings and go deeper into the participants' self-perceptions and viewpoints on including special-needs children in their regular classes. The findings of this study revealed that: i) In Japan, policy and law knowledge is linked to inclusive education, and teachers' prior experiences with special needs students have a significant impact on their teaching efficacy and attitudes and ii) In Singapore, gender, educational levels, and knowledge are all important. In-service teachers' teaching efficacy was found positively related to their

attitudes toward inclusive education in Singapore and Japan, which was consistent with previous studies. Teachers with disabled relatives in Japan had a more positive attitude toward children with special needs. In Singapore, secondary school teachers and teachers who received in-service special needs education training showed a more positive attitude than primary school teachers who did not receive in-service training. Japanese and Singaporean teachers encounter challenges such as school construction, teacher training, large class numbers, specialised manpower, and help for their children. To resolve challenges for the benefit of their students, they employed a variety of strategies. School leaders and other stakeholders in both countries should support the inclusion of students with special needs in regular schools on the ground and in policy.

Mangope, Otukile-Mongwaketse, Dinama, and Kuyini (2018) carried out research on “Teaching practice experiences in inclusive classrooms: The voices of special education student instructors from the University of Botswana”. The study was qualitative phenomenological in nature. The main objective of this study was to look into the teaching experiences of student instructors in order to better understand the issues they faced while teaching special needs students in inclusive Botswana secondary classrooms. The study questions were: i) What are the expectations of student teachers in respect to teaching in inclusive secondary school classrooms? ii) How have these experiences influenced their opinions and attitudes toward the Botswana University of Education's teaching practice program? This research was conducted in a few junior secondary schools in the southern region. The participants were 23 student instructors in their third and fourth years of the special education program. They were selected from four schools in the country's southern area. The findings revealed that student teachers found it difficult to teach students with exceptional educational needs. They shared both

excellent and poor teaching experiences in terms of knowledge and abilities, mentor relationships, and how teaching is arranged. Teaching experience, experience teaching in the inclusive classroom, and training in teaching children with special education needs all had a substantial impact on participants' impressions of inclusive education.

Murphy (2018) wrote an article on" Transforming Inclusive Education: Nine Tips to Enhance School Leaders like principals and assistant principals play instructional roles in ensuring the success of inclusive education in schools." The findings of this study were collected from school administrators and they forwarded the issue: a shortage of knowledge and skills, which impact on the quality of inclusive education. Furthermore, there was scarcity of leadership training that focuses on leading inclusive education programs. This article discussed definitions, laws, and concepts related to inclusion, as well as models of co-teaching, transformational leadership theory and traits, school leaders' roles and responsibilities in inclusive education programs, and practical strategies to improve current inclusive education practices for school leaders.

Hadjiyiannakou (2006), Regmi (2017), Adrian. (2017), Mangope, B, Otukile-Mongwaketse, M., Dinama, B, & Kuyini, A.B (2018) and Murphy (2018) all of the researchers have given importance on how we practise inclusion in classroom.

International Practices in Inclusive Education

Ewa (2015) carried out research on "A study of The Inclusion of Primary School Children in a Rural District in Nigeria". Data were collected through documentary analysis, observations, and interviews at schools as part of a qualitative case study with an interpretive approach. The study involved 30 youngsters aged 11 to 16 years old from various ethnic backgrounds who were recruited from three public primary schools' primary 5 classrooms. The data were analysed using the social constructivist theory. The

research questions were: i) How much do students participate in school? ii) What resources could be used to overcome these obstacles? The issues affecting inclusive education were inequalities in national education policy and in-school factors such as classroom procedures, religious attitudes, grade repetition, and social contact and different factors outside of the classroom impact on inclusive education.

Muhammed and Rahaman (2011) carried out an article on “Inclusive Education Practices for Secondary School Students with Disabilities in Bangladesh”. This study was based on phenomenological qualitative research. The goals of the thesis were to investigate how teachers have envisioned and advocated for inclusive education, as well as how instructors have experienced and comprehended it for students with disabilities. For this research questions formulated for this study were i) How inclusive in current educational practice in secondary schools in Bangladesh? ii) How do teachers' knowledge, beliefs, and attitudes influence whether or not children with disabilities are included in inclusive practices in Bangladesh? For this study interviews and observations were used to gather information. The social constructivist interpretation of Lev Vygotsky's work served as the foundation for this argument. The findings of this study suggested that: inclusive education is helpful because it encourages collaboration and academic accomplishment among students with and without impairments. Furthermore, inadequate information, limited professional development scopes, difficulty in managing big class sizes, and evaluation are all impediments to inclusive education. In order to develop inclusive pedagogy, we need to empower instructors in the classroom. This study's findings recommend policymakers and other researchers in formulating policies and practices for inclusive education in Bangladesh.

Nunes (2017) wrote an article on ‘Promoting Self-Determination Skills of Individuals with Intellectual Disabilities Participating in the Inclusive Concurrent Enrolment Initiative Programs throughout Massachusetts'. The study's research questions were: i) Do postsecondary students with intellectual disabilities and Autism Spectrum Disorder believe they have control over their lives? ii) Do postsecondary instructors believe students with intellectual and autism spectrum disorder have accurate self-determination skills? iii) What does "self-determination" mean to educators? iv) Do postsecondary instructors believe they are well prepared to teach self-determination skills? v) Does the ICEI program model include elements that encourage students to develop self-determination?

Ewa (2015), Muhammed and Rahaman. (2011) and Nunes (2017) have studied how inclusion was practised internationally.

Collaborative, Co Teaching and Peer Learning

Smith, Julie and Rebecca (2017) carried out research on ‘Exploring the relationship between metacognitive and collaborative talk during group mathematical problem-solving – ‘what do we mean by collaborative metacognition?' The goal of this research was to understand more about the relationship between collaborative and metacognitive discussion in mathematical problem-solving groups. The research questions were: i) Is there a link between metacognitive utterances and transactive conversation in mathematics group work? ii) How can collaborative metacognition be operationalized to better understand its reciprocal collaborative engagement? The purpose of this research was to understand more about the link between collaborative and metacognitive conversation when solving arithmetic problems. The following questions were addressed in the study: i) Is there a good association between metacognitive

utterances and transactive talk in mathematics work? (ii) Is there a link between metacognitive utterances and transactive talk in mathematics work? ii) How might collaborative metacognition be operationalized so that we can better understand their reciprocal collaborative interaction?

Thus, in the classroom we need collaborative teaching.

Chan and Idris (2017) carried out research on ‘Cooperative Learning in Mathematics Education.’ The findings were centred on the use of cooperative learning in mathematics education.

Ethnomathematics

Ethnomathematics is the study of mathematical ideas prevalent in any culture and was coined by D'Ambrosio (1985) to characterise the mathematical activities of identified ethnic groupings. According to D'Ambrosio (1990), mathematics is defined as follows:

The prefix 'ethno' is now widely regarded as a broad term referring to the social-cultural framework, which encompasses language, jargon, standards of conduct, myths, and symbols. The word mathema has a complicated etymology, but it usually means "to explain," "to know," "to understand," and "to conduct things like ciphering, measuring, inferring, and modelling." The suffix tics is derived from the root word techno, which is the same as technique.

According to D'Ambrosio (1990), the quest for solutions to specific problems that aid in the creation of mathematics is always embedded in a cultural context: to understand how mathematics is developed, one must first comprehend the difficulties that lead to it. It is vital to address these issues by taking into account the cultural environment in which they occur.

The ethnomathematics program's mission, according to D'Ambrosio (1993), is to recognize that there are different ways of doing mathematics by considering the appropriation of academic mathematical knowledge developed by various sectors of society, as well as different modes in which different cultures negotiate their mathematical practices that can be identified as mathematician. Ethnomathematics can be defined as the use of mathematical ideas and concepts by people from a particular culture to deal with quantitative, relational, and spatial aspects of their existence (Borba, 1997).

According to Orey (2000) “Ethnomathematics is the paradigm that varied cultures utilise or function under arises out of unique interactions between their language, culture, and environment". According to D'Ambrosio (2006), mathematical thinking develops in different cultures in response to common challenges encountered in that culture.

Ethnomathematics understands that all cultures and people develop unique techniques and complex explanations to understand and transform their own realities, and that all cultures and people develop unique ways and sophisticated explanations to understand and transform their own realities (Orey, 2000). Ethnomathematics, according to D'Ambrosio (2001), has evolved to signify the study of how people from distinct cultural groups construct strategies to explain and understand their world in response to difficulties, struggles, and human survival activities. Ethnomathematics is a term that describes many types of mathematics that have evolved as a result of being entrenched in cultural activities other than mathematics. Orey (2000) asserted, and as such, it provides insights into the social role of academic mathematics.

According to Dossey (1992) and Orey (1994), mathematical knowledge is learned through social interactions in which appropriate ideas, facts, concepts, principles, and abilities are gained as a function of cultural context. Students integrate representations

and processes into their cognitive systems through socially produced activities (Rosa & Orey, 2008). As a result, according to D'Ambrosio (1990), mathematics originated from the requirements of organised society, which cannot be separated from the activities and practices of mathematics. So, a mathematics teacher should understand all ethnic group students and provide education which fits their needs so that we can get good outcomes in mathematics.

Student Engagement in Mathematics Classroom

Sen (2022) carried out research on 'Middle School Students' Engagement in Mathematics and Learning and Learning Approaches'. The purpose of this study was to find out how middle school pupils engaged in maths classes based on their learning styles and attitudes about the subject. In a city in Turkey's Central Anatolia, a quantitative research model involving 383 pupils, 209 girls, and 174 males was carried out with the participation of students in the fifth through eighth grades. The data were analysed on the basis of structural equation modelling. The findings revealed a correlation between participants' involvement in the mathematics course and their learning methods, but no correlation between participants' involvement in the mathematics course and their methods of learning.

Sen showed how students were engaged in mathematics learning.

Motivation

Yunos, Thangal (2022) carried out research on 'Motivation for Learning Mathematics.' The purpose of this study was to look into how three different academic fields—social sciences, business, and science and technology—motivate students to learn mathematics. 234 students at a Malaysian public institution were given a set of

questionnaires as part of this quantitative study. The questionnaire's 24 total items were divided into three sections: affective components, expectancy components, and value components. The results of this study revealed that learning mathematics required motivation.

Middleton (1999) carried out research on ‘Motivation for Achievement in Mathematics’. The review was made on motivation in mathematics education. Contextual factors, cognitive processes, and the positive effects of interventions were found to influence students' and teachers' motivational attitudes.

Jang (2008) carried out research on ‘Supporting Students’ Motivation, Engagement, and Learning During an Uninteresting Activity.’ One hundred thirty-six undergraduates (108 women, 28 men) were taken on an uninteresting 20-min lesson after either receiving or not receiving a rationale. Findings highlighted that externally provided rationales helped students to generate the autonomous motivation and needed to engage constructively.

Vansteenkiste (2009) carried out research on ‘Motivational Profiles from Self-Determination Perspective: The Quality of Motivation Matters.’ The research was focused on autonomous and controlled motivation in learning. Mixed research was taken from high school students and college students. The findings of this study were the group with high levels of motivation demonstrated the best learning patterns and received the highest marks for supportive instruction.

Howard (2021) carried out research on’ Student motivation and associated outcomes.’ Motivations were carried out in different types of motivation using 344

samples with 223,209 participants which were related to 26 performances. The findings highlighted intrinsic motivation leads to student success and well-being.

Yunos, Thangal (2022), Middleton (1999), Jang (2008), Vansteenkiste (2009) and Howard (2021) were the researches related with motivation which was used in mathematics learning.

Teacher-centred Versus Student -centred Learning

Mascolo (2009) carried out research on' Beyond Student-Centred and Teacher-Centred Pedagogy.' The results revealed that there was a conflict between a student-teacher-centred approach and the necessity to emphasise the student's active participation in sociocultural activities for which both the student and the teacher shared equal responsibility in order to promote successful learning.

Garrett (2008) carried out research on 'Student-Centred and Teacher-Centred Classroom Management.' A qualitative case study was carried out among four maths teachers who had been teaching for two years in two secondary schools. According to the study's findings, maths teachers initially struggled to change their usual teacher-centred classroom instruction to a more student-centred one, but they overcome these obstacles by developing new coping mechanisms.

Mascolo (2009) and Garrett (2008) gave emphasis on student's active participation in mathematics learning and teachers needed to cope with new mechanisms in learning.

Teaching Materials

Sinay (2016) carried out research on' Teaching and learning mathematics research series l: Effective instructional strategies.' This study of the literature explored how

instructional methods for teaching mathematics support and encourage students' mathematical growth. Therefore, through inquiry-based learning, a variety of teaching techniques, and ongoing and evolving evaluation methods, mathematics programs needed to be encouraged in problem-solving, creativity, collaboration, exploration, and excitement.

Ridhwan, Sumarmi et.al (2019) carried out research on 'Student Perception on Teaching Materials Development to Increase Students.' Descriptive statistics were utilised to assess the findings of a quantitative study design. The study's findings suggested that in order to improve students' understanding, instructional materials should be used.

Physical Facilities/Dropouts

Marks (2000) carried out research on' Student engagement in instructional activity: Patterns in the elementary, middle, and high school years.' The findings suggested that proper care and support helped to flourish in students' learning.

Nwankwo (1982) carried out research on' Educational Administration: Theory and Practice.' Poor budgeting for education, dropout rates, learning environments and facilities, low student enrolment, and inadequate school infrastructure were the study's key findings.

Nampila (2021) carried out research on 'Factors that influence learners' decisions to drop out of subjects at the Namibian College of Open Learning (NAMCOL).' Financial difficulties, illness, a lack of enthusiasm, and a lack of aptitude were shown to be the primary causes of student dropouts.

Adeyemi (2008) carried out research on ‘The influence of class-size on the Quality of Output in Secondary Schools in Ekiti State, Nigeria.’ The 141 secondary schools that made up the population of the study were chosen at random to select 120 of them, and the data were then examined using the chi-square test, correlation analysis, and t-test. We conducted semi-structured interviews with a few principals and education officials. In comparison to other schools, the results showed that schools with an average class size of 35 students or less performed better than the others.

Marks (2000), Nwankwo (1982), Nampila (2021) and Adeyemi (2008) studied the importance and various reasons for drop out students.

