

CULTURAL DIVERSITY AND DIFFICULTY IN LEARNING MATHEMATICS

A

THESIS

BY

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LETTER OF CERTIFICATE

This is to certify Mr. **Binod Pokharel**, a student of the academic year **2073/2075 BS** with thesis number 1727, Exam Roll No. **7328337**, Campus Roll No. **137**, and T. U Regd. No. **9-2-311-17-2012** has completed his thesis under my supervision during the prescribed by the rules and regulations of T. U Nepal. The thesis entitled “**Cultural Diversity and Difficulty in Learning Mathematics**” embodies the result of his investigation conducted from **2021 to 2022** at the Department of Mathematics Education, University Campus, Tribhuvan University, Kirtipur, and Kathmandu. I recommend and forward that his thesis is submitted for evaluation to award the Degree of Master of Education.

Date:

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Prof. Dr. Bed Raj Acharya

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LETTER OF APPROVAL

“Cultural Diversity and Difficulty in Learning Mathematics”

has been approved in partial fulfillment of the requirements of the Degree of
Master of Education.

Viva-Voce Committee

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RECOMMENDATION FOR ACCEPTANCE

This is to certify that Mr. **Binod Pokharel** has completed his M. Ed. thesis entitled “**Cultural Diversity and Difficulty in Learning Mathematics**” under my supervision during the period prescribed the rules and regulations of Tribhuvan University, Kirtipur, and Kathmandu, Nepal. I recommend and forward his thesis to the Department of Mathematics Education to organize the final viva-voce.

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Mr. Krishna Prashad Bhatt

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Date:

DEDICATION

This thesis is dedicated to

*My father **Mr. Khumananda Pokharel**, My mother **Mrs. Sita Pokharel**,*

Whose love, support, and encouragement have enriched my soul and inspired me to

Complete this research.

DECLARATION

This dissertation contains no material which has been accepted for the award of another degree in any institution. To the best of my knowledge and belief, this dissertation contains no material previously published by any authors except due acknowledgment has been made.

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ABSTRACT

This study focuses on the "**Cultural Diversity and Difficulty in Learning Mathematics**". The objectives of this study were to identify the causes of difficulties in learning mathematics of culturally diverse students at school and to explore the relation between culture and learning mathematics. It is a case study and qualitative in nature. This study was conducted with the sample of one school from public selected by purposive sampling. One head teacher and one mathematics teacher and four students through purposive sampling. Direct interviews with students, head teacher, math's teacher and parents were taken. Classroom observation was done for two times with different days during teaching learning activities. The collected information from teachers and students were analyzed with the help of theoretical and conceptual framework developed by the researcher. In this study, I have found that pupil's weak perception on mathematics, lack of culture friendly curricular materials, mathematics anxiety, traditional teaching learning activities, family's socioeconomic status, discrimination in classroom, and home-school mismatch are causes of difficulty in learning mathematics of culturally diverse students at school. Due to lack of practical knowledge of school mathematics, students do not find the connection between their real life and the mathematical knowledge they have learnt. I have also concluded that mathematics teaching and learning ways from the schooling is not good. Existing school mathematics teaching learning practices seem failing to address social and cultural needs of the students. There is lack of use of effective teaching learning activities in mathematics classroom. School mathematics is totally based on rote learning and lecture methods. Teaching learning process fails to connect the link between mathematical theoretical knowledge and the student's real life. Culture and learning mathematics has mutual relation. Culture of home and school directly affect in learning mathematics. Most of the schools are following culture of dominant group in society. So, it is difficult to adjust for the minority groups students. Achievement in mathematics of children has affected by family's socioeconomic status. There are effective teaching approaches in culturally diverse classroom. Integrate culturally relevant content and social issues, utilize culturally responsive instructional strategies, and use cooperative learning in mathematics are effective teaching approaches in culturally diverse classroom.

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CHAPTER- I

INTRODUCTION

Background of the Study

Mathematics is the subject that is most usable subject in our daily life. The development of mathematics coincided with the development of human civilization. “Mathematics is used throughout the world as an essential tool in many tools in many fields, including natural science, engineering, medicine and the social sciences”(Burner,1983).Nepal is multi-religious, multi-caste, multi-lingual, multi-cultural country with geographical diversity and inhabited by various regional groups. Because of diversity in the Nepalese society, there are inequalities in socio-culture, economy, and educational based on the caste (Bista, 2004). The social function of the school is that it equips individuals with societal norms, values; behaviors and those norms can be both discriminative and not discriminative. The social injustices of past schooling practices can no longer be tolerated. Mathematics has become a critical filter for employment and full participation in our society. It indicates the vital role of mathematics that filters pupil; which generates negative attitude of the students towards mathematics (Upadhyay & et al. 2067). Different researches show that mathematics is considered as a difficult subject and most of the student fear of it.