Teacher’s Training

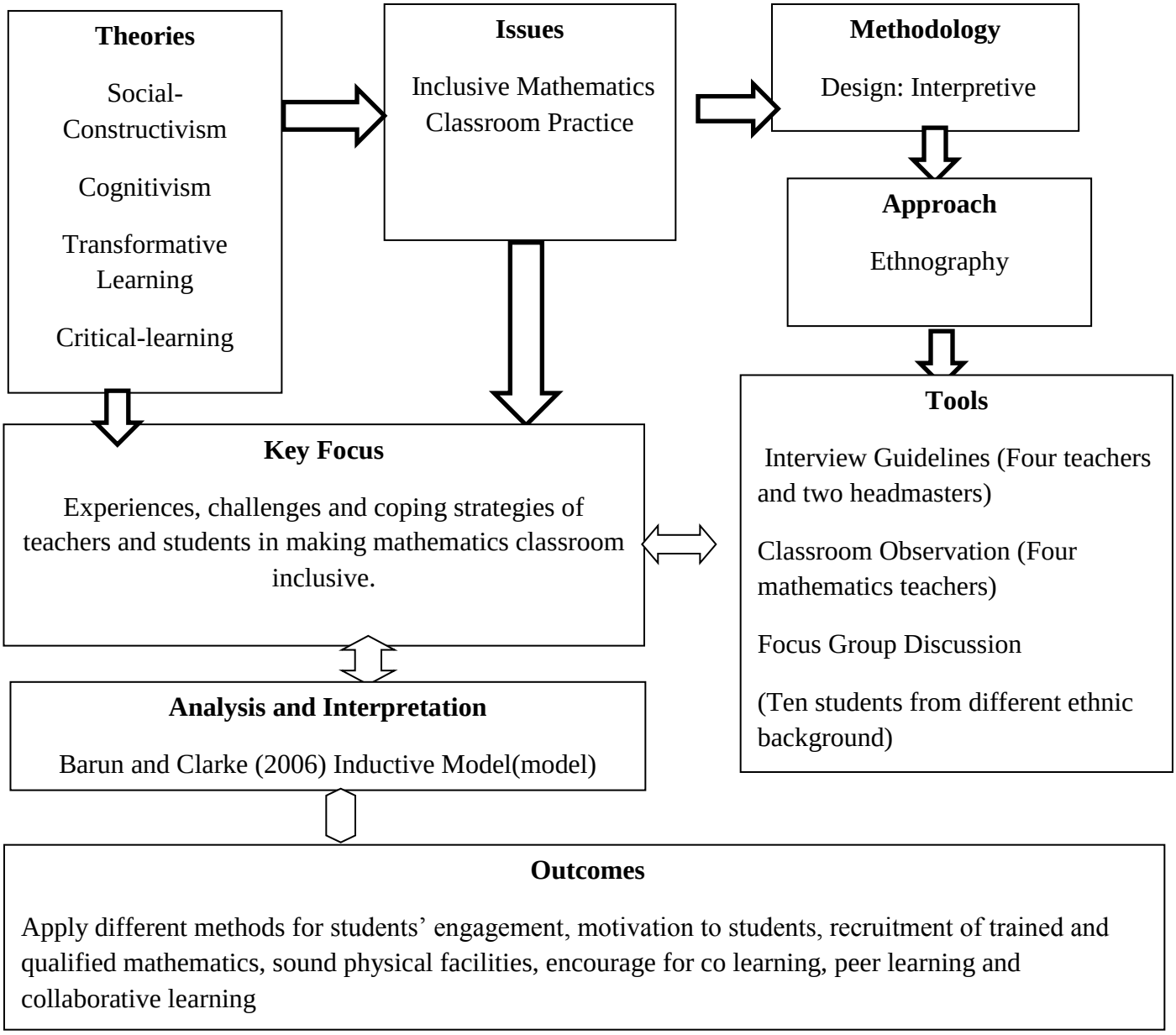
Hanley and Brown (2017) studied research entitled ‘Building a professional discourse of mathematics teaching within initial training courses.’ The study involved first-year college students who were taking elementary mathematics as their foundational training subject. Anecdotes were employed. Students were examined on the basics of discourse from the expert.

Conceptual Framework of the Study

Conceptual framework is the visual representation which shows how a researcher carried out a thesis. A conceptual framework is a framework that the researcher believes and explains best the natural course of the subject under investigation (Camp, 2001). It includes different theories and empirical research used in research. Conceptual framework is the research process that involves observing and analysing data depending on a certain topic. As I am concerned with research entitled 'Inclusive Mathematics Classroom Practices', I used different methodologies to make this research meaningful.

Moreover, in a classroom, I found diverse students and it is difficult to provide an equitable classroom environment. My concern was how a teacher and student make classroom inclusive and what are obstacles faced by them in making classroom inclusive and lastly concern with strategies imposed by teachers to make mathematics classroom inclusive. From many theories, I used Social-Constructivism, Cognitive, Critical learning theory and Transformative theory.

This study stands on qualitative research with ethnographic design to answer my research questions. Thus, various concepts are incorporated in my conceptual framework which clearly plays an ontological, epistemological and methodological role in my study. The following diagram visualises the entire structure of the study based on the reviewed theoretical and empirical literature along with my reflection on the topic entitled 'Inclusive Mathematics Classroom Practices.' In depth interview, classroom observation and focus group discussion were used as methods for data collection procedures. The obtained data were translated, transcribed and analysed based on Braun and Clarke, Inductive method where key focus was on experiences, challenges and coping strategies of teachers and students in making mathematics classroom inclusive.



Gap Spotting

Gap-spotting is a method of approaching research contributions in which the goal is to fill a gap, clear up a misunderstanding, or add to what is already known about a subject (Sandberg & Alvesson, 2011). Gap-spotting refers to the identification of different gaps in current literature. I studied various articles, thesis, and other documents available on hard and soft copies which are related to my topic. I found that literature has given me ideas based on my research topic,' Inclusive Mathematics Classroom Practices'.

Moreover, those literatures have also given me what barriers are related to Inclusion. In those literatures, researchers centred their ideas on Practice of Inclusive education but they have not studied on coping ways for removing barriers in inclusion. Moreover, most literature has employed quantitative research but I am going to use qualitative research which gives us opinions easily. Also, most researchers have used Phenomenology as research design but I wanted to use ethnography as my research design. So, I found, there is a research gap or problem in this study. Therefore, I wanted to fill this gap found in this research about how inclusive mathematics education is practised, how teachers and students face obstacles in the classroom and how we can address those obstacles.

Chapter Summary

In this chapter, I reviewed different articles, thesis based on my objectives. I used cognitive theory, Vygotsky constructivism, transformative and critical learning theories. Different journals and data from different participants helped me to formulate thematic reviews which were: teacher perception in inclusive education, culturally diverse mathematics classroom, social justice in mathematics classroom, inclusion practice in mathematics classroom, international practices in inclusive education, collaborative classroom, ethnomathematics. I prepared a conceptual framework. There was much research carried out in inclusion but I carried out inclusive practices, obstacles and coping strategies in mathematics classroom which was different from this study.

Chapter III

METHODOLOGY

Methodology is a theory of methods with respective tools and techniques; it is a graph of ways of thinking and doing (Callaos, 2002). It produces the procedure of study It is a guideline for ways of knowing, being and valuing reality which depends upon the nature of research. Fraenkel & Wallen (1993) define research as "a rigorous, systematic, patient study and examination in some field of knowledge, undertaken to find or establish facts and principles." According to Wilson (1999), research methodology is a specific approach for collecting data. In this chapter, I have described the research paradigm, research design, study site, sampling method, data collection tools, data collection procedures, data analysis procedures, ethical consideration and quality standards.

Research Paradigm

According to 'interpretative' research (Flick, 1998), social reality can only be grasped via social constructs like language and awareness. The following major features of Creswell's (2007) approach to qualitative research are all considered essential to the entire research process. Interpretive research is a broad term for social inquiry that creates knowledge assertions based on the interpretation of participants' lived experiences in the classroom, with a focus on the practice of inclusion in the classroom. Thus, interpretive approaches are based on the researchers' philosophical positions rather than their methodological orientation, which necessitates the use of a variety of methods (Walther, Sochacka, & Kellam, 2013).

Interpretivists argue that new experiences or theories are interpreted in the context of what we believe and teach (Hay, 2011). Interpretivists, in other words, are fascinated by the significance of what teachers and students do when they interpret their social

surroundings (Hay, 2011). As my research is entitled "Inclusive Mathematics Classroom Practices", I am inspired to document experiences, challenges, and opportunities faced by teachers and students.

Ontology of my Study

The ontology of my study is based on relativism, which believes that there are multiple realities. Ontology is the study of beings which claim what exists and how they interact with each other (Blaikie, 1993). I believed that there is diversity of students in the classroom and there is discrimination in terms of classes, gender, and language. Some students are quick learners whereas others not. There is discrimination in mathematics students, so they pay less attention in the classroom or more probably drop out from the classroom.

Epistemology of my Study

The process of thinking that establishes the relationship between what we know and what we see is known as epistemology (Creswell, 2007, as cited in Lincoln et al., 2011). The knowledge of this research is subjectivism which is based on real life phenomena. In interpretive research we know and observe from real life phenomena. The epistemology of my research is dialectic and dialogic in nature. How is inclusion in mathematics carried out in school? This knowledge can be generated from an iterative process of active dialectic and dialogic conversation with diverse students, mathematics teachers involved in the class and my own reflections.

Axiology of my Study

Axiology is the study of moral and aesthetic values (Chopra, 2005). Value is both free and laden in axiology. Value is laden for interpretivists. I'm inspired to create an

inclusive classroom climate in which all children are welcomed and valued. Furthermore, I have placed a high importance on mathematics instructors' ability to be committed educators, change agents, reflective practitioners, and powerful facilitators of students, all of which are essential components of an inclusive mathematics classroom.

Research Design

This is a study based on qualitative descriptive research. According to Patton (1990), qualitative research accepts that people know themselves best and can describe, interpret and talk about their own environment. There is a natural setting and uses multi-method to interpret, understand, explain and bring meaning to them. According to Anderson (1990), it is a disciplined attempt to address questions through the collection and analysis of primary data for the purpose of description, explanation, generalisation and prediction. Qualitative research, according to Van Maanen (1988), is closely linked to reality. Its fundamental goal is to hear voices that have previously gone unheard. A qualitative approach to social science is one that describes and analyses human culture and behaviour from the perspective of people being investigated (Bryman, 1988). Mason (1996) has defined qualitative research as a method which focuses on the way people interpret the social world.

There are many qualitative designs and among them, I have chosen ethnographic as my approach for the study. Ethnography provides deep, comprehensive insights into people's worldviews and activities, as well as the nature of the environment they live in (Hughes 1992). Hammersley (1985) documents the culture, attitudes, and activities of the people in these contexts. The goal was to "get inside" each group's perspective on the world". The research was carried out in a natural setting and rapport was built with

respondents. This research was carried out in natural settings and I have got thick information.

Study Site

Purposive sampling has been used as sampling because my study is qualitative in nature. My participants were four maths teachers, two head teachers and ten students from different ethnic background who assisted me in my research. For this, I enlisted the Class -8 basic level, 10 students who were from different ethnic background and four mathematics instructors who were teaching for more than 10 years and two head teachers from Shree Ram Secondary School in Bhaktapur and Mahalaxmi Secondary School in Bhaktapur.

Sampling Method

In this design I preferred to choose purposive sampling. It is a non-probability sampling based on characteristics of the population and objective of the study. Purposive sampling has been used as it is convenient for me to choose samples according to my desire. So, I chose four teachers, two head teachers and ten students who were teaching and studying respectively in those two schools in Bhaktapur district.

Data Collection Tools

To collect valid data different types of tools were used which are in-depth interview, participant observation and focus group discussion.

In-depth Interview

It is the main method for collecting primary data where a person verbally collects information. Interviewing is the data collection procedure involving verbal communication between the researcher and respondent either by telephone or face-to-face

situation (Eckhardt, & Ermann, 1997). Before going to take interviews from teachers and headmasters, I first prepared interview guidelines based on research questions and asked the questions according to the guidelines to four mathematics teachers, two headteachers from those selected schools. In that process the respondents did not know that they were being interviewed as the interview was carried out in natural settings. An interview is a dialogue started by an interviewer with the goal of gathering appropriate information focused by him/her in terms of content on the objectives of the research. (Watts and Ebbutt, 1987)

Participant Observation

The systematic description of the events, behaviours, and artefacts of a social situation is known as observation (Marshall & Rossman, 1989). The main tool in ethnography is participant's observation. It's also a tool that researchers use on a regular basis to collect data based on classroom activities. Denzin (1989) defines participant observation as "a field method that includes document analysis, interviewing of respondents and informants, direct involvement and observation, and introspection all at the same time". Being me as an observer and participant, I chose participant observation based on research objectives. It was observed in natural settings in those schools. In my school one-year continuous participants observation was done and neighbouring school I went five times for participant observation.

Focus Group Discussion

A focus group discussion is a method in which a researcher gathers a group of people to talk about a given topic, with the goal of eliciting the participants' complicated personal experiences, beliefs, perceptions, and attitudes through mediated interaction (Cornwall & Jewkes, 1995). In my research, I have conveyed five times focus group

discussion from ten students from grade-8 in an inclusive way (gender, economic background, cognitive level, ethnic background) in my own school to discuss their inclusion in mathematics. FGD assisted me in collecting primary data in accordance with my objectives.

Data Collection Procedures

The data collection procedures are: identification of participants and sites, gain access, determine the types of data to collect, develop data collection forms and gather data in an ethical manner (Creswell, 2007). I visited different schools and met teachers and students and took informed consent. I explained objectives, method of my study to the participants which are related to inclusive education. Then, I made a plan for interviewing the participants. Furthermore, I recorded those interviews into my mobile and transcribed them and at last analysed them thematically. Participant observation was based on practice of inclusive education in mathematics classroom, difficulties in making classroom inclusive and along with strategies used for inclusive mathematics classroom. Also, from focus group discussion I found views, difficulties faced by students and teachers in making mathematics classrooms inclusive.

Data Analysis Procedures

In qualitative research, I used an inductive approach. The broad inductive approach consists of a set of procedures for examining qualitative data that can yield accurate and valid results. The data obtained from interview guidelines, participant observation and focus group discussion were first recorded into mobile and note books. Moreover, mathematics teachers' views were also taken. After that the core data were translated, similar codes were collected and from the open coding themes were made. Thus, data was transcribed and at last the report was prepared. There are many data

analysis procedures and among them, I have used the Braun & Clarke (2006) inductive method for analysing the data. In the following ways, I used Braun & Clarke (2006) which steps are as follows:

Familiar with Data

At first, I listened to the interviewed data repeatedly which was obtained from different tools and translated into English language in my notebook.

Generating Initial Code

In the next step, from the translated data different codes were constructed.

Searching for Theme

From the different codes, I made themes from the similar codes by axial coding.

Reviewing Theme

The themes thus developed were reviewed with the objectives of my research.

Defining and Naming Theme

In the next step, the themes were named in attractive phrases.

Producing the Report

At last, from the different themes, I came to a conclusion from the raw data.

Ethical Considerations

In informed consent, all research participants must have been appropriately informed about the research aims and purposes, and their participation must be completely voluntary, according to informed consent (BERA, 2004). The following aspects were the ethical consideration of my study:

- I informed the selected participants the topic of the study and its objectives.

- I followed all the rules and regulations illustrated by the participants or institutions.
- I took verbal agreement from each participant and related institutions to study participants at research sites.
- I placed respect for the privacy of participants of my study.
- I used pseudonyms of my participants for anonymity.

Quality Standards

I have maintained the quality standard of the study. I have also maintained trustworthiness and authenticity of my study. The main quality standards for qualitative research developed by Guba, Lincoln and colleagues (Guba, 1981; Lincoln, 1995; Lincoln & Guba, 1985; Lincoln et al., 2011) are credibility, transferability, dependability and confirmability. I have triangulated participants' views and the four quality standards used in my research are:

Credibility. The "truth value" of the research participants is represented by credibility (Lincoln & Guba 1985). Credibility can be established through strategies such as triangulation (using multiple sources of methods; Padgett 2008), peer debriefing (sharing questions about the research process interpretation), and member checking (returning findings to participants to determine their reflective experiences; Creswell and Miller 2000, Padgett 2008). For establishing credibility, I established a sequence between research questions, theories and conceptual framework. Furthermore, the collected data were analysed within the given framework of the study. To maintain the study's credibility, I spent more time in monitoring and engaging with participants in accordance with the research objectives. Then, based on my research questions, I took field notes.

Dependability. Dependability is the degree to which research techniques are documented, allowing someone outside the research to observe, audit, and criticise the research process (Sandelowski 1986, Polit et al. 2006, Streubert 2007). I recorded all the field notes from the interview on my mobile. Furthermore, classroom observation and focus-group discussion were also taken as focus points. Also, I got incredible help from my supervisor and his mentor.

Conformability. Miles and Huberman (1994) highlight the major criteria of confirmability are researcher predisposition, beliefs, and assumptions. To maintain conformability, I gave the narratives to the participants for reading and confirming their views.

Transferability. My study will apply in other similar situations. Transferability is the degree to which the phenomena or findings presented in one study are transferable or beneficial to theory, practice, and future research, and it is a sort of external validity (Lincoln & Guba 1985).

Chapter Summary

My research is interpretive qualitative with ethnographic design. Interpretation of participants' lived experiences in the classroom, with main focus on the practice of inclusion in the classroom. The ontology of my study is based on relativism, which believes that there are multiple realities. The epistemology of my research is dialectic and dialogic in nature. Value was laden. I used a purposive sampling method where two community schools of Bhaktapur district were selected for the research. In-depth interviews were taken from four mathematics teachers and two head teachers with participant observation from the interviewed mathematics teachers and moreover, ten

students who were from different ethnic backgrounds of grade 8 of my own were selected for FGD.

I visited different schools and met teachers and students and took consent. I explained objectives, method of my study to the participants which are related to inclusive education. Then, I made a plan for interviewing the participants. Furthermore, I recorded those interviews into my mobile and transcribed them and at last analysed them thematically. Observation was based on practice of inclusive education in mathematics classroom, difficulties in making classroom inclusive and along with strategies used for inclusive mathematics classroom. Moreover, from focus group discussion, I found views, difficulties faced by students and teachers in making mathematics classrooms inclusive. I have used the Braun & Clarke (2006) inductive method for analysing the data which were: familiar with data, generating initial code, searching for theme, reviewing theme, defining and naming theme, producing the report. For ethical considerations, I informed the selected participants for the topic of the study and its objectives. In addition, I followed all the rules and regulations illustrated by the participants or institutions with verbal agreement were taken from each participant and related institutions to study participants at research sites. Furthermore, I placed respect for the privacy of participants of my study and pseudonyms of my participants for anonymity. I have maintained quality standards by creating credibility, transferability, dependability and conformability.

Chapter IV

INCLUSIVE PRACTICE IN MATHEMATICS CLASSROOM

In this chapter, I have appended various practices used in inclusive mathematics classrooms. This chapter includes the detailed description of inclusive mathematics classrooms based on different themes which are engagement of students in mathematics classroom, teacher centred teaching method, multiple use of teaching materials, collaborative learning, motivation in classroom, respecting individual differences, and lack of localised curriculum. These themes aim to address my first research objective: to investigate practice of inclusion in mathematics classroom.

Through the process of in-depth interview with participants, observation of their teaching practices in their classroom, focus group discussion with the targeted participants and my own reflection while teaching mathematics at school level, I have apprehended the practices of students and teachers in an inclusive mathematics classroom. Their practices vary with others. But the essence is making the mathematics classroom inclusive.

The practices that student teachers have will surely be impacted by inclusion (Bukari & Kuyini, 2014). According to Green, Forrester, Mvambi, Jan Van Vuuren, and du Toit (1999), teachers are crucial for the achievement of inclusion and adjustments of necessary attitudes and behaviours. Teachers and students help to make mathematics inclusive which requires various dimensions to be adjusted in the mathematics classroom.

In this chapter I have discussed students' and teachers' different practices in making mathematics classrooms inclusive under different themes. Before making themes, I needed participants who would help me fulfil my research objective. For this, I purposefully selected four mathematics teachers and two head teachers from two public

schools. Also, I have selected ten students from different backgrounds for a focus group discussion on making my mathematics classroom inclusive.

T_1 is a trained secondary mathematics teacher having qualification of M.Sc. in mathematics as a major subject. He has 24 years of experience teaching mathematics at public schools at the secondary level. He is a dedicated teacher who is regular, punctual, and responsible.

T_2 is an experienced lower secondary teacher having qualification of M.Ed. in mathematics as a major subject. He has 17 years of teaching experience in both public and private schools. He also teaches at the college level in the morning. He is from the Newari ethnic group.

T_3 is a secondary-level trained mathematics teacher with a M.Ed. in mathematics as a major subject. She is from Dhanusha district and belongs to the Madhesi ethnic group. She is a dedicated mathematics teacher who has nearly 10 years' experience in private school and five years' experience in public school.

T_4 is a primary mathematics teacher who teaches up to fifth grade and has 35 years' experience in teaching in public schools. He is a dedicated teacher who always wants to learn and teach students in an interactive way.

H_1 is a headteacher who has long experience in the teaching field and who upgraded the school from primary to secondary level. All the local people send their children to that school apart from private school.

H_2 is the headteacher of a basic school who has turned a zero-level school into a model school. At her school, all the teachers teach using a smart board, and project work is given to students in every subject.

The above participants' names are not their real names; instead, I have used their pseudonyms in order to protect their privacy. I observed the above participants' classroom. I had purposefully selected 10 students for focus group discussion who are from different backgrounds. In FGD, I selected five talented and five weak students from different ethnic groups.

I interviewed four teachers and two head teachers based on the first objective, which is the practice of inclusive education in mathematics education. In the next step, I carried out observations on those selected participants in class, and at last, I asked questions to the selected students. After carrying out an in-depth interview, participant observation, and focus group discussion, I got data that was recorded on my mobile. After that, I listened to their interview two-to-three times, transcribed it, and generated the following themes:

Students' Engagement in Mathematics Classroom

Mathematics classroom should have a good environment in which teachers are well prepared about the content and related materials and students are eager to learn. A teacher should make every learner understand the content, irrespective of their diversities. Skinner stated that student engagement was crucial since it addressed a student's level of attention, effort, persistence, positive emotions, and commitment in the learning process (Handelsman, 2005). Engaging students in learning is a difficult task for teachers. In this regard, one of the participants in this study, T_1, shared his views as follows:

> *Some of the students enjoy the mathematics learning but many students mentally think it is a very difficult subject. So, they don't fully concentrate on mathematics learning. They understand mathematics from interactive models. I create the*

learning environment by discussion and problem-solving methods for them. (Interview transcription, January 14, 2022)

This practice of my participant shows that there are multiple methods used in mathematics learning. Another participant (T_2) expressed about engagement of mathematics as:

Mathematics is the subject which is used in daily life. Most of the students feel difficulty in learning because it is not related with their daily life. This subject is taught by using rote-learning. There is a lack of applied knowledge as the teacher has to finish the course, so they solve exercises from the prescribed book only. In a few topics only students are involved in participation. (Interview transcription, January 25, 2022)

Another participant (T_3) narrated as:

Mathematics is a compulsory subject at school level. It is found that students get good marks in lower classes but gradually when they are promoted their performance decreases. It is because mathematics concepts move from concrete level to abstract level. Also, students can't connect mathematics to their daily life, so they feel difficulty in learning. To engage students in learning project work, group work needs to be used. (Interview transcription, January 25, 2022)

Another participant T_4 shared his views as:

Students are encouraged to learn mathematics because different learning methods are used to make mathematics interesting. Students ask questions immediately when they have problems but some students don't participate in learning. Students who are good at mathematics teach their friends also. Physically and

> *mentally all students don't participate in learning. (Interview transcription, January 24, 2022)*

One headteacher H_1 Krishna expressed his views as:

> *As we are in the technical era, we have to use multiple methods in mathematics learning. In learning we motivate teachers to use local materials in the classroom. If one method does not work then we have to apply another method. We should totally engage students in learning. It was a challenge to handle students of diverse needs of learners. (Interview transcription, February 1, 25, 2022)*

Another headteacher H_2 expressed her views as:

> *There was a problem with conducting classes in the Corona period. That problem became an opportunity for us to learn. We got training from the government about online classes. After that all teachers bought laptops in the classroom. Teachers got guidance from YouTube, friends and from children. Then classes were conducted in online mode. Teachers are motivated to use Smartboard. After that all teachers take laptops in every class with rare use of board markers. Teachers used White boards to take board tests for students. (Interview transcription, February 1, 2022)*

On the basis of shared experiences made by different participants, it can be concluded that there are multiple methods used in learning. All the students are fully engaged in learning. Students who are good at mathematics are more motivated to learn mathematics. Instead, other students feel anxiety when learning mathematics. There are multiple methods used in learning. A teacher should consider and perform teaching based on the student's mental structures, or schema. (Ertmer & Newby, 2013) Learning

mathematics becomes much easier when teachers are aware of their students' mental states.

Furthermore, in the next step, to find out how students are engaged in learning in the classroom and get confirmation, I carried out observations in the above participants' classes. On January 15, 2022, before I left my room, I made a phone call to the particular school headteacher and mathematics teacher for my appointment. After that, I ate food and went to school at 9.45 a.m. At that time there was an assembly, which I observed, and after finishing the assembly I met the headteacher along with the mathematics teacher. We introduced each other, and after that, the mathematics teacher went to grade 8. The headteacher told me to go with him, so I went to grade 8. The size of the classroom was large, with a proper desk and benches where, on each bench, three students sat together. There were very few mathematics materials hanging in the classroom. I sat on the last bench. A mathematics teacher told students that he was going to teach sets. He provided definitions and examples of various types of sets. All the students carefully listened to his teaching. The classroom was quiet, and there was interactive learning. Before finishing the class, he revised all definitions again and told all students to write set definitions with one example each. *(Observation transcription, January 25, 2022)*

After that, I visited another school after getting an appointment from the school headteacher. I left my room and reached the school. The weather was cold and rainy. I took my umbrella and reached the school. There, I had a good conversation with the headteacher, and she told me to visit in grade 7. She went with me to grade 6. I sat on the last bench. I found the classroom well equipped with materials, and there was a Smartboard. The mathematics teacher entered the classroom with a laptop. He connected

his laptop with a smart board wire. He was teaching the students to find the perimeter of a rectangle. At first, he explained about rectangle definitions and showed different rectangular objects present in the classroom. After that, he showed the formula for perimeter on the smart board, which is given as follows:

Perimeter of Rectangle=l +b +l +b=2l+2b=2(l +b)

After that he found perimeter of rectangle with particular example:

Length of rectangle=3cm

Breadth of rectangle=2cm

Perimeter of Rectangle=2(l+ b)

=2(2+3)

=2x5=10cm

In the next phase, he stated five problems with students to find the perimeter of a rectangle. All the students were excited to solve problems and solved them correctly in class.

After that I observed the participants' mathematics teacher. I found that first the teachers discussed the concepts of mathematical problems in the class and asked the students to solve other similar mathematical problems. Teachers were found to use different strategies and methods in teaching. They involved all the students in mathematics learning. They imparted a clear concept with materials to all the students. We need to use different mathematical tools to transform students into new learning (Mezirow, 1978).

At last, I organized a focus group discussion including ten targeted students who represented different ethnic backgrounds. I called them in the computer room and asked

questions about how students engaged themselves in mathematics learning. Mathematics teachers used textbooks as the base for learning and also used other materials based on content. They first taught the concept of each chapter and then gave students time to solve problems. Teachers roamed around the room to check students' activities and guide them where students had difficulty. For showing homework some of the students copied homework from talented students. According to Vygotsky's (1978) "Zone of Proximal Development" theory, we should identify students' prior knowledge and assist them in developing new knowledge, which will assist them in developing permanent knowledge. (FGD, February 4, 2022)

Teacher Centred Teaching Method

Teacher-centred teaching method is a traditional method where the teacher acts as a speaker and the student as a listener. For me, it is against learning by doing methods. According to Acat and Dönmez (2009), in teacher-centred learning, teachers typically use certain textbooks and present contents to students where the role of the teacher is dominant over students. In teacher-centred teaching, students cannot interact with teachers and assume mathematics teachers as super power. Nowadays, slowly teacher-centred learning is transposed into child-centred learning. Students' activities are important indicators in the learning process. The quality of the learning product in this approach, teachers consider the needs of the students both as a group and individuals, and encourage them to participate in the learning process at all times (Zohrabi et al., 2012). In student-centred teaching, teachers play the role of facilitators rather than educators, and participate actively in the learning process to assist and guide the students. Student-centred learning helps to make mathematics inclusive and involve all the students in mathematics learning. In this regard, one of my participants T_1 shared his experiences as:

> *Though we are in a technological era, we could not apply student-centred learning in the classroom. We got 40 minutes time, in that time 5 minutes will be lost concentrating students in class. There is burden of teaching and checking copies in classes. Also, we have to finish the course in the required time. So, always we are in a rush to finish our course. (Interview transcription, January 14, 2022)*

Another participant T_2 delivered his practice as:

> *I try to be student-centred in the classroom. I want to address student's problems inside and outside the class. But in the classroom only talented students ask questions. As there is a limitation of the course, I cannot address each and every student of the class. (Interview transcription, January 14, 2022)*

In reference to the above theme another participant T_3 stated: 'Though we have knowledge about how to apply student-centred learning but due to different reasons I could not be able to apply it perfectly in class. *(Interview transcription, January* 14, 2022)

On the contrary one H_1 head teacher discussed his thought as:

> *It is easy to use student-centred learning in a class of around 20-25 students but is challenging to apply in large classes. Most of the students get afraid of teachers and can't ask any questions as compared to other subject teachers. So, the students who are good in mathematics create interaction with mathematics teachers in and outside the class. (Interview transcription, February 1, 2022)*

From the above interview with the participants, we can conclude that it is difficult to apply student-centred learning because class sizes are large, teachers have to finish the course in the required time, and students hesitate to interact with teachers. But students

learn properly from interaction. Constructivism builds, produces, and invents to generate new knowledge. (Vygotsky, 1962) So, to involve all the students in learning, we need to apply student-centred learning, which successfully implements inclusive education.

In the next phase, after getting an interview at the same time, I got their permission to enter one of the mathematics teacher's classes. I walked with him to grade 7. In that class, he was teaching "Indices" He had prepared five rules of indexing on chart paper and gave simple examples of each rule. Most of the students participated in the learning, but some kept quiet. He asked, "Did you understand?" Some of the students did not answer. Following that, he clarified the preceding rules by applying them to both variables and constants. In that class, most of the students participated in learning.

From the above observation, I have concluded that teachers mostly use teacher-centred learning and give less importance to student-centred learning. Teachers first teach the students using different methods and then ask the students whether they understand or not. In that situation, only teachers involve students. Habermas (1984) used communicative rationality, where students could put different ideas under any particular subject and get results. As a result, student-centred learning should be preferred over teacher-centred learning when implementing inclusive mathematics education.

At last, for FGD, I called ten students (from different ethnic backgrounds) into one class. I asked them which learning method (teacher-centred or student-centred) is used by your mathematics teacher in the classroom. They shared their views as our mathematics teacher mostly uses teacher-centred learning and sometimes involves all of us in learning, especially in project work. He always rushes to finish the course. Students who are good in mathematics can understand, but the rest of the class ignores the problems and copies from talented students when submitting homework. Weak students

hesitate to interact with teachers and don't ask any questions at all. In my perspective, in schools, partially student-centred learning is used and mostly teacher-centred learning is dominant over student-centred learning. If we can employ student-centred learning, all the problems of the students will be addressed, and we can create an inclusive environment in class. Student-centred learning approaches result in improved outcomes and increased student satisfaction (Kemm & Dantas, 2007).