According to D'Ambrosio, the mathematics competencies learned at home, which are listed on the first year of schooling is essential for everyday life and labor. Bourdieu's cultural capital theory states that the major role of educational system is cultural reproduction. Cultural reproduction refers to the ways in which schools in conjunctions with other social institutions, helps to up-date social and economic inequalities across the generation which hinders equalities to all the students. He also states that children whose home culture is similar to the school can achieve more (Upadhyay & et al. 2067).The religion, social, cultural practices of indigenous people still have some originality. Whether the mathematics is practiced by the illiterate or literate, the purpose is to adjust or fulfill the present demand. Mathematics adopted by the illiterate people of indigenous group is the scope of this study.

Human being is divided in many respects. They belong to particular place, region, caste, ethnicity, language, culture and different value system. All these things contribute a person to be different from one to another. Nepal as a multicultural, multiethnic and multilingual society has

more divisions and these divisions are manifested in different forms. It has diversity in many respects such as geographical, socio-cultural formations as well as deep rooted caste system, kin system and inhibition of mixed ethnic group along with their own different norms, values, culture and religions. As school reflects the society, Nepalese classroom therefore consists of all these heterogeneity in its construction. In this context without examining the micro social setting of the classroom and understanding its meaning, structure and interaction, no classroom business and any forms of outside intervention would be meaningful, effective and successful (Adhikari, 2007).

Cultural Diversity and Mathematics Education

The multicultural education literature, on the other hand, emphasizes issues of cultural and linguistic diversity and equity, but with little consideration of the specific demands of the different academic disciplines. Since mathematics usually tends to be presented as a set of objectives and universal facts and rule, these subjects are often viewed as “Culture free” and not considered socially and culturally constructed disciplines. The vision of current reform aiming at academic achievement for the students requires integrating disciplinary knowledge with knowledge of student's diversity. Unfortunately, the existing knowledge based for promoting academic achievement with a culturally and linguistically diverse student population is limited and fragmented, in part because disciplinary knowledge and student's diversity have traditionally constituted separate research agendas. In mathematics education, although reform documents highlight “Mathematics for all” (NCTM, 1989, 2000; cited in Acharya, 2013) as the principle of equity and excellence, they do not provide a coherent conception of equity or strategies for achieving it.

Mathematical techniques are essential tools for the development of every field of knowledge. Either, it is science and technology, social studies, like economics, management etc. need mathematics for advanced study. Thus, twenty first century is said to be that of computer-based information technology and it is all based on mathematics or equivalently logical thinking. The training of basics mathematics and computer is imperative for skill manpower in every field of national development. It is already mentioned that mathematics education is necessary to every field and every person, so mathematician felt that it must be made popular to all. To make mathematics popular different mathematical programs such as family mathematics program, ethno-mathematics, and woman mathematics has conducted. Many mathematical organizations

such as ICMI (International Commission on Mathematical Instruction), IMO (International Mathematical Olympiads), and ICME (International Congress on Mathematical Education) have played vital role to make mathematics popular. The ICMI (IV) declared the policy of mathematics education “Mathematics for all” and everyday life mathematics.

In context of Nepali society, people say that mathematics is the so hard subject, only gifted students can study this subjects, the girls students can't study optional mathematics in school level etc. these are the traditional thinking and this is the example of Nepali culture towards the mathematics. Similarly, people said that mathematics subject is only for teaching occupation, it can't use in others sector. So, this is also the main difficulty in learning mathematics due to the negative thinking of people. By this discussion we can say that gender beliefs towards mathematics, approach towards the mathematical literature, religious and cultural approach to study mathematics and relevance language, learning mathematics and its future etc. are the cultural diversity in mathematics education.

Teachers need to understand what count as knowledge in mathematics as well as howknowledge may be related to norms, values of diverse language and cultures(Acharya, 2013).Cultural diversity in mathematics education is a widely used expression todiscuss questions around why students from different culture, ethnic, social, economicand linguistic groups perform differently in their school mathematics. These questionsare not new in cultural perspectives to mathematics education development since thelate 1980s and in cultural approaches to mathematical cognition. Learning is theprocess of acquiring new knowledge and new responses. (Hull, 1998; cited inAcharya, 2013) defined learning as a relatively permanent change in behavior potential which occurs as a result of reinforced practice. There are certain steps in learning such as goals, motivation, recreation, obstacle, responses and generalization. In each of steps in learning, culture plays a key role. So, the cultural difference shouldbe regarded as one of the influential factors for children's learning. The children withdifferent family background to the school may face difficulty in involving and interacting in order to assimilate them accordingly to educational setting. Because of the difference in the home and school cultures, the nature of curriculum and text books differs to the children's needs and they feel difficulty in learning.Mathematics like a language is a basic tool of communication. Daily communication involves the frequent use of mathematical concept and skills so forunderstanding of every discipline, mathematics is essential. Now every humandiscipline such as chemistry,

physics, social science, economics, psychology, engineering etc. are interpreted as a mathematical model. Without having mathematical knowledge, it is very difficult to understand those disciplines.