Multiple Use of Teaching Materials

According to Ajayi (2007), textbooks and instructional materials influence the teaching and learning process. These support teachers in meeting the objectives of a class (Oppong Frimpong, 2017). Furthermore, it promotes a thorough knowledge of the principles. A mathematics teacher uses different teaching aids in order to establish long lasting learning in students. Teachers nowadays use a variety of learning materials in addition to markers and white boards. Proper use of teaching materials should be developed by teachers, which makes the classroom interactive. All the learners are motivated to learn, which ultimately supports inclusive education. In this context, one of my participants, T_1, stated the following:

> *Sometimes I use traditional methods of teaching in the classroom. But mostly I use technology-based learning methods to teach mathematics where students enjoy learning. Variability of learning techniques is used in learning. As our curriculum in compulsory mathematics is changed where students get 50 marks from external examination and 50 marks for internal examination. On the basis of project work, attendance, classroom activities, homework internal examination is taken and there are three terminal external examinations. (Interview transcription, January 14, 2022)*

Another participant (T_2) shared his experiences as:

> *I wanted to use technology-based learning instead of using a traditional method of teaching in the classroom. For this various teaching methods with appropriate materials according to the contents are used. As I have to finish the course in time, I could not take them into field visits. Like for teaching Simple Interest, Mensuration, Unitary method etc. (Interview transcription, January 25, 2022)*

Another participant (T_3) discussed her views as:

> *I mostly use traditional learning instead of using technology-based learning. There are many students in class and as I need to finish the course in time, I cannot apply teaching materials in the class. I am totally focused on books and white-board. There is no proper place to place prepared material in school. (Interview transcription, February 1, 2022)*

Also, another participant (T_4) discussed his ideas as:

> *I use different models of teaching but it is difficult to apply in every classroom as we have to finish the course in time and there is a lack of teaching materials also. We have to buy materials ourselves as the school administration cannot help us. Most often I use chart paper and the available materials in the classroom. (Interview transcription, February 1, 2022)*

One headteacher H_1 shared his experiences as:

> *We have sent teachers for different training sessions. They prepare their teaching materials before the new session and in their leisure period. We motivated them to use local materials but could not buy expensive materials. Furthermore, there is no mathematics room which can safeguard their teaching materials. So, this year's materials may not be found next year. (Interview transcription, February 1, 2022)*

Another headteacher H_2 expressed as:

> *Teachers collectively make mathematics teaching materials and we preserve them in one separate cupboard. Also, student project works are hung on the mathematics board monthly. All the teachers are motivated to use proper teaching materials according to the necessity of the content. (Interview transcription, February 4, 2022)*

From the above interview, it can be seen that teachers were trying to use different materials and models for teaching the contents. But due to course targets, a lack of materials in school, and no support from the school administration, teachers were not motivated to use teaching materials. There was another problem in school where teachers could not find a place to keep the prepared materials. Teachers should understand their students' cultures and local materials and incorporate them into classroom activities. (D'Ambrosio, 2001) Use of local materials in the classroom and understanding students' cultures help ensure successful learning.

In the next step, I carried out observations on the targeted schools. For this, I got an appointment from the targeted schools. I carried a diary, pen, and mobile for the visit, along with other necessary materials. I reached the first school on February 1, 2022, at 10 a.m., where all the teachers had already entered the classes. After a short conversation with the headteacher, he told me that there was no separate room to keep the mathematics materials. In the office itself, there was a mathematics box along with a geo-board and other different geometrical shapes. I got it from the headteacher to meet the mathematics teacher. I met him, whom I have already interviewed. We talked together, and he invited me to grade 6. We went together to that grade, where students greeted us with "Good Afternoon." We both told the students to sit down, and they thanked us. Then he started to teach, and I sat on one bench. The teacher started

teaching "fraction." He took a sheet of paper from a student, folded it into different parts, and asked the students about its parts. After that, he made two like fractions and showed their addition to students in the following way:

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It, in the first fraction means that the area of the shaded part is $\frac{2}{8}$ and that of another part is $\frac{3}{8}$ whose addition is $\frac{5}{8}$. He used the waste paper of class to give the concept of addition of like fraction. The students were interested in learning. After that he assigned some problems from the book to the students. Then, I asked the teacher after the classes whether he used materials in every subject or not. He replied that he tried his best but could not use teaching aids for every content.

Next, I visited another school. After getting permission from the headteacher and mathematics teacher I went with her. She was teaching the Unitary Method. At first, she asked what the cost of one pen was, and they replied it was Rs 65. She again asked what the price of 5 such pens were. They replied Rs 325 that was the correct answer. After that she drew a

relation showing smaller into bigger units by multiplying and bigger changed into smaller units with division.

She clarified the concept of direct proportion and indirect proportion with different examples. At last, she asked the students to write five direct and indirect proportions for each with examples.

After carrying out observations in two schools, I had found that there was no separate room for mathematics materials. Materials were placed in the corner of the office room. Teachers used the available materials in the classroom. They occasionally carried materials.

In the next step, I conducted FGD with ten students from different backgrounds. I asked them how often their mathematics teachers used materials in the classroom. One student replied that, especially while teaching contraction, the teacher used teaching materials but not in other topics. Another student replied that the teacher used the materials available in the classroom. Another student replied to me for project work. Only the teacher used materials but not in every class. They conveyed to me that they could understand mathematics easily if materials, based on their culture, were used in the classroom. Students understand any topic when it is based on their own real life (Orey, 2000).

Collaborative Learning

In my own perspective, if one carries out the work it takes time to complete but if many people are involved in the same work, it takes less time. Likewise, collaboration is also essential in mathematics learning. Collaboration beautifies learning. Learners have the opportunity to interact with others, propose and defend ideas, share varied perspectives, challenge other conceptual frameworks, and are actively engaged in collaborative learning (Srinivas, H., 2011). Students work together to solve problems whereas they can use their creative power. It shifts from teacher-centred learning to student-centred learning. In

collaborative learning there is harmonious intersection between teacher and student and students with students. Teachers use different techniques and set definite rules in collaborative learning which makes mathematics inclusive. As the basis of collaborative learning one of the participants T_1 shared views as:

> *A class is a heterogeneous mixture of students of different ethnic groups. Their culture is also reflected in mathematics learning. In the same bench students of different categories sit together where one leader is selected in every bench. For collecting homework everyday different students are selected. In the classroom group work is given to them. The students who are weak can easily ask their friends. (Interview transcription Feb 2, 2022)*

Similarly, another participant T_2 expressed:

> *A classroom is a small society where students of different classes read together. There is rotation of students in between the benches. While doing board-test all the students are given equal chance with more performance for weak students. Weekly project work is given to the students and they present it in different groups. There is a harmonious environment for students. (Interview transcription Jan2, 2022).*

Another participant T_3 discussed:

> *As our curriculum is totally changed, from one to three integrated curricula has been introduced and from four to seven 50 marks has been allocated for the continuous assessment system and 50 marks for the external examination system. The internal 50 marks is given to the students in different categories like attendance, classroom-participation, homework, project work, and their cooperative behaviours. (Interview transcription Jan 2, 2022)*

Another participant T_4 shared views as*:*

> *In mathematics class weekly mathematics project work is given to the students in a group which is related to the recently taught chapter. The students who can't solve the problems easily are helped by the students who can solve them. There is a rotation of the students daily. Those students who have problems with sightedness sit in the first bench. Each student gets help from their friends. (Interview transcription Jan 2,2022)*

One headteacher H_1 expressed his thoughts as:

> *Our school is a community school where most of the students have a very weak financial background. So, they do not have learning materials like books, exercise books, etc. For some students we can manage but we can't afford all the students' expenses. So, parents should provide materials to their children. All the teachers, along with the school administration, are helping for quality education to students. (Interview transcription Jan 22, 2022)*

Another headteacher H_2 shared views as:

> *School is a small society where students of different classes read together. In every class, in each bench, one leader is there whose job is to make his bench partners better than the others. The best bench will be rewarded every month. As most students get lower marks in mathematics, there is a cooperative feeling developed in students so that talented students teach weak students. (Interview transcription Jan 22, 2022)*

It was found that talented students helped weak ones. Teachers made groups from different heterogeneous students and leaders were also selected. Moreover, the bench leader also targeted to make their bench as the best bench. Students learnt properly from

the interaction collaboratively. (Vygotsky, 1962) knowledge should be shared so that we can get good results.

In the next phase on the same date January 22, 2022, I got permission from the headteacher and the mathematics teacher and we visited grade 8 where he was teaching construction of rectangles. All the students were prepared with a geometry box along with a plain sheet of paper. At first the teacher clarified the properties of the rectangle as two opposite sides are equal and each angle is 90^0. Then he said they were going to draw a rectangle where AB=5 cm and BC=4 cm.

He told all the students to draw a straight line and then cut a 5 cm segment from that line. After that step he went to each student's side whether they had finished the above instruction or not. After that the intersection line segment was named as A and B. In the next step he drew an angle of 90^0 at vertex A and vertex B. Again, the teacher visited each student to see whether they had done it correctly or not and helped in their difficulties. Moreover, their friends also taught students who couldn't draw. In the next step, he told them to join a line from vertex A to 90^0 and vertex B to 90^0, along vertex A and vertex B onward intersecting 4 cm and to join the four vertices. The teacher observed all the student’s construction and guided them in their difficulty. So, in that class there was collaboration among students.

From the above classroom observation all the students at first got basic concepts from the teacher. Talented students could solve problems properly and share their knowledge with friends so that all the students could solve the problems. We need to transform students into new learning. (Mezirow, 1978) to transform into new learning we need to apply collaborative learning.

At last, FGD was carried out among ten students from different backgrounds. The following conservation was carried out with the students:

Participant: How do you get helped and help your friends?

Student A: We help each other in different ways.

Participant: How are you helped in mathematics learning?

Student B: We first try to solve problems by ourselves and ask the talented students if we have difficulty. In project work also we work together.

From the above FGD, we can conclude that there is collaborative learning. Teachers should also monitor and regulate the students' interactions (Lai, 2011). Active learning promotes engaged learning and critical thinking skills (Giles, 2009). Teachers play an important role in putting collaborative learning ideas and support into practice (Van Leeuwen and Janssen, 2019). Thus, a teacher is a role model who guides the students for better learning and students also help their friends.

Motivation in Classroom

In learning a teacher uses different tools and among them motivation is one because it energises students for effective learning. Motivation is a condition that energises activity (Ryan & Deci, 2020). Motivation awakens learners for learning. It evokes the learner physically, emotionally for learning. Motivation is a state of cognitive and emotional arousal that leads to action and provides the means to achieve previously established goals (William and Burden, 1997). A teacher should inspire in students the belief that "if they can do it, I can do it" (Schunk, 1995). "Lazy students are unmotivated to learn." (Hardre et al., 2008). One of my participants T_1 had shared his view as:

> *I frequently use motivation and reinforcement in mathematics learning which ultimately makes the classroom interactive. According to the condition we use*

different types of motivation like Clapping, thanking students, giving prizes, etc. Sometimes, we use examples of different students in the classroom who at first were not good in mathematics but due to regular practice the student got a good score in mathematics. (Interview transcription Feb2, 2022)

Similar views were expressed by T_2:

Motivation and reinforcement are very important in mathematics learning. It evokes students for learning. It reduces anxiety in students. If students make a mistake, then correct their mistakes without scolding them. Different tests like unit tests, monthly tests are given and students who get good marks are rewarded. Sometimes, students become sick, so I explained that topic in an extra period. (Interview transcription Jan 22, 2022)

Another participant T_3 shared his views:

Motivation enforces students for better learning. Sometimes I use punishment also. For those students who irregularly do homework, don't pay attention in class, at first, I console him. If he repeatedly does the same activities then I do call their parents. After that, most students' habits have changed a bit. Finally, I tell him about the advantages of studying. (Interview transcription Feb 15, 2022)

Another participant T_4 expressed:

Nowadays most of the students are habituated with playing mobile, so they are found irregular in studies. Most of the students' study in class and finish homework at school only. They totally depend upon school and teachers. So, I monthly call parents for meetings and inform them about their progress. Regularly I take tests and reward the highest score students. All the students are encouraged. (Interview transcription Feb15, 2022)

One of the headteacher H_1 shared his views:

> *Most of the students of my school are from different districts of Nepal. They live on rent and there is a major problem of migration. We have to take admission at any time. Most of their parents are uneducated and work from early morning to late night. They visit school only on result day and school's special programmes. Parents think the school should provide extra classes for their children, so we are managing extra classes from 6-10 in the morning with extra teachers. There are 2 periods daily: Science, Mathematics and English. (Interview transcription March 5, 2022)*

Another headteacher H_2 also expressed:

> *Apart from traditional concepts of teaching we need regular motivation in the classroom which energises students in the active learning process. Our job is not only for teaching, it is for learning. For this we need to apply new motivational tools in learning. (Interview transcription March 5, 2022)*

From the above interviews, we can conclude that a teacher uses different motivational tools. Students have different difficulties in learning from their family background to health hazards. Teachers console students in learning. The process of learning in all the students is different based on their developmental stage (Evgeniou & Loizou, 2012).

Early in the morning I woke up, washed my face. Yesterday I fixed my meeting with a mathematics teacher, so I prepared all the materials in my bag. Then at eight o'clock I ate food and left my room at 8.15 a.m. I took the bus at Sita petrol pump and at 9.30 a.m. I reached Thimi. After a 20 minutes' walk from Thimi I reached the targeted school. When I reached there all the teachers were in the office room. I introduced myself

to them with the purpose. After that, the headteacher introduced me to the mathematics teacher of his school. He had leisure in the first period and was busy checking students' assignments. His second period was in the fifth grade. We went to that class. In that class he had already started and defined the types of angles in the previous classes. He at first asked the definition of acute angle to the first bench student. After the student's reply, he again asked the other students the definition of obtuse angle, right angle, straight angle, reflex angle. The same questions were asked to all the 30 students in the class. 22 students answered correctly. The students, who had answered right, were clapped by their friends. At last, he instructed them to write about different types of angles in their exercise books. The students who first submitted the answers were rewarded with chocolate. Thus, there was a constructive teaching learning environment in the class.

From this observation it was found that teachers motivated students for their learning by providing extra time in tiffin period and leisure period. He used polite language in the classroom while teaching. He checked the homework and classwork of all the students, and offered prizes to good students in mathematics. Students learn properly when they are properly guided and we need to use the 'Zone of Proximal Development Theory in Learning' (Vygotsky, 1978).

FGD was carried out with ten students from different ethnic backgrounds. I took all the students to the office room after school. I asked them 'Are you motivated by your mathematics teacher to learn mathematics?' One of the students shared that he used polite language, checked homework and class work and rewarded the students who did well in the classroom. A teacher should inspire the students to believe that "if they can do it, I can do it" (Schunk, 1995). He encouraged them to learn better. Thus, motivation energises students for learning.

Chapter Summary

My first objective was ‘To explore the teachers’ experiences and students’ in practices of inclusive mathematics education.’ For this I interviewed four mathematics teachers and two headteachers, and observed four mathematics classes of the interviewed teachers. I conducted a focus group discussion including ten participant students from different ethnic backgrounds. I transcribed data and developed different themes which were ‘engagement of students in mathematics classroom, teacher-centred teaching method, multiple uses of teaching materials, collaborative learning and motivation in classroom’. Teachers used problem solving methods, project work and interactive models. Teachers also used their students for teaching for the whole class. Most of the classroom was more teacher-centred than student-centred. Teachers used local materials and other technological materials in the classroom. In learning, collaborative learning was widely used in the classroom. Moreover, teachers used motivation for students’ effective learning.