In the Nepalese society, much diverse varieties of classroom are experienced. All students are not from same cultural background. They have different perspectives towards the learning mathematics. The students who have low economic condition, illiterate family, narrow conception towards mathematics, lack of equity and justice are not ready to study mathematics properly. Low passes rate and overall poor achievement also affect the school education sector. This is always blamed that school has used traditional methods of teaching, poor school environment, monolingual instruction, lack of teaching materials, dominant culture, school has not been addressing justice, equality, freedom, peace, compassion and clarity of all students in learning, teachers failing on to use multiple culturally sensitive techniques to assess complex cognitive and social skills. So, I have been thinking that how cultural diversity affects in learning mathematics? What are the causes of difficulties? Why they do feel difficulties in learning mathematics at school? In which area of mathematics, they feel more difficulty? What are the relation between culture and learning mathematics? How to teach effectively in culturally diverse classroom? What is the relation between everyday life and learning mathematics? These questions are challenging for all who are interested in learning mathematics. Therefore, I am motivated to select this topic for the inquiry.

Statement of the Problem

The cultural diversity and difficulty in learning mathematics research is an emerging field of study in the context of Nepal. This research focused on to find out the cultural diversities and difficulty in learning mathematics. In Nepal, cultural and linguistic diversity (CLD) students are disproportionately overrepresented among poor and low-income households. Therefore, the relationship between culture and social class is relevant to discussions surrounding the education of CLD students. Often the terms social class and socioeconomic status (SES) are used interchangeably and refer to “distinctions not only in income but also in property ownership, occupation, education, personal and family life, and education of children” (Taylor, 1986; as cited in Terry & Irving, 2010).

In the perspective, the teacher needs to teach the students so that they used mathematics to solve their own community problems. Such practice helps the students grasp a deeper

understanding of their local environment and circumstances. The cultural discontinuity and children's learning would be the state controlled national curriculum and teaching methods, which might be, in terms of the need and cultures of children, inappropriate and irrelevant to them. Administrative team and the teacher should be carefully about the needs, interests, choices, voices, economic backgrounds, family environments and understanding level of students. In my view, in order to manage this type of diversity inside the school and among the classrooms, the teacher should follow the principle of equity.

In favor of this notion, (Ogbu, 1982; as cited in Adhikari, 2006) has argued that children cannot acquire the intended learning outcomes of curriculum through certain teaching methods provided in a different learning environment, which is culturally different from their home environment. In addition to that, the children, who learn to learn in one culture, i.e., the culture of home, may face difficulties in learning in another culture, i.e., the culture of school (ibid).

The cultural differences between home and school can influence children's learning. There are so many castes in society; they have different cultural perspective and individual differences. The students who have been participated in classroom, they have not same language, culture, religion, and beliefs. Due to this diverse, the achievement of students seems different. Generally, teaching language of Nepalese school is in Nepali and English, but those students who have own martial language, it was the problem to know him/her. They cannot understand properly, what is taught in class. Therefore, language is one of the main problems in learning mathematics. All students have not same home environment, their home environment infamous to learn mathematics therefore there arise different question related to mathematics as far as dalit, disadvantaged, and marginalized students are concerned.

Do they feel difficulties in learning mathematics at school? In which area of mathematics, they feel more difficulty? Do their everyday lives support to learn mathematics? Is their cultural diversity a hindrance? What factors influence them to learn mathematics? Is the environment at home supportive to learn mathematics? There are numerous such questions, which, I cannot include at once. So, my concern is on difficulties, influencing factor and impact of home and school environment on learning mathematics, relation between culture and mathematics and effective teaching learning activities. In this study, I want to find, causes of difficulties in learning mathematics, why the students from diverse background feel more

difficulty in the units such as arithmetic, algebra and geometry and on teaching learning strategies, classroom practices. Therefore, the study proposed to seek the answer of above raised questions.

Objectives of the Study

Objectives are basic tools that underlie all planning and strategic activities.

The following were the objectives of the study:

1. To identify the causes of difficulties in learning mathematics of culturally diverse students at school.
2. To explore the relation between culture and learning mathematics.

Research Questions

The Research questions of my study were:

1. What are the causes of difficulties in learning mathematics of culturally diverse students at school?
2. What is the relation between culture and learning mathematics?
3. How should we teach effectively in culturally diverse classroom?

Justification of the Study

Each study is important for the institutions, scholars, professors, students and the researchers who are interested in this area. Mathematics is an essential part of school curriculum, so every student should study. It has been taught for all pupils as a compulsory subject at school level as well as optional subject. Teaching mathematics is a difficult and challenging because of its nature, course content, social need, student interest and exploration of new field of knowledge. The world now has become a global community. Nepalese community can't live in isolation. We have to cope our challenges and need to stand upon our reality. If we try to meet the challenges, significant changes in education need to occur. Nepal's education sector suffers from several constraints that affect its efficiency and effectiveness. The educational reforms seemed to be able to convince the public of the benefit of change and not all the efforts made so far have brought desirable change.

In this context this study can make significant contribution on the school improvement process and building up the model of learning culture in an ineffective school. This study is helpful to get information about the effect of cultural diversity and difficulty in learning mathematics. This study has the following significances;

-) It offers the systematic ways to discourage discrimination among students
-) This study enables to manage classroom as an inclusive approach. in classroom activities.
-) Teaching is an art of the artist with skillful and tactful tasks so this approach is very helpful for teaching effectively.
-) It is also help to the teacher, parents and other common people to create better environment and awareness to provide positive attitude towards teaching.
-) It is helpful to be the integrated learning mathematics.
-) It is helpful to make the inclusive classroom teaching.
-) This study also helps to know the effect of individual difference in mathematics achievement.
-) This study provides the knowledge about the relation between culture and learning mathematics and difficulties in learning mathematics.
-) This study provides the different factors which effects in learning mathematics.

Delimitations of the Study

The delimitation of the study is as follows:

-) This study was limited in secondary level of Shree sarbajanik secondary school, chhatradev-5, Arghakhanchi.
-) This study was limited only the secondary level students.
-) The study was limited to the data collect from in-depth interview, observation and document analysis.
-) The study was based on qualitative analysis.
-) This study was limited only the responses of head teacher, mathematics teacher, parents and students.

Definition of Related Terms

Delimitations are boundaries that are set by researcher in order to control the range of the study. The proposed study was limited to the following aspects:

Culture. Culture has defined as the distinctive patterns of ideas, beliefs and norms that characterize the way of life and relation of a group within a society.

School culture. School culture reflects the values, beliefs and traditions of the school community delineation, the relation among students, parents, teacher and head teacher.

Diversity. The concept of diversity encompasses acceptance and respect. It means understanding that each individual is unique, and recognizing our individual differences. These can be along the dimensions of race, ethnicity, gender, sexual orientation, socio-economic status, age, physical abilities, religious beliefs, political beliefs, or other ideologies.

Cultural diversity. Cultural diversity is the existence of a variety of cultural or ethnic groups within a society.

Learning. Learning is the act of acquiring new or modifying and reinforcing, existing knowledge, behaviors, skills, values, or preferences and may involve synthesizing different types of information.

Achievement. In this study, student's achievement means the score obtained by the students.

Inclusive education. Inclusive education is a process of addressing and responding to diversity of needs of all learners on the classroom, in school, and on the society. Inclusive education creates suitable environment for all learners addressing multicultural differences.

Difficulty in learning mathematics. In this study, difficulty in learning mathematics belong difficulties in acquiring knowledge and skills of mathematics to the normal level expected of those because of cultural diversity.

Public school. All the government school in Nepal

CHAPTER- II

REVIEW OF RELATED LITERATURES

Review of related literature is an essential part of the research for the researcher because related literature helps and guides researcher to meet the motto of the study. A brief summary of previous researches and the writing of recognized experts provide evidence that the researcher is familiar with what is already known, and with what is still unknown and untested. Since effective research must be based upon past knowledge, this step helps to eliminate the duplication of what has been done, and provides useful hypothesis and helpful suggestions for significant investigation. The review of related literature should conclude with the summary of area of agreement and disagreement in findings. Review articles, that summarize related study, are often useful ensuring time and effort. By understanding a literature review we are able to critically summarize the current knowledge in the area under investigation, identifying and strengths and weaknesses in previous work. By reading many different studies, we will begin to gain an impression about the important aspects of the topic, identify data sources that other researcher has used, identify and become familiar with style of writing that is used-particularly within the ethos of the area that we are researching, identify ideas for further consideration and create our own reading and critiquing strategy.