Chapter V

OBSTACLES OF INCLUSIVE EDUCATION IN MATHEMATICS CLASSROOM

In this chapter I have appended various obstacles that were found in inclusive mathematics classrooms. So, for this purpose, I had interviewed four mathematics teachers and two head teachers based on the second objective on obstacles of inclusive mathematics education. In the next step, I observed selected participants in class and I asked questions to those selected students from different backgrounds. I recorded information on my mobile through in -depth interviews, participants' observation and focus group discussion techniques. After that I listened to interview record repeatedly and transcribed to generate the following themes:

Discrimination among Students

Students in school come from ethnic backgrounds. According to Stromquist (2007), "boys continue to dominate classroom time and space, a practice that appears to create understated girls and naturalise gender differences." Boys dominate girls in the classroom. Students from high socio-economic and cultural backgrounds also dominate students from poor socio-economic and cultural ones. Students who experience discrimination from their peers (and teachers) have a lower sense of connection to others at school (Byrd and Chavous 2011; Hurtado and Carter 1997). Traditional Nepalese gender concept/construct prioritises male education while relegating women to housework (Central Bureau of Statistics, Nepal, 2003). One of the participants T_1 expressed:

> *In any mathematics class only, less students pass. The Failure rate of girls is more as compared to boys. The students who are good at mathematics ask*

questions regularly but others sit in the class as ideal. We give answers to the students who ask questions. (Interview transcription Feb5, 2022)

Another participant T_2 shared:

In my classroom only talented students ask me questions and I solve them. If I ask other students, they say they cannot. They have anxiety from mathematics. If I explain to them, they try at once but after that leave. Students from weak economic backgrounds have very less interest in mathematics. There is a rotation of students in class so that all the students get equal opportunity to sit in all the benches. (Interview transcription Feb 15, 2022)

Other two teachers also shared similar experiences. The principals also said that there were no biases to any students regarding teaching learning activities. They had given more time for and focused on students who were poor in mathematics. Moreover, students from poor economic backgrounds get scholarships. Parents could change their belief that their son and daughter are equal for education. Parents, students, teachers and school management should work in a team to provide quality education to children then we can transform in new learning (Mezirow, 1978).

On February 4, I prepared my notebook, pen, mobile and other materials in my bag. On February 5, I woke up at 5.00 a.m., washed my face, worshipped, cooked and ate food. I dressed and phoned the participant mathematics teacher and he suggested that I visit his school for both interview and observation. After that, I checked out from my room to get a bus to Bhaktapur. There was an assembly when I reached the school after one hour. I took part in that assembly and met the mathematics teacher. He had first period leisure and I interviewed about 30- 40 minutes during this time in the school ground. In the second I observed his grade 6 mathematics teaching. He was teaching the

calculation procedures to find the perimeter of a rectangle. He wrote its formula as P=2(l +b) where l=length and b=breadth of rectangle. He solved two related problems using two lengths and breadths separately. After that he assigned five other problems to calculate the perimeter of the rectangle. Then the students solved the problems. One girl finished the problems and he checked and encouraged her to solve other similar problems to previous ones. The teacher approached all students in the class through due observation on problem solving and would guide them to solve if they had any difficulties. Students also helped their friends. There was a fair environment in the classroom. Students were ready to transform into new knowledge (Mezirow, 1978).

In the next step, I carried out FGD with students in grade 8 after school. I asked them, "Is there any type of discrimination carried out by your mathematics teachers? They told me that the mathematics teacher answered the questions of the talented students only. He went to their side if they asked the teacher repeatedly for more than three times. If they asked questions, he would tell them to ask later on. Backbench students get always scolded by him. Teachers' major duty is facilitating all the students equally irrespective of their background in their learning. We should manage extra time for the students who are weak in mathematics. Nepalese policymakers should open their eyes to improve education quality so that parents believe in community schools and send their children to them (Khanal, 2018).

Completion for Course

Time is planned specifically for various subjects. There is an academic calendar from Baishak to Chaitra in almost all schools. There are three to four terminal examinations in an academic year. There is a necessity of a clear distinction between

what is important and what urgent is for effective time management (MacKenzie, 1990). In this regard, one of the participants T_1 shared his ideas:

> *Classes 1 to 5 run from 10 to 4.10 with 40 minutes for each period. Classes 6-7 run from 10.00 to 4.45 and classes 8-10 run from 10 to 4.45 along with morning classes from 7 to 9.30. There are two periods for Mathematics, English and Science from Class 8-10. There is a course syllabus which we need to finish before each terminal. Students get admission at any time and no entrance exam is given for them. Books are not available in time. (Interview transcription March 6, 2022)*

Another participant T_2 expressed as:

> *There are heterogeneous students in class. There is a course target which we need to finish in the required time. We don't get the books in time. There are strikes also. In one-two days we have to finish one lesson. We are always in a rush to finish the course. Students who are talented solve problems and finish in the required time but other students do not finish. (Interview transcription March 6, 2022)*

Another participant T_3 shared as:

> *There are four terminal exams in a year. After each three months we have to finish the targeted course. We are in a hurry to finish the course in the allocated time. We are not able to help the students who are weak in mathematics. We cannot get books on time. Our target is to finish the course only. (Interview transcription March 9, 2022)*

Another participant T_4 expressed:

> *Most School admission starts from Baishakh -5 but we get books at the end of Jestha. School Administration gets students admission in irregular time sometimes at the end of Chaitra also. They don't take entrance exams. There is an exam committee organised by the Municipality where there is a course target which we have to meet. We need to finish the course in the required time, so our main focus is to finish the course only. We have to separate time for project work and time to check their works. We cannot give extra time for the students who are weak in mathematics. (Interview transcription March 9,2022)*

One of the headteacher H_1 shared:

> *Exams are conducted from Municipality where definite course syllabus is organised. For different classes we also need to prepare questions which change in every terminal. There is a diary given to each student and the class-teacher checks them regularly. Furthermore, there is a lesson plan prepared by all the subject teachers and they have to prepare materials too. So, the teacher gets less time for finishing the course. (Interview transcription March 9, 2022)*

Another headteacher H_2 shared:

> *School session starts from Baishak and ends in Chaitra. Due to different incidents, there are holidays (Strikes, natural disasters, different diseases). In spite of all these things, we have to meet the required syllabus in time. So, extra time is separated for Mathematics, English and Science. There is a separate committee organised by the Municipality for conducting exams. Furthermore, we don't get books in time and students who are economically weak don't bring books*

after months also. So, it is very challenging to finish the course. (Interview transcription March 10, 2022)

After the interviews with four mathematics teachers and two headmasters, I noticed that they admit students anytime even at the end of the school session without due processes like placement entrance. Due to unpredicted happenings like disasters and others the teachers do not get sufficient time to complete the course. Since they are always in a rush to complete the course, they cannot practise the student-centred approach of the curriculum. Moreover, students' diaries checking, homework checking, extra class in leisure time, and lesson planning make teachers busy instead of focusing on the course. They do not get sufficient time to test each student's in-depth learning achievement. We need to discuss the emerging issues in school among its stakeholders to overcome them so that we could manage time to complete the course in a given time (Habermas, 1984).

To get detailed information about time management, I planned to revisit the previous school. So, I prepared with the required materials in my bag and checked out from the room. Immediately after I reached the school, I had a short talk with the Assistant-headteacher as the headteacher was not available. I asked him how he had been teaching in each terminal. He replied that they have a syllabus from grade 1- 10 prepared by the Municipality. Schools have offered some additional courses like English-II, Mathematics II neglecting the course weightage designated by national curriculum for the courses in the national syllabus. All teachers got the syllabus and directed to complete the course in the given time framework. Government supplies only predetermined sets of books off time e.g., in June/July instead of March/ April the session initial time. So, neither does it help the teachers to complete the course in a given time nor do late comer

students get textbooks to continue their study. They cannot stop the late comer students' admission. Then I asked the Assistant-headteacher whether all the teachers were able to complete the course in time. He replied they completed the course most of the time, but if they could not finish, the subject teacher adjusted the questions during examination. I requested the vice-principal for permission to visit the mathematics class and visited grade 7. In that class, the mathematics teacher was teaching 'Indices'. It was the last chapter for the first terminal examination. Only three days were left to complete the course. So, the teacher was under pressure to complete the course. He was teaching only important questions from the chapter with general concepts. He was focusing only on important questions.

The teacher directly or indirectly was in a rush to complete the course. It was difficult for both talented and weak students because they did not get sufficient time to comprehend the problem in detail. Admission at any time, placing students in any grade without evaluation, and not supplying prescribed textbooks on time are the main hindrances in school. We need to avoid the above hindrances to change our school reality (Horkheimer, 1993).

At last, I conducted FGD with students. Every subject teacher is provided with a syllabus after every terminal examination. At first, they teach the chapters slowly but closer to the examination, they rush to complete the specified chapters. The students could not catch chapters in a rush. So, a teacher needs to follow the time framework properly and try to complete the given chapters in the given time framework.

Lack of Use of Teaching Materials

We should develop teaching materials in accordance with the student's needs and concept of the chapters (Brown, 1995). It is difficult to select teaching materials in the classroom. According to Brown (1995), materials can be defined as any systematic description of the techniques and exercises to be used in classroom teaching. Appropriate use of teaching materials makes learning stable in learners. In this regard, one of the participants T_1 discussed his ideas:

> *I use different teaching materials from local materials to different mathematical apps. In small classes I prefer to use concrete materials along with different mathematical rhymes. In my school, in every classroom there is a separate corner for mathematics where we prepare materials after the end of the session and paste in that corner. There is a mathematics notice board where students paste mathematics related news, IQ, and materials monthly. After Covid period we all are familiar with ICT, so now we are teaching in class through smart-boards. (Interview transcription Feb 15, 2022)*

Another participant T_2 shared his experiences:

> *In school there are a geo-board and a geometry box. I have collected bottle lids in one bottle. Those lids are used for the operation of numbers. I have prepared teaching materials but due to lack of a separate place those materials are misplaced. Due to that I cannot use those materials again. There is only one computer in school which is used for administrative purposes. We rarely get a chance to print mathematics materials. (Interview transcription Feb 15, 2022)*

In this regard another participant T_3 discussed:

> *I have six classes daily and mostly I have to take a proxy class because of other teachers' absence. There is only a leisure period and it is impossible to make materials in that period and I have to check their works too. I have to buy chart paper myself as there is no financial support from school administration. (Interview transcription Feb 22, 2022)*

Similarly, another participant T_4 expressed:

> *I involve students in making materials. Like making cubes, cuboids, cones, cylinders, pyramid. The best materials are hung in the class. For making materials students bring all needed materials themselves. There is no separate room for keeping materials. To protect chart-paper materials I laminate it with plastic paper and put it in my rack. Sometimes I use teaching materials. (Interview transcription Feb 22, 2022)*

One of the headteacher (H_1) shared his experiences:

> *There are 2 ECD teachers, 6 primary teachers, 3 lower secondary teachers with four secondary teachers. We are running from ECD to ten classes. Each teacher has to teach six periods daily. Teachers have two leisure periods and most of them have to take seven periods as teachers become absent. In one period teachers cannot manage new materials, so they use the prepared materials in the class. There is no extra room for placing mathematical materials. So, there is more of a chance of losing the materials. Teachers make materials after the end of the session for the next session. (Interview transcription Feb 22, 2022)*

Another headteacher (H_2) shared her experiences:

> *The necessary mathematics materials are constructed by teachers after the end of the session. Chart-paper written materials are laminated from plastic and are placed in every class. In every class there is a separate corner for separate subjects. All of those materials are revised yearly. Moreover, students also do project work. We easily provide materials to mathematics teachers whatever they demand. (Interview transcription Feb 26, 2022)*

According to the requirement of time, use of materials in the classroom has been shifted from traditional and local materials to ICT equipped materials. From the above participants' sharing, we can see that some schools are able to use proper materials in the classroom and update the materials but some others are still using the traditional materials like books and markers. We need to update the materials and equip the classroom with the recent teaching materials. We need to transform mathematics classrooms for new learning (Mezirow, 1978).

For the observation, I planned to visit two schools in Bhaktapur district. With the help of my friends, I found two schools in Bhaktapur using proper teaching materials. Other schools rarely use teaching materials. At first, I visited an ICT equipped school. The resource centre school which is located in Dadhikot , Bhaktapur. The atmosphere of that school was very tidy. At first, I entered the office room and asked the other teacher about the head teacher. They told me that he would come after an hour. He asked me about my purpose of visiting that school. So, I clarified my purpose and asked him where the mathematics teacher was. Then he introduced me to the mathematics teacher. I asked him whether he was using materials or not. He replied, after COVID period, all the

classrooms have Smart-boards. He has a laptop. Sometimes he would not be able to prepare the slides, and would use words and smart-boards based on the contents. Along with a smart-board, there is a mathematics laboratory inside the school where all the mathematics teachers store all the materials. From that room, depending upon the content, he would carry the required materials and tell the students to prepare materials as well. After a conversation with the mathematics teacher, the headteacher arrived. The mathematics teacher briefed the principal about my purpose of visiting that school. After five minutes I was called into the principal's office. We talked together about how mathematics teachers are conducting classes based on using materials. He replied the same answer as the mathematics teacher did. Then after that, the headteacher along with the mathematics teacher introduced me to each class. All the classes were furnished with teaching materials. Corner-wise all subject materials were pasted on the wall. The materials were laminated with plastic. Other mathematics teaching materials were placed in the mathematics laboratory. I found that all the teachers use PowerPoint in laptops. There was a smart-board in every class. Moreover, the headmaster showed me a mathematics notice board which was updated monthly. In the next step, I visited the next school which is nearby. I introduced myself with the purpose to the headteacher. We had a long talk of around half an hour. He told me how he had given duties to all the teachers. The school fund did not come from outside. School has been run from students' exams and admission fees. He had to pay the salary of two teachers. Government had not given enough quotas for teachers. There was no separate room for the principal and teachers. So, mathematics teachers used the local materials and chart-paper in the classroom. They could not afford expensive materials for teachers. When I visited the classroom, there

were very few materials hung on the walls. There was a whiteboard where teachers taught using traditional markers.

Based on data from the above observation in two schools, I found that most of the community schools targeted for using materials in the classroom. Financially sound community schools were shifted from traditional to ICT equipped materials whereas financially weak public schools were found to use local materials, chart-paper, board with book. To provide quality education to students according to time and students' needs, we need to transform into a new learning environment (Mezirow, 1997).

At last, I conducted FGD among the ten participants from different ethical backgrounds. I discussed how often their mathematics teachers use teaching materials in the classroom. One of the students delivered his thought or experience as: sometimes the teacher used teaching materials especially while constructing rectangles, square, parallelogram but not in all chapters. Most of the time they taught one particular chapter, solved some problems on white-board and told us to finish that exercise at home.