So, I have collected some books, journal, articles, researches which are related to cultural diversity and difficulty. By deeply study of these resources, I am going to review the related literature as follows;

Empirical Literature

An empirical review in research methodology is when the write reviews the information and theories currently available concerning the topic and the historical background of the topic. The point is to do two things. First, it is to demonstrate through understanding of the field in which s/he is conducting research. Second, it is to show that the problem being studied has not to be done before or has not been done before in the way proposed by the writer. A study report came up with the finding, verbal problem; algebra and geometry were difficult area of learning for the students. Language of the students was too poor. To comprehend the language use in textbook as well as the teaching technique was almost traditional. Without the objective to identify the basic learning needs of primary school children of disadvantage and unprivileged population groups especially those rural and remote areas, in the context of Nepal, science,

Mathematics and social studies and to devise illustrative samples of teaching learning modules in private schools (CERID, 1993).

Wagle (2017) conducted the research study entitled “Classroom discourse in mathematics: A multicultural perspective.” She used questionnaire for teacher and students. Such as how are existing teaching strategies in classroom discourse from multicultural perspectives? And how are existing teaching strategies in classroom discourse as students friendly? She was used qualitative research design with case study approach. In this research, altogether 8 persons were involved according to purposive sampling techniques. Classroom observation form and interview guideline were the main tools of this study. She uses different theories to produce the information and draw conclusion on the study. Strategies to Promote Equity in...7 From the analysis of the data, she has found that theoretically teachers were well known about to preparation of lesson plan but practically teachers were unable to practice in actually classroom teaching. She has also concluded that for making classroom discourse students friendly through: culturally based pedagogy, by using different strategies in teaching-learning mathematics in the classroom, by replication of communities of practice in the classroom, by avoiding rote memorization, by implementing co-operative learning.

Upretee (2006) has carried out a case study research on “Classroom management from multicultural perspective.” The objective of his study has to find out the knowledge about multicultural perspective and to find out the actual situation of mathematical classroom management from multicultural perspective. This study was limited to the school with students from diverse cultural background in Kavrepalanchok district. The selected respondents were primary level students, head teacher and other teachers. They use different ways like observation from interview, guidance and school documents. This research was interpreted by using qualitative method. The major findings were teacher beliefs and understanding of multiculturalism directly affected the classroom and there were multiculturalism and its effect on the classroom. The level of understanding of multiculturalism was higher in Brahmins and Chhetris in comparison to Newars.

Molefe (2004) completed the Ph. D. on “Challenging Students Through Mathematics: A Culturally Relevant Problem Solving”. He raised the research questions: What are the students' concepts of mathematics when posed with culturally relevant problems? Using any language of their choice, can students' participation of their thinking help us understand their

learning process? What can we learn about student mathematical understanding when students are provided an opportunity to solve culturally relevant problems using their own thinking? To deal the above-research questions, he used participatory action research design and research tools were class observation, participants, journals, and transcripts of audio taped interviews. By this research, he found that, the belief system held by the teachers about mathematics is overflowing into students. Conceptual mathematics began to emerge as soon as we started solving culturally relevant problems. The revelation that the participants are able to use their own strategies to some success. They adjusted these when the need arose and they made reflections. These strategies helped them give their own meaning of the problem. The achievement by the struggling students is possible. Instruction that encourages culturally relevant problem solving, led the students to use their own individual strategies. Teachers must develop an effective strategy of communication.

He also concluded that, if given chance they can connect knowledge and practice by constructing previous experiences and previous agreed norm of community, class and culture. They learn through the use of their own language to communicate and feel comfortable in explaining their discoveries.

Adhikari (2006) carried out the study entitled "Cultural discontinuity and learning difficulties in mathematics; A case study of primary Dalit school children". Her aim were to identify the cause of difficulties in learning mathematics of Dalit children at school, to identify the influencing factors in learning mathematics for the Dalit children at school and to identify the impact of home environment of the Dalit children to learn mathematics at school. She raised the research questions: How do Dalit children feel difficulties to learn mathematics at school? Do other children influence Dalit children while learning mathematics? Do the teacher's behaviors influence Dalit children to learn mathematics at school? Do the school environment support their mathematics learning at school? And do the home environment of Dalit children support their mathematics learning at school? She used qualitative research design and tools were participation observation, in-depth interview. She concluded that caste system in Nepal appeared to be a focal point that has affected the everyday lives of people. That also affected their way of talking and behaving to other people, their relations, experience and perceptions towards other thing and people. It is the caste system that determines peoples' everyday lives and their occupation. Similarly, children adopt different learning strategies. Caste

system seems to be influencing factor for perception and thinking towards other people. The dalit have developed adominated nature. In every field whether it is in the home/community or in school, they have to be dominated, humiliated and oppressed due to their culture and poor languages. As they do not match with other experiences and everyday lives in learning mathematics. Cultural discontinuity was the main cause of learning difficulties in mathematics.