Lack of Training Opportunity and Under -Qualified Teachers

The materials used in the classroom should be relevant to learners' level and subject matters. We can use materials easily available in the classroom and related to student's life problems. In my perception a teacher should not only use materials but also use his whole-body movement (hands, heads, eyes, voice) to deliver the content to students by which he can develop different skills in learners. According to Allwright (1990), "materials should teach students for learning along with providing ideas and activities for learning." A school should send teachers for training. We can get different updates from different types of training. Subedi (2015) discovered that teacher education

had contributed to improve teacher-student relationships in which students were more actively engaged in learning. In this regard, one of the participants T_1 expressed his ideas:

> *Training is given from different agents. As the community school up to secondary is handed over to Local government, most of the training is conducted by them. Principals do not send teachers on teaching days. They want the training only during the holiday period but teachers don't want to go during the holiday period. So, there is less coordination between the principals with the training agencies. Also, the qualification of teachers from basic to secondary level should be revised. A trained teacher delivers things properly by understanding all students's needs and interests. (Interview transcription Feb 22, 2022)*

Another participant T_2 opined similar concept:

> Teachers *need in-service training for professional development. There is TPD training which we need to do. After doing three TPD training we can get a certificate which is used for our promotion. Principal does not send all the teachers for TPD training. Principal thinks if we send teachers for a week in training there will be disturbance in class. In our school the tenth pass teacher is the principal and how can he lead the school? (Interview transcription March 5, 2022)*

Another participant T_3 shared his views:

> *Curriculum of the school is revised and changed regularly. To get knowledge of the curriculum and its evaluation tools we need orientation training. In that training unrelated teachers are sent for training. There is a package in training period and the trainer's job is to finish the targeted course. They can't address the*

problem faced by the teachers in their teaching-learning activities. (Interview transcription March 5, 2022)

Another participant T_4 shared:

Training is required for all the teachers whether they have got qualification from the education field. They need pedagogical knowledge also. If we polish our shoes, it makes us smart like that training makes us smart in teaching-learning activities. If our one pattern of teaching doesn't give good results then a teacher needs to change another model of teaching. Teacher's job is very crucial. A good teacher delivers good knowledge to students. I need this type of training which is centred on my daily life problems. (Interview transcription March 5, 2022)

The headteacher H_1 shared his experiences:

There are less teachers in school and due to different reasons teachers become absent in school. It is difficult to send teachers for training for seven long days. There is a course we have to finish before the terminal. It is okay if the training is organised before school hours or in holiday periods. (Interview transcription March 5, 2022)

Another headteacher H_2 expressed:

Training is very important for teachers. Training should be need-based. With time new training should be given to teachers. As we know in Covid period we needed ICT training, so different agencies organised the training. Those training helped teachers to conduct classes in online mode. We are happy to send teachers in

different types of training. We send them and the teachers deliver his experience of training to the rest of the teachers. (Interview transcription March 5, 2022)

The interviews with four mathematics teachers and two headmasters indicated that teachers are hardly given opportunity for training. Headteachers could not send teachers due to insufficient teachers to substitute class in school. If schools send their teachers in training, the trained teachers share their learning with other teachers in school. So, training enables a teacher to add or update new knowledge and apply new methods and techniques in teaching (Vygotsky, 1978).

For the observation, I prepared all the required materials and visited the school at Bhaktapur which I had already visited once. After I got into the school, I entered the office and went to the headteacher and teachers as well in the same room. While we were talking, one primary teacher recently came from integrated curriculum training and shared his experiences:

We have to teach Mathematics based on themes given in each chapter and evaluation should be made accordingly. After fulfilling an objective one theme we can move into another theme. That school did not have any external examination; however, an integrated curriculum was implemented up to class 3. In the last period, the headmaster instructed the focal teacher to share his knowledge with other teachers teaching in class 1 to 3 individually one by one. He shared his knowledge including its evaluation tools to his colleagues. Thus, to enhance our teaching as a profession, we need different training. In the next phase, I visited a school which is nearby from the previous one. I reached there after half an hour from the previous school. I came to know that one secondary school teacher who was selected for ten days training was filling up the TPD

online form. He shared that information with the principal but the principal expressed: How can I send you for a ten days training? Students' first term is coming near and many students get low marks in exams. Why don't you tell the organiser to organise the training in summer and winter vacation? There are no other teachers who can teach your subject. After that the teacher cancelled the training. I felt really bad for the teacher.

In my perception, the Government has set qualification for primary teachers as Intermediate, for lower-secondary teachers is Intermediate level and Secondary teachers' qualification is bachelor level with one-year training for each level. There are only two levels in schools which are basic and secondary level. If we observe in school, Intermediate graduates have to teach the secondary level students which is not a sufficient qualification. So, qualifications for the teachers need to be revised and they should be sent in training so that they can reflect the knowledge of training in real classroom practices. Also, if we observe in most of the government schools, in some schools the qualification of the headteacher is just tenth pass and they obviously find it difficult to run and lead quality schools. The people who are involved in the education sector need to change the present status of community schools (Mezirow, 1997).

Irregularity, Migration and Drop out

According to Skar and Cederroth (1997), children in rural areas drop out after two to three years of school. In the community schools, mostly students in community schools are from working class people who live in tent rent. There are fewer local children in community schools and others are sent to nearby private schools. According to Sebaly (1988), children start school late because they must work both at home and in the fields. Similarly, one participant T_1 expressed:

> *Students become absent in class due to different reasons like sickness, going to maternal uncle's house, birthday parties, going to fields, different other rituals, etc. It is found that after a big occasion like Teej, Mother's Day, Father's Day, and Jatra students do not come to school. Also, when there are disputes among parents also, they do not come to school. Moreover, students who have not finished homework also do not come to school. (Interview transcription March 5, 2022)*

Another participant T_2 shared:

> *The students who read well, who are obedient come to school regularly but the students who don't do homework regularly become absent in class. Most of them have bigger issues at their house also. Parents don't send books along with educational materials. Sometimes, they come to school with a hungry stomach. Parents don't have time to look after their children's activities. They send their children for time-pass only. (Interview transcription March 5, 2022)*

In this regard another participant T_3 delivered his views as:

> *Students are more involved in extra-activities apart from studies, so they become absent in regular classes. Also, they are involved in income-generating activities. Students who are good in studies come to school even if they become sick. On the contrary, students who are lazy in studies search for numerous reasons to be absent in school. (Interview transcription March 6,2022)*

In this support another participant T_4 expressed her views as:

> *Most of the students stay on rent. They regularly change their places in search of food, clothes and shelter. Without completing the session students move into another school. Regular movement of school hampers their studies. It is very difficult for students to adjust in a new environment with new friends and teachers. (Interview transcription March 6,2022)*

One of the headteacher H_1 shared his views as:

> *Local students finish their classes from our school from ECD to class ten but on the contrary students who stay on rent, read for a few years. Also, students have many home issues, they cannot get a favourable learning environment and more likely they have a greater chance to drop out from school. Some girls leave school due to early marriage. (Interview transcription March 6, 2022)*

On this support other headteacher H_2 discussed me that:

> *When students reach the fifth class opposite sexes are found more attractive. If we place girls and boys together in one bench, their negative activities start and they cannot focus on studies. So, from five to ten classes we put girls and boys separately. Their home environment also disturbs learning. (Interview transcription March 7, 2022)*

From the interview of four mathematics and two headteachers, students are absent on different occasions, parents send their children for time-passes, most students come to valley government schools and stay on rent and they cannot complete their secondary level education in the same school and they migrate from one place to another. Students

who want to earn money leave school without completing the final exam. Students who fail in many subjects also drop out from school. Girls leave school due to early marriage. So, to eradicate such challenges in school, we need to make a new plan for the education system which transforms into a new education system (Mezirow, 1997). In the next phase, I went to my focus school where I had previously interviewed one. I was already familiar with the environment during my last visit. The mathematics teacher and I went to class five in the first period. While taking attendance four students were absent. He asked the class why those students were absent. Students replied that two boys from the same family had changed schools. One girl was absent because she had to go to the field to care after younger brother. And another boy was absent due to sickness. In that class boys and girls shared the same benches. Talented students helped other weak ones in their learning. The class teacher reported to me that he collects one rupee fine daily from absent students. If students become absent regularly for more than three days, they need to make their parents call. Moreover, the teacher needs to report students absent daily to the school administration.

From the observation, it can be concluded that class-teachers keep a record of all the students and try their best to make their students regular in the classroom and they provide information to school administration as well. But due to different problems students are absent, and some of them drop out from school. So, a teacher should understand the cultures of every student and transform them into their own realities (Orey, 2000).

In the next step, I carried out FGD with the same ten students from different ethnic backgrounds in one classroom after school. I asked how many of their friends were irregular, migrated and dropped out from school and what type of activities were carried

out by their class teacher and school administration to make them regular in the classroom. One of the students replied that due to separation of parents, one student left school after Jestha, where the elder brother was taken by father and younger brother was taken by mother. Another student replied that Terai students are absent for a month during Fagu Purnima and Dashain to Chhath festivals. Students told me that when they are absent, they have to write an application to the class-teacher. If they are sick for more than three days they get phone calls from the class-teacher and from the principal as well. If they had to go early, they needed permission from the principal. According to Khaniya and Kiernan (1994), there are multiple problems in schools, including poor economic background, home-environment, etc. (Estvad, 1998). Such theoretical aspect, you need to write at the beginning of the theme wise topic and link your data. For me it's better.

Physical Facilities

Hallak (1990) identified facilities as the most important factor influencing academic achievement in the school system. Buildings, proper desks, benches, adequate lighting in the classroom, playground, drinking water, toilets, and so on are some examples of physical facilities. Along with teachers, students need good facilities in school. No student wants to leave the school if there are good teachers along with good facilities. Similarly, T_1 expressed:

> *There are enough subjective teachers in our school from ECD to class ten. In all the classrooms there are big white boards placed. There are enough desks and benches. In one class we can adjust 45 students with three students in one bench. There is good passage of light in all the classrooms. We have a reservoir where we can store water. Students get filtered water. The facility in this school has increased after making two buildings. There is one Nurse room, computer room,*

hall, library, science laboratory along with a canteen. (Interview transcription March 6, 2022)

Another participant T_2 shared his views as:

In my school with the class increasing the number of students also increases. There are more students in bigger classes. We can't hold 55 students in one class and there is no room and extra teachers so that we can break the class. It is very difficult to take classes. Moreover, in the upper classes there is tin in the ceiling. In the rainy season we can't take classes as there is disturbance due to rainfall. Moreover, in mid-day direct sunlight comes into the classrooms, so it is very difficult to conduct classes. (Interview transcription March 6, 2022)

Another participant T_3 discussed as:

There are small classes where only 30 can sit. Windows are made from wood where there are no glasses. Near the school there is bamboo. In the ground floor classrooms small snakes enter, so students get afraid. The floor of the class is wet and cold. There are only two dustbins to throw the waste. There is no soap for washing hands. (Interview March 7, 2022)

Another participant T_4 expressed:

In a school a good *teacher is necessary for students with good facilities. If students get facility with good teachers, then they will read in that school up to the last level. After they come out from school, they love school and respect their teachers. The classroom size is appropriate where enough light enters in every*

> *classroom. There is a dustbin in every classroom. All classes from 4-10 clean their classrooms every day. (Interview transcription March 7, 2022)*

One of the headteachers H_1 discussed:

> *There are three buildings with six classes in each building. There are ECD, Nursery, L.K.G., U.K.G., and class 1 to 10. There is a Nurse room, Science laboratory, Library, Canteen, two office rooms. There are two Aayas who look after the ECD and lower-class students. There is a dustbin in every class. Student's clean classes daily. There is a facility for drinking water which is filtered. There is soap given to the students for washing hands. (Interview transcription March 9, 2022)*

Another headteacher H_2 shared:

> *There are classes from ECD to class-8. There are two office rooms, computer-lab, auditorium hall, library, separate staff and student's toilet. There are fans, clocks, separate desks and chairs for teachers. There is a separate corner for every subject. Everyday students' clean classroom. There is a separate notice board where students paste learning monthly. Sometimes with the help of students and teachers they clean the flower pots. (Interview transcription March 9, 2022)*

From the above interview of the participants, we can conclude that some of the Community schools have good facilities like desk-bench, canteen and the sound school atmosphere. Another type of community school's classroom was wet without a proper desk and bench where many students had to learn. There was no place for playing, no proper drinking water and toilet facilities. They have to cure themselves when they get

injured. A student cannot study in a school where there is a lack of appropriate facilities. So, community schools should be equipped with good facilities. So, the government should critically address the issues of school (Habermas, 1984).

I planned to visit a nearby school located in Bhaktapur. As I had visited earlier, it was easier for me to talk to the principal. I got permission to enter into different classrooms and the whole periphery of the school. The size of the classroom was big where enough light entered. But senior classes were fitted with tin ceilings. There was enough drinking water facility. But there was no tap in the toilet where students had to carry water in one bucket. There was no lock in both toilets. The ground was plastered. Some of the fans worked well while some were not repaired. Again, I visited a nearby school. When I entered the ground, along the ground side there were beautiful flowers blooming in different mud vessels. There were taps along with soaps where students washed their hands. There was an underground reservoir where they stored water. Students got Euro-filtered water. In the toilet there was a separate provision for disposing of the sanitary pads. There were taps in each toilet.

Thus, from the above observation of two public schools we can conclude that the physical facilities in each school are different. But we need to provide minimum facilities to the students in every government school. So, we need to transform schools (Mezirow, 1978).

At last, I conducted FGD with previous students after school in one classroom. I asked them whether they got appropriate facilities in school or not. They told me that there was a routine for cleaning the classroom based on rotation. There were dustbins in every classroom. They got pads from the office whenever needed. They collected soaps

from all classrooms yearly and were placed in a separate Child Club Cupboard which was taken out whenever necessary. They got appropriate facilities from the school in every aspect. They needed to hold discussions in school for its betterment and quality learning (Horkheimer, 1982).

Chapter Summary

In this chapter, I summed up different views, discussions of four teachers, two head teachers from interviews, observations of respondent's school and FGD from ten students from different ethnic backgrounds based on my second objective: 'To explore challenges faced by teachers and students in making mathematics classrooms inclusive. I found there was discrimination among students could not manage time for quality learning, lack of use of appropriate teaching materials, lack of qualified and trained teachers, students' irregularity in classroom, migration and dropping out and lack of minimum physical facilities. I got consent of teachers and students from different sample schools. I explained objectives, method of my study related to inclusive education to the participants. Then, I made a plan for interviewing the participants. Furthermore, I recorded those interviews on my mobile, transcribed them and at last analysed them thematically. Observation was based on practice of inclusive mathematics education in the classroom, difficulties in making classroom inclusive and along with strategies used for inclusive mathematics classroom. Moreover, from focus group discussion I found views, difficulties faced by students and teachers in making mathematics classrooms inclusive.