Adhikari (2007) carried out the study entitled “learning Culture in Mathematics Classroom in an Effective School (A case study)”. His aim was to explore the mathematics classroom culture and climate in an effective school. He raised the research questions: What types of learning culture is adopted in mathematics classroom effective school? And what is the relation between culture and learning mathematics? He used qualitative research design and the tools were non-participant observation, ethnographic interview and school documents. He concluded that indeed classroom is full of heterogeneity constituted and influenced among other things by the socio-cultural complexities. There is certain structure, culture and a value in which classroom is operated. They have their own rituals and traditions. The achievement of the students responds to the cultural capital of the students, the rich have different cultural capital than the poor students. The students from the matched and educated family have the opportunities to learn at home, they are also getting guidance from their parents. But in the school there were no any symptoms of discrimination between different cultural group students. The learning culture in the classroom is inclusive where every child can share their beliefs, values, norms among all member of such community.

Todd (2010) completed the Ph. D entitled “Supports Teachers, Learning Difficulties and Secondary School Culture (STLDs)”. Her main object was to add to the research literature and provide directions to enhance the provision of education services by STLDs for secondary students with learning difficulties and to examine how STLDs operate in NSW (New South Wales) government secondary schools; especially in terms of their modes of operation and whether these modes of operation were congruent with policy. She raised the research questions: To what extent are STLDs' reported current and preferred modes of operation congruent with NSW government policy? What differences exist among STLDs in terms of gender, age, teaching experience and teaching qualifications? What is the relationship between individual school cultural factors and STLDs' modes of operation? And what are the other influences on STLDs' modes of operation besides school cultural factors? To deal above research questions she used

the mixed method research design and tools were questionnaire, recording observations, artifacts, documents and interview. By this research, she found that there is a vital need for the presence of a sub-culture of learning support in secondary schools and for the STLD to play a major part in leading this sub-culture. The presence of certain additional factors is also essential for STLDs to work in the recommended modes of operation. These factors are: having empathy for teachers, the ability to persuade and act as a change agent, perception of situations and reaction to needs, ability to a positive profile in school, a high level of autonomy, flexibility, providing respect, enjoyment of job as STLD, and accepting and sharing responsibility in addition to commitment.

Pradhan (2010) carried out research entitled “Uncovering Frozen Mathematical Knowledge of Chundara: An Ethno mathematical Perspective”. His aim was to uncover the hidden mathematical knowledge of the Chudara. He raised the research questions: How do they acquire unschooled mathematical knowledge to perform their daily works? How are their mathematical knowledge tied up with the western mathematical knowledge? How can we link their artifacts and ways of doing work with the mathematical knowledge? He used qualitative research design and ethnography approach to deal above- research questions. The research tools were participant observation and in-depth interview. He found that the Chundaras culture have inherently mathematical activities, however, they have unspoken mathematical knowledge in their everyday activities. Thus, the relationship between social scientific knowledge and the everyday lives of Chundaras, their institution and their ways of making sense of the world is perhaps the trickiest one of all to address. He also concluded that Chundaras have their own ways of teaching and learning approaches. Chundaras teaching and learning approaches involve observation, practice, estimation and imitation. Besides these, Chundaras made the wonderful wooden stuffs involving high level of knowledge and skill. They used high level of mathematical concepts and knowledge while constructing wooden materials. They have the indigenous ways of knowledge generation and distribution of the acquired knowledge to their generations.

Hartas (2011) carried out a study entitled “Families' social backgrounds matter: Socio-economic factors, home learning and young children- language, literacy and social outcomes”. Her aim was to examine the relationship between parents' socio-economic factors and home learning at ages three and five and their impact on child language, literacy and socio-emotional competence at the end of the first year of primary school. She raised the research questions: Are

Are there any differences in the number of parents involved with their children in home learning prior to (age three) and after the start of formal schooling (age five) as a function? What are the effects of socio-economic factors and the frequency of home learning (e.g. homework, enrichment activities, and emergent literacy activities) on children's language/literacy and social competence as measured by teachers at the end of the first year at school? Are family income and maternal educational qualifications associated with a differential variation in children's language/literacy skills and social-emotional competence? She used quantitative research design. She concluded that the effect of socio-economic disadvantage on children's development have been explained through parent's decisions about how to allocate arrange of resources, for example money, time and energy (investment model). The amount of money parents spend on children (e.g. purchasing books, toys) and the time they spend with them in joint activities (e.g. reading books) are considered investments that have the potential to enhance children's cognitive skills and language and emergent literacy. The investment model often explains the link between family income and children's cognitive and linguistic development, whereas the link between socio-economic disadvantage and children's behavioral functioning is explained through the impact of poverty on parental skills and capabilities and has been found to be modest.