Chapter VI

COPING STRATEGIES FOR PROMOTING INCLUSIVE MATHEMATICS CLASSROOM

In this chapter I have appended coping strategies used by students and teachers in making mathematics classrooms inclusive. So, for this purpose, I interviewed four teachers and two head teachers based on the third objective which was to investigate the coping strategies to overcome the challenges faced by mathematics teachers and students in inclusive practices. In the next step, I observed and asked selected participants from different backgrounds in the class. After carrying out an in-depth interview, participant's observation and focus group discussion, I recorded information on my mobile. Then I listened to their interviews repeatedly, transcribed and developed them in the following themes:

Student-centred Teaching Method

We use different teaching methods in teaching-learning activities. Especially in the educational field, our teaching methodology has shifted from teacher-centred to student-centred. In student -centred teaching methods we care about learners' needs where every learner benefits from effective instruction (Stuart, 1997). Students design their own learning environments. If learners are more motivated to learn, we can easily engage them in learning. Regarding this issue a participant T_1 shared:

> *We are in the 21st century which is a technological era. While teaching we use different models of teaching. In previous ages teachers taught students to learn where students followed all the orders of the teachers. Nowadays a teacher acts as moderator who creates a friendly environment with students. They give them a chance to explore things. (Interview transcription March 9, 2022)*

Another participant T_2 discussed me that:

> *I will create a friendly environment with students by keeping distance with students. When they ask questions, I will solve them in class and outside if they ask then also, I will manage time for solving problems. When I enter the class, first I will create a good environment for learning. I will provide regular motivation to all students. (Interview transcription March 9, 2022)*

Another participant T_3 shared her views as:

> *Classroom is the place where teacher and students work together to fulfil the learning objectives. For this I will create a favourable environment in the classroom. Give time for students to explore their needs. I will provide equal opportunity to students for solving questions on board. Sometimes, I will call students to teach on board so that they can explore their thoughts clearly to all students. (Interview transcription March 10, 2022)*

In this regard another participant T_4 expressed his views as:

> *We are teaching students and we should satisfy all the students. I will get information about all the students from their port-folio and from other teachers also. I will give extra time to the weak students. I will watch every student's performance. I will listen and address all the students. I will create democratic environment for all the learners. Sometimes I learn from the students. (Interview transcription March 10, 2022)*

In support of this, H_1, the headteacher discussed:

> *In the starting of the session all class-teachers prepare port-folio of all students and all information is given to all teachers. There is no cruel punishment given to students. Students are familiar with every teacher and they don't have any hesitation to ask questions. Students are free to answer questions and teachers provide guidelines to them. (Interview transcription March 10, 2022)*

Another headteacher shared the similar experiences. Teachers cooperate in fulfilling student's needs. From the above interviews, the student-centred method is a must to engage all students in learning. In a student-centred method, students get a platform to explore their knowledge in the classroom. It ultimately supports the implementation of inclusive education in the classroom. According to Vygotsky (1978) for a constructive classroom, we need to develop a scaffold classroom environment.

Furthermore, on the same date I visited two schools in Bhaktapur. In the first school, I got permission to observe one mathematics class. Headmaster permitted me to go to class 7 with the mathematics teacher. I sat in the last bench when the teacher was teaching the experimental verification ' The sum of angles of a triangle is 180^0 '. He had a scale, marker and compass. At first, he drew three different angle triangles (acute angled, obtuse angled and right-angled triangle) on the white board. All the students drew triangles properly and named them A, B and C. Then teachers taught how to measure all three angles. Those students who could not do properly were guided by teachers. In that classroom all students were eager to learn so all students were engaged in learning.

Thus, from the above observation, teachers tried to implement student-centred learning in the classroom where every student was involved in learning. So, a teacher

should involve all students in learning based on their mental state (Ertmer & Newby, 2013).

At last, FGD was carried with the students after school. I asked them what type of learning method they would prefer (teacher-centred or student-centred). Students conveyed to me they wanted to implement student-centred learning in the classroom. All of them equally participate in learning. Thus, student-centred learning promotes inclusive education successfully. We need to develop dialogues and discussions among students so that all students will participate in learning and explore knowledge (Horkheimer, 1982).

Use of Appropriate Materials

"Students require materials that allow them to learn and connect with the real world based on their age, level of education, social attitudes, and intellectual ability" (Cunningsworth, 1984) According to Faize and Dahan (2011), teaching materials are printed and non-printed materials that are designed to give information to students during the educational process. Teaching materials help to develop permanent learning to students. Regarding this issue, the participant T_1 shared:

> *I will try to make and use teaching materials in the classroom. I will use previously made teaching materials. Maximum time I use chart paper and local materials. After COVID we are compelled to use ICT in class. Though I don't know how to use a computer well, now I am familiar with it. I can properly use a smart-board in the classroom. I will give project work to each student after each chapter. (Interview transcription March 12, 2022)*

Another participant T_2 discussed his thoughts as:

> *There are different teaching tools used in the classroom like board, marker, chart-paper, sticks, marbles, different concrete materials, and different mathematical apps. The materials which are already used will be used again. In the beginning of the session, we prepare materials according to the class. There is a separate corner for putting mathematical materials in class. (Interview transcription March 11, 2022)*

Another participant T_3 shared her views as:

> *Teaching materials in the classroom help to fulfil the desired learning objectives. According to subject matter I will prefer to use both concrete and abstract materials. I was sent to different training sessions. I will use the training ideas in my classroom. A classroom without use of teaching materials will be dull. When I use teaching materials in class students are motivated to learn and give answers quickly. (Interview transcription March 11,2022)*

Another participant T_4 discussed his views as:

> *Teaching materials makes students active in the learning process. They can get permanent concepts of subjects easily from teaching materials. As far as possible I will use the previous teaching materials which were prepared already in previous years. Now, after COVID I am using ICT tools. Sometimes, I will take them in the field also. Also, different project works will be given to students. I sometimes use games to solve mathematical problems.*

In this regard one of the headteacher H_1 shared his views as:

> *We have sent teachers for different training sessions. We are encouraged to use teaching materials in every classroom. Teachers make lesson plans and carry materials in every classroom. We have bought different mathematical tools. Teachers use the made materials again. Also, in the classroom different games and rhymes are especially used in lower classrooms. ((Interview transcription March 11, 2022)*

Another headteacher H_2 shared her views as:

> *We encourage teachers to use teaching materials in the classroom. We have provided them with text books, curriculum, syllabus, teacher's guide with different teaching materials. They can easily purchase the materials. After COVID we have been focusing teachers to use ICT tools also. In the leisure period and after the end of session all the teachers prepare necessary teaching tools. ((Interview transcription March 11, 2022)*

From the above quoted sharing, it can be deduced that teachers were ready to use appropriate materials based on content in the classroom. Furthermore, games were used in classrooms, especially in lower classrooms. School management and teachers motivated them to make and use appropriate materials in the classroom. During and onwards COVID period, most schools shifted to use ICT based learning in the classroom. Students can get clear concepts of the subject if appropriate materials are used in the classroom. Thus, use of appropriate materials in classroom scaffolds constructive learning (Vygotsky, 1978).

In the next step, I carried out observations in the previously visited schools. I managed all the required materials. When I visited the first school in the middle of Chaitra, there were no students in the school and the teachers had already checked their answer sheets while the computer teacher was preparing the marks sheets. I got permission to enter all the rooms using classes. The ECD class was large with well decorated teaching materials and there are playing tools also. There were two teachers sitting in the classroom and making materials for the next session. All the materials were printed in different colour papers. The materials were laminated and ready to paste on walls. There was a smart board too. In different rooms different subject teachers were preparing teaching materials. Then, I visited another school nearby the previous one. The time period was the end of Chaitra. They already prepared the results, so they were getting ready to go for a field visit. All the teachers were ready to go to their parents' home with different materials.

From the above observation, I found teachers were motivated to make materials which would be relevant for teaching. It is really a challenge for teachers to manage learning based on appropriate materials (Hallahan, 2011). Use of appropriate materials establishes permanent learning in students so that all students enjoy learning which promotes inclusive teaching learning.

Student-friendly Learning Environment

Maths anxiety has been defined as "an incredible dread of mathematics that can interfere with manipulating numbers and solving mathematical problems in a variety of everyday life and academic situations" (Buckley & Ribordy, 1982). Students have deep fear in their mind 'Mathematics is a difficult subject'. Parents mostly encourage their children to study mathematics. Teachers and parents who are afraid of maths invoke the

fear in their students and children and parents who are afraid of maths invoke that fear in their children (Furner & Duffy, 2002). This excludes students and all students don't easily participate in learning. In this regard one of the participants T_1 shared his views as:

> *Students feel anxiety in mathematics learning. They are afraid of solving problems. They can quite easily solve simple problems but leave word problems. They don't try any attempt to solve problems themselves. They have developed in mind that they will not study mathematics in higher classes. So, for those students, I will motivate them to learn mathematics which is also an easy subject like other subjects. (Interview transcription March 11, 2022)*

Another participant T_2 expressed his thoughts as:

> *First, I will see the results of all the students. I will have a conversation with the students who have difficulty in studying mathematics. Again, ask them how they can learn mathematics in a better way. After collecting their suggestions, I will try to apply in the classroom. I will create democratic environment for students to ask questions. I will give more time to the students who are weak in mathematics so that they are more encouraged to learn mathematics. (Interview transcription March 11, 2022)*

Another participant T_3 shared her views as:

> *I will make good contact with every student's parent so that I can easily convey to them how their children are making progress in mathematics. Further, I will spend more time studying mathematics. In every classroom, I will encourage students to make a daily routine for studying different subjects and separate extra*

> *time for studying mathematics. I will regularly motivate them about the importance of mathematics in their life. (Interview transcription March 11, 2022)*

Another participant T_4 discussed as:

> *First, I will arrange students who are weak in the first bench and give additional time for them to solve mathematics. I will try psychologically to erase in their mind that: mathematics as a difficult subject. If they solve problems, I will motivate them to do more mathematical problems. I will link the mathematics content with myr own life. (Interview transcription March 11, 2022)*

Furthermore, I carried out interview with headteacher H_1 who has shared his views as:

> *In lower-level classes' students get good marks in mathematics or they can solve objective questions easily and get good marks. With the increase of classes their most of the students' performance decreases. They are choosy in solving problems. They sit in classroom with mentally absent. So, for those students we have collected names of people who are weak in mathematics and teach them in extra period after school. Side by side we will motivate them to learn mathematics in an enjoyable environment. (Interview transcription /March 11, 2022)*

Similar views conveyed by another headmaster. From the above interviews of respondents, mathematics teachers console students who were weak in mathematics and provided extra time for learning. They provided the importance of mathematics in their life so that they love to do mathematical problems and be more conscious in the classroom. According to Horkheimer (1982), students struggle to learn, so we need to address their problems with continuous discussion.

In the next phase, I took the observations of my mathematics teacher. We were familiar with each other. So, I followed him and entered with him in grade eight where the teacher had started to teach: To find areas of different figures (Rectangle, Squares, Right- angled triangle, equilateral triangle, Trapezium, Rhombus Parallelogram, Quadrilateral). He had prepared all the formulas and displayed them in front of white-board where all students could easily see. He found an area of one rectangle, one square and right-angled triangle on white board. Side by side he recalled students with formulas. In the next step, he had a problem finding an area of them for the students. In that class students were talented in mathematics and solved problems quickly. He instructed them to solve other problems from the textbook. He guided weak students to find the areas. In this way, he was roaming around the classroom to keep in touch with every student. At last, all the students solved problems properly and they could easily tell the formula of area of rectangle, square and right -angled triangle.

From the observations I found, the teacher used appropriate materials in the classroom and motivated all students for learning. Teachers' role is to support all students for quality learning (Vygotsky, 1978).

At last, I conducted FGD with the targeted students in one classroom. I asked them how they felt about mathematics. Some of them said it was a very easy subject but the rest reported a difficult subject. They told me that whenever they tried to solve problems, they would not get the right answer, so they quit solving problems. Teachers only checked the exercises and solved the problems of talented students. So, they need more attention from teachers to solve problems. So, a mathematics teacher should regularly motivate students to learn mathematics. Motivation has a significant role in students' learning effectiveness. It helps to include all students in learning mathematics.

A teacher should teach students based on their present form of knowledge (Mezirow, 1978).

Collaborative learning, Co-teaching and Peer-teaching

Co-teaching occurs when two or more professionals collaborate to deliver instruction to students in order to support the development of inclusive classrooms (Cook & Friend 1995). In school there are different levels of teachers who teach students from ECD to secondary level classes. All mathematics teachers from ECD level to secondary level work together to provide quality education to students. Collaborative learning occurs when learners communicate to one another (Golub, 1988). They help and cooperate with each other as collaboratively teaching learning to carry out the desired work. Many learners' ideas work together to finish the targeted work. In this regard one of the participants T_1 discussed his views as:

> *It is very easy for us if we are together in a group. Ideas will be exchanged among persons. There are mathematics teachers who teach from ECD to higher level. They are sent in training also. When they come back from training, we listen to them and gain knowledge. There is sharing of experiences and knowledge among teachers and students. (Interview transcription March 12, 2022)*

To support above concept another participant T_2 expressed his thought as:

> *Teaching is a very challenging job and a teacher has to face different difficulties. It is easy if the teachers convey their problems regarding the subject matter along with students' information to their friends so that they can get help easily. I do not feel hesitate to ask problems to my friends. So, I don't feel ashamed to ask my*

friends and also feel easy to help other teachers too. (Interview transcription March 12, 2022)

Another participant T_3 conveyed her thoughts as:

Students can easily share their problems with their friends. They feel very easy and comfortable to ask for help from their friends. In each bench one captain is made and there is a class captain also. The selected captain is good in every activity. If students have problems, they ask their friends easily. They learn easily from their friends. So, in their leisure period the student who is talented in mathematics will teach to their friends. (Interview transcription March 12, 2022)

Another participant T_4 expressed his thoughts as:

According to the situation and students' view, I use different methods of teaching. A teacher's job is not to teach also but instead enable students to learn. For solving problems sometimes, I made different groups and give them a definite task for doing. In that situation, students work together in a group to solve problems. They put their best energy to solve that problem. After that I reward the group who have solved problems correctly. So, there is competition in groups and all students put their ideas. (Interview transcription March 12, 2022)

One of the headteacher H_1 shared his views as:

There is a class-captain in every class which is selected from the students' group and there are also school captains who are selected house-wise. School captain does all the extra activities along with the participation of teachers. They give all the information and look after class when the teacher is absent or comes late.

Students feel easy to ask questions to the talented students. We have developed a feeling among the talented students that when you teach you learn better. (Interview transcription March 12, 2022)

Similar views were conveyed by another headteacher. So, from above interviews from four mathematics teachers and two headteachers, for giving quality learning collaborative learning was practised by teachers, where all teachers work together as a team. Moreover, a teacher can get knowledge from other colleagues too. So co-teaching was also used where a teacher who had better knowledge shared their knowledge with their friends. Furthermore, students learn faster and easier from their friends. So, peer-teaching was mostly used by teachers. Collaborative learning, co-teaching and peer-teaching is beneficial which can fill the gap of that learning from ZPD (Vygotsky, 1978).

In the next phase, I planned to visit the previous school and got ready with necessary materials. After one hour on the bus and half an hour of walking, I reached the target school. As I was familiar with the school from the earlier visits, with the permission from the headteacher, I visited grade-7. When I entered the class, I found that the mathematics teacher was absent and the class was being taken by the first boy. The first boy solved the problems of exercise related to mensuration properly using the basic concepts. He clarified the questions asked by his friends in a confident way. It seemed that the class was being taken by a real mathematics teacher. There was a cooperative feeling among the students. In the next step, I visited another school, an hour away from that one. With the permission from the Assistant headteacher and mathematics teacher, I entered grade-5. After entering the class, I found that the mathematics teacher had given one assignment to the students. He had already made a group for the presentation of making a solid figure of a cube from chart-paper. So, the students were ready to present

in groups. He had made four groups based on four houses white, blue, red and yellow. At first, the teacher instructed the red house students to go to the front for the presentation of the cube. They had made a big cube and also illustrated their number of faces, number of edges and number of vertices properly. All the students from that house presented properly. Next was the turn of the blue house, so blue house students went to the front and showed a figure of cube in a cardboard paper with its number of vertices, number of edges and number of vertices. Some of the students were corrected by their friends. Similarly, white house and yellow house students also presented the solid figure of cubes. Some of the students from blue house and yellow house had made mistakes, so the group leaders of those houses corrected them. In that class, the red house students' presentation was the best among all. Then the mathematics teacher praised the red house students for their good presentation and told the others to do like the red house the next time. The mathematics teacher gave an eraser to each student of the red house as a reward.

From the above observation, a mathematics teacher was ready to use learning which makes students enjoy learning. The knowledge achieved from collaborative-learning, co-teaching and peer -teaching makes knowledge stable. So, we need to transform students for new learning by using different methods of learning (Mezirow, 1978).

At last, I carried out FGD with targeted students in one classroom. I asked them which method they could learn properly. They said they learnt quickly from their friends because they didn't get afraid of their friends. They said, "We are encouraged to learn from project methods which are organised in groups. We get different ideas from our friends. So, we are able to solve maximum mathematical problems." Peer teaching allows students to learn from one another without the intervention of a teacher (Boud, Cohen, &

Sampson, 1999). Students learn easily from friends as they have no hesitation. Vygotsky believed that when individuals were challenged by a more knowledgeable or capable individual, learning could occur at a faster rate (Hogan & Tudge, 1999). Sometimes competition also encourages learners to learn. All the activities encourage learners for learning and implementing inclusive education.

Proper Teacher-student Ratio, Placing Trained Teachers, Physical Facilities with Support System

In my perception, there should be a proper facility in the classroom like proper light, fans, space, desks and benches. Further, a school should place trained teachers who have studied mathematics. Moreover, in one classroom student-teachers should be properly adjusted. In this regard one of the participants T_1 shared his thoughts as:

> *At school we need to have a classroom having a good environment with proper light, space along with desks and benches. The drainage system should be checked properly. There should be a good facility of drinking water and toilets. A student feels easy to learn in a classroom with a good environment. It is more better not to use tinceling in classroom. Tin ceiling creates maximum disturbance in the classroom. (Interview transcription March 12, 2022)*

In support of the above theme one participant T_2 shared his thoughts as:

> *The construction work should be carried out in off-school time which saves students from accidents. The classroom should be clean. The materials in the classroom should be placed in proper order. The desk and bench which are broken should be taken out from the classroom. Near the corridor, one water*

filter should be placed. In one class there should only be 30-35 students. (Interview transcription March 12, 2022)

In the support of above theme another participant T_3 conveyed her thoughts as:

A school needs a good atmosphere for learning so that students feel relaxed and their drop out ratio is reduced. Also, a school should place teachers who have studied mathematics. As in basic level non-mathematics (Nepali, English) teachers are also found teaching mathematics. I found they are struggling more in teaching. (Interview transcription March 12, 2022)

In this regard another participant T_4 conveyed his thoughts as:

A good school needs to consider different activities. From administration, Teachers, classroom structure and other facilities also need to be considered. There should be a separate fund managed for the low economical students. As the government has provided tiffin to the school students, they don't have to read on an empty stomach. (Interview transcription March 12, 2022)

In this support one of the headteacher H_1 expressed his thought as:

The scholarship provided by the government and other organisations is provided to the students who have a low economical background. Tiffin is provided to the students which is prepared at school. Every day the classroom is cleaned with one dustbin in each class. The physical facilities in the classroom are checked. Government provides a maximum quota for primary level. So, primary level teachers have to teach at secondary level too. Before two years, there were only

> *three lower-secondary level teachers in school. After 2074, three secondary level teachers were added. (Interview transcription March 12, 2022)*

Another headteacher H_2 conveyed her views as:

> *Under the coordination with school captains and other teachers, students participate in gardening. We are trying our best to recruit mathematics teachers from ECD to the higher level. We have managed from Class 4 to higher level but we are unable to do so in lower level. All the classrooms are decorated with teaching materials. There is a proper facility of drinking water and toilets. We provide first -aids to students when they are injured. (Interview transcription March 12, 2022)*

From the above interview transcriptions of the participants, it can be said that some public schools have good facilities whereas some others do not have even minimum facilities. Students are compelled to learn in the crowded classrooms. Classrooms are cleaned by students. Some of the government schools have many quotas in particular level whereas some others have fewer teachers. So, the primary level teacher teaches at the secondary level. The physical facilities in all public schools are not appropriate. There is a good support system from different organisations and local levels in some government schools whereas some public schools had to manage funds themselves. As, government has made a plan to distribute tiffin to students from ECD to class-five, it indirectly supports students in learning. So, we have to discuss the issues of schools from different stakeholders (Habermas, 1984).

In the next phase on March 13, 2022, I visited the previous school. I have visited their classrooms, and I found that sunlight easily enters there. There are teaching

materials placed properly on the walls. The classrooms are neat and clean. According to students' height, benches are prepared so they can place their bags under the bench. There is a proper facility of drinking water. In some classrooms there are 30 students and in higher classes from 5 onwards there are more than fifty students. The classroom size is appropriate. After that, I sat in the office and asked about the qualification of teachers and number of teachers in each level. He said all the teachers have master's degree qualification but in primary level four teachers have got a degree in Nepali. There are ten teachers in primary level, three teachers in lower-secondary level and four teachers in secondary level, three ECD teachers and two other teachers who have been recruited by the school itself on the internal resources. Four years ago, there were only primary and lower-secondary teachers. Nepali teachers have to teach other subjects like English and Mathematics. He has been exercising more to get a secondary level teacher for the school.

From the above observation, in public schools there were maximum students in higher classes as compared to lower classes with a minimum number of secondary level teachers. Primary level teachers were more than secondary level ones. So, a primary level teacher had to teach in secondary level too. Non subject teachers were also teaching at the schools.

At last, I carried out FGD with ten students from different ethnic backgrounds. I asked them whether they were satisfied with their school. One student replied affirmatively and said there was a routine for cleaning the classroom which needed to be carried out by every class from class-4 onwards daily. There were dustbins and brooms in every classroom. Another student replied that they had to bring a spoon and bowl and the school provided them tiffin. The tiffin is different every day. Another student told me that

there was a good facility of drinking water, toilets, fans, and lights in the school. Thus, a well facilitated school promotes students for better learning. All the students were involved in learning. One of the students reported that in class-8 there were 60 students and they couldn't learn properly. Thus, a school needs to be equipped with all the essential things that enforce better learning. Schools need to be transformed by providing all essential needs (Mezirow, 1978).

Chapter Summary

My third objective is to investigate the coping strategies to address the challenges faced by mathematics teachers and students in inclusive practices. For this I had interviewed four mathematics teachers and two headteachers. Observations were carried out in those mathematics teachers and focus group discussion was carried out from ten students from different ethnic backgrounds. After using those tools, in making an inclusive classroom, we need to apply a student-centred teaching method, with use of appropriate teaching materials. We need to provide motivation to the students for learning mathematics. Furthermore, collaborative learning, co-teaching and peer teaching also help to establish an inclusive classroom. A school should have a good support system. Student-teacher ratio should be maintained. Subject wise teaching learning needs to be managed in school.

Chapter VII

FINDINGS, CONCLUSIONS AND IMPLICATIONS

This chapter includes main findings, conclusions and implications of this study.

Findings

Inclusive education is used in teaching mathematics in order to ensure wide participation in mathematics education. There are different reasons why students are not included in mathematics learning that may be due to discrimination among students, lack of use of teaching materials, lack of training opportunities for teachers, time management and also lack of physical facilities at school. I studied different studies and research findings to carry out this research. Also, participants have played a vital role in carrying out findings of my study. I realised that we need to plan and use different techniques in order to make mathematics inclusive. By analysing my reflections and participants' views I have found the following facts:

My first objective was 'To explore the experiences of teachers and students in inclusive mathematics classroom practice.' Existing classroom discourse seems to be passive in solving mathematical problems as it uses fewer methods of learning in the mathematics classrooms. Similarly, our classrooms were teacher dominant. There was ignorable motivation used by teachers to students and collaboration in mathematical problem solving.

My second objective was 'To explore challenges faced by teachers and students in making mathematics classrooms inclusive.' From the observation I found that mathematics teachers give more priority to talented students and weak students are mostly not cared for. Moreover, a teacher cannot manage time as they have to complete

the course in time. Furthermore, teachers, excluding fewer local materials, rarely use teaching materials in the classroom. Similarly, teachers are not offered training. Poorly qualified and non-subject teachers teach mathematics at school level. Especially in city area public schools, students reside in rent or do household work for another person so they are frequently irregular. They do not complete homework and have insufficient stationary materials. So, it leads to a high dropout rate from school. Also, public schools do not have good physical facilities like desks, benches, supply of drinking water, or toilets, so local people do not send their children to nearby public schools.

My third objective was 'To investigate the coping strategies practised by mathematics teachers and students in inclusive practices.' They have been engaging students in student-centred learning, collaborative learning, peer learning, and co-teaching as a better practice. Teachers should give more time to weak students. Furthermore, a teacher makes a proper plan before entering the classroom and uses teaching materials which are relevant to the study.

Conclusions

After writing this thesis, as we are employing conventional methods of learning, we need to intensify our teaching-learning activities in an innovative model so that we can imply inclusive education properly. Though our classroom is habituated and ruled mostly by talented students who enjoy mathematics while in the other face indirectly, we are ignoring other students. So, we need to diagnose students properly and make them ready for mathematics learning. Moreover, teachers are always in a rush to finish the course and find rare use of local materials, ICT tools, so we need to lighten ourselves into a new atmosphere of teaching. An effective and hidden enforcement motivation invokes students for good learning. Even though our classroom is teacher-dominant, we need to

modify our classroom with a child-friendly environment. Similarly, teachers need to drive themselves into using multiple methods in teaching learning which makes students learning stable, so promotion of collaborative, co-learning and peer learning is also adopted in the classroom.

Most of the schools which have minimum physical facilities need to transform with good facilities. Directly or indirectly, we have heard that students are discriminated against in the classroom and to remove this difficulty, we, as teachers, should adopt the equity principle in the classroom. Our body performs well if all of our organs are properly functioning and malfunction of any organ makes us sick. Similarly, for a good mathematics classroom, a teacher needs support from students, parents and school administration. Their unity and cooperation make the mathematics classroom inclusive. For better learning a teacher needs to revise previous teaching methods by employing new teaching methods. Most of the students feel anxious in mathematics learning. So, a teacher needs to ensure students are motivated and behave in a friendly manner to students. From the above thesis and in real practice unqualified, untrained teachers teach mathematics subjects, so our priority is to recruit trained and qualified teachers for teaching mathematics. Furthermore, the number of quotas of teachers should be increased, especially at the upper level. Each unit of the school should be updated with students and need to keep port-folio so that we can reduce irregularity and drop out issues. There is no proper teacher-student ratio maintained at most of the schools. So, we need to maintain a proper teacher- student ratio. Moreover, a model classroom accelerates with not more than 20-30 students. A teacher needs to manage time for a better learning environment for students. The most essential factor for learning is school, so schools need to provide a support system for students who are economically poor. Moreover, a

teacher should take teaching as a profession so that s/he can enjoy and give her/his best to the students and students also need to study well in the classroom and at home. A regular visit of parents to school also triggers students for better mathematics learning.

Implications

My research has been momentous in promoting inclusive mathematics classrooms. It will assist mathematics teachers, students, school administration and parents, and policy makers to participate with all the students for quality learning. Teachers need to use multiple methods in teaching. The implications of this research in different levels are as follows:

Policy Implications

The implications of the findings of this research at the policy formulation level can be the following:

- It might be reinforcement to the mathematics teachers for making the mathematics classroom more inclusive.

- It can be referenced to use a flexible curriculum.

- Schools might set mathematics laboratories and ICT labs by using multiple learning materials relevant to the context of the study.

- Concerned agencies might consider recruiting capable mathematics teachers in sufficient numbers at schools.

Pedagogical Implications

Pedagogical implications concern with the methods and strategies of teaching and learning mathematics. Especially, for school level teacher my research will be useful in following ways

-To assist teachers to use different models of teaching and replace traditional teaching with ICT.

-To motivate teachers to use appropriate teaching materials in the classroom.

-To advise teachers using and reflecting the teacher training in a real classroom.

-To support teachers to motivate students and establish themselves as ideal models.

-To motivate teachers to understand students' state of mind by using collaborative, co-teaching and peer-learning.

-To help students by ensuring their 100% participation in mathematics learning.

- To help students to make a plan or routine for study.

-To reference administration to provide all physical facilities at school.

-To reference administration to send mathematics background teachers to the classroom for teaching mathematics.

-To support administration to convey students' progress to parents.

-To assist administration not to get admission in irregular periods

-To advise school administration to manage extra time for students who are poor at mathematics.

- To include only the points explored from the study.

This study has been carried out on a small scale. There might be some suggestions for the further researchers on a similar theme.

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Appendix I Classroom Observation Guidelines

The main purpose of classroom observation is to grasp the moments observed during classroom activities. Following guidelines are the observational tools of my study:

- Teacher's response to students
- Teacher's behaviours towards students
- Management of classroom tools
- Use of teaching materials
- Providing time for students who are weak in mathematics
- Use of different models of teaching
- Checking of physical facilities present in school
- Interaction of student with teachers

Appendix II In-depth for Mathematics Teachers and Headteachers

Dear Sir/Madam

As a part of the require for Master of Degree of Master of Philosophy in Mathematics Education, I am going to conduct a study entitled' Inclusive Mathematics Classroom Practices: An Interpretive Inquiry.' I want your cooperation for me in taking interview to the selected mathematics teachers and headteacher. Moreover, I inform your consent in observing your mathematics classroom in irregular time with your kind support to select ten students (5 girls, 5boys taking their category from brahmin, Chhetri, Newar, Dalit, Madhesi and economically poor students. For this purpose, I have prepared following questions and I want your cooperation in interview and observation in classroom along with proper environment for taking focus group discussion with the selected students.

Regards

Muna Bista

1. How do you engage students in mathematics learning?

   ……

   ……

2. How diverse (economic, gender, class, ethnic) students are addressed in mathematics learning?

   ……..

   …….

3. What type of learning method (traditional versus technology based) is mostly applied in classroom and how do students enjoy?

   ……

   ……

4. How school administration provide support for low economic background students for mathematics learning?

   ……

   ……

5. How is mathematics classroom organized, are you getting mathematics background teachers for teaching and how frequently training is organized to mathematics teachers?

   . ……

   ……..

6. How portfolios are organized and updated? How diversity of students' effect in mathematics learning?

   ……

   ……

7. What sort of activities do you organized to make mathematics learning enjoyable?

   ……

   ……

8. How do you coordinate and cooperate students for learning mathematics? How do you practice peer learning in classroom?

   ……

   ……

9. How often you use motivation and reinforcement in mathematics learning and what type of motivational tools you use in classroom?

……

……

10. What sort of activities do you carry out to reduce irregularity of students?

……

……..

11. How do irregularity and migration of student's effect in mathematics learning?

……

……

12.How do you deal with students who have low cognitive level and what sort of strategies are used to lift their cognitive level in mathematics learning?

……

……

13.Which medium(language) of instruction is used in mathematics learning and are students feeling comfortable with your instruction?

……

……

14. How do you contact to each student's parents and how do you provide feedback to parents?

……

……

Appendix III Interview Guidelines to Head teacher

- Providing an inclusive classroom
- Providing minimum physical facilities in school
- Whether they sent for teachers in training or not and whether mathematics is taught by mathematics teachers or some other subject teachers is asked
- Coordination with teacher, student and parents
- Providing materials to teachers from marker to laptop

Appendix IV Focus Group Discussion Guidelines with Students

- Problems related with mathematics learning
- Problems related with cooperation
- Problems of classroom management
- Problems related with teachers and administration
- Problems of low-economic background students
- Problems related with student's interests