Ghimire (2013) carried out a study entitled "Promoting and Demoting factors for professional development of mathematics teachers in Nepal". His aim was to explore the promoting and demoting factors of professional development for mathematics teachers. He raised the research questions: How do mathematics teachers mean by professional development? What are the areas of their professional development? What efforts have been made for the professional development of mathematics teachers? What are the encouraging and discouraging forces? And what are the obstacles for the professional development of the teachers? He used mixed method research design to deal above- research questions. He used chi-square and inferential statistics method to analysis collected data. He found that professional development as skill for the time management as a tool for developing contents and pedagogical knowledge as a skill in the use of information, technology, process for modernization. In the same way professional development ensures the continuous attachment with academic community, method of survive, method of self-satisfaction, a skill of balancing the household life and social life. He also concluded that the motivation towards students success, level of experiences, nature of the job, qualification of teachers, opportunities for professional development and career development requirement for the

promotion and maintaining the hierarchy on the post, capability to develop the decision making, access to benefit, preparation time, financial factors and attitude of teachers were the influencing factors for the professional development.

Acharya (2013) carried out a study entitled “Problem Encountered in Teaching-Learning Mathematics in Multicultural Classroom”. His aim was to explore the problems faced by students in learning mathematics in multicultural classroom at primary grades, and, to explore the challenges faced by teachers in teaching mathematics in multicultural classroom. He used qualitative research design and ethnography approach. The research tools were interview and observation. He found that the school environment was not suitable for the mathematics learning for culturally diverse students. There were communication problems between teachers and students at mathematics classroom. The teachers were found incompetent in teaching mathematics in multicultural situation as they were not trained for this purpose. Further, the pedagogies they were found mono-cultural using Nepali language. Mathematics has been conceived as a difficult subject and hence this hegemony may have contributed to creating problems in mathematics teaching learning activities in the classrooms. He also concluded that the present primary level mathematics curriculum materials should be revised. It should be better to introduce inclusive curriculum for every cultural group. The knowledge of learners is silent receiver of the prepared knowledge. The lessons are not contextualized. So, we must change this scenario of education system of Nepal.

Pangeni (2014) carried out the Ph. D on “Factors Influencing Quality of Education: A Case Study of Eighth Grade Students' Mathematics Learning Achievement in Nepal”. He raised the research questions: what are the factors affecting mathematics learning achievement of eighth grade students in Nepal? And what are the mathematical knowledge/concepts and skills associated with each other, and which are the knowledge and skills essential to develop further mathematical knowledge onto them and then, to improve the mathematics learning of eighth grade students in Nepal? To deal the above research questions, he used quantitative research design and he used four types of instruments- mathematics tests, and questionnaires for students, head teachers and mathematics teachers. Multi-stage random stratified sampling method was used to select the samples and multiple regression analysis, weighted mean, one way ANOVA methods were used to analyze the data. He found that, numbers of family members, fathers and mother's education, numbers of books at home and

presence of certain household items were significantly related to student's mathematics learning achievement in Nepal. The effect of the level of mother's education was estimated stronger compared to the father's level of education on their children's learning achievement in mathematics although fewer mothers have completed secondary education compared to that of fathers. There are two possible reasons for the higher effect of mother's education level. The first reason is that mothers are less employed than fathers regardless of their level of education, which provides mothers more opportunities to spend time with their children and on their schooling. And second is explainable by ownership on household resources, particularly land. It is believed that the distribution of resources is more effective when women participate in decision making about the use of resources. There are negative relationships between family size and students' mathematics learning achievement. Students with smaller families outperformed children in larger families. The availability of additional books at home and the possession of certain items eg. Radio, bicycle, water tap, cassette player, television, telephone, gas stove, computer and motorbike, which reflects a family socioeconomic status (SES) is significantly related to students' academic achievement. The effect of student's characteristics as measured by gender, ethnicity, absenteeism, homework completion, perception of their mathematics teacher, time spent on household chores, and preschool experience were examined in the second model and found a significant relationship with mathematics achievement. Gender was significantly related to mathematics achievement. Boys have high socioeconomic status (SES) than girls measured by completion of father's and mother's level of education, additional books at home and possessions at home. The findings indicated that ethnic background of student is negatively associated to students' learning achievement in mathematics.

Despite significant improvement in school participation at all levels of school education, grade repetition and school absenteeism are still the major concern for educational development of Nepal. Teacher-student ratio is negatively associated with students' mathematics learning.

Khanal (2015) completed the Ph.D entitled "Learning Strategies of Mathematics Students". His aims were to explore students' learning strategies in mathematics, to analyze the differences in students' learning strategies by gender, ability group, location and school types, to identify the most effective learning strategies for better achievement in mathematics, to examine classroom practices as learning strategy promotion activities, and to determine the factors contributing to the formation of learning strategies. He raised the research questions: what are

the learning strategies of students in mathematics? What learning strategies do secondary level school students adopt most to solve mathematical problems? What difference is there between boys and girls students in their preferred learning strategies? He used mixed method research design to deal above research questions. The research tools were questionnaire, observation and open ended interview. He found that students created and used different learning strategies while learning mathematics like: peer learning, elaboration, help seeking, effort management, rehearsal, time and study management, organization, Metacognition and critical thinking. The present curriculum of mathematics was elite favored and designed to meet the need of urban school students. As a result urban school students used more learning strategies; but rural school students depended on limited learning strategies, teachers' teaching strategies had contributing role in promoting students' learning strategies. However, mismatches existed between teacher's teaching strategies and students' learning strategies. The effective teacher was an extremely good classroom manager. Effective teaching and learning could not take a place in a poorly managed classroom. Most of the mathematics teachers used indifferent teaching strategy in class. They were indifferent towards the personal life and behavior of students. Teaching and learning situation in the school was an important contextual factor for the development and use of learning strategies. Secondary school mathematics teachers in Nepalese school used traditional teacher-centered approach for teaching mathematics without encouraging students to participate in the classroom activities.

He also concluded that students attempt to memorize material by repeating over and over. Similarly, they even elaborate by summarizing and putting the materials in their own words. They are also involved in deeper processing through the use of various tactics such as note-taking, drawing diagrams, listing, developing concept map or organizing materials in some manner. Students even use critical thinking strategies to learn mathematics. Students do certain planning, summing and setting up goals as promoted by met cognition strategies. In addition, they performed to seek assistance from their peers, teachers and elders. Asking for help is a good strategy as it allows students to learn from others when s/he cannot deal with the problem alone. They learn in different ways like: by seeing and hearing, reflecting and acting, reasoning logically and intuitively, analyzing and visualizing steadily. The action of varied students produce varied strategies in learning. However, peer learning, elaboration, help seeking and effort management are the learning strategies mostly used by the mathematics students. There is

significant difference between urban and rural school students in their use of learning strategies. Rural school students' family background, attitude, environment, cultural value system, limited exposure to the learning resources and materials are the major causes for these differences. Teachers' teaching strategies have a significant role in promoting learning strategies. Classroom practices play significant role in promoting students' learning strategies. The nature and design of mathematics curriculum is one of the important contributing factors for the strategies. Goal-oriented learning is another significant factor for the formation of effective learning strategies.

Acharya (2015) carried out the Ph. D on the topic, *Relevance of Primary Level Mathematics Education in Nepal: A Cultural Perspective*. He raised the research questions: To what extent are the existing primary school mathematics curricular materials students' cultures friendly? How are the pedagogy used by the teachers in multicultural classroom culturally relevant? What challenges/problems are faced by teachers and students while teaching- learning mathematics in the multi-cultural classroom? What vision do mathematics educators, mathematics teachers, educated cultural group people and curriculum planners have for making primary mathematics education culturally relevant? In dealing with research questions based on the above themes, he used ethnographic methodology under interpretive paradigm to explore the multiple realities through the methods of observation, documents analysis, and in an interactive or dialectical manner. The data have been analyzed using a sequential process of transcribing, coding, categorizing, and thematizing. The phenomena have been visualized from multiple theoretical perspectives and the researcher's own reflections or insights. He found that contents of primary mathematics curriculum were related to the everyday problems of human life to some extent. However, these were not sufficient to solve practical problems related in various dimensions of daily life. Further, the existing pedagogical practices were less appropriate to address the multicultural classroom environment. There was a huge gap between the practice and the theory of culturally responsive teaching learning process. Moreover, the medium of instruction was found to be a key challenge in the multicultural classroom teaching- learning process. De/contextualization of mathematics teaching- learning activities, incompetent teachers in teaching mathematics in multicultural situation, mono-cultural pedagogies, and contents dominated by ideologies of western culture were found challenges of mathematics education. He also found that the application of fallibility approach rather than absolutistic one in teaching learning activities, mother tongue based primary education, incorporation of local mathematical

knowledge in the curriculum; culture friendly pedagogy and continuous assessment system are the major approaches to make mathematics education culturally relevant in primary level.

Likewise, teaching learning mathematics is to be linked with the culture of students, associating it with the real life situation, mitigating the existing dilemma of making culture unfriendly curriculum and promoting multiculturalism as well as culture friendly assessment is to be the other important aspects to make mathematics education culturally relevant. Thus, from the above literature review, it can be noticed that the studies about the cultural diversity and difficulty in learning mathematics have not been done any researcher. I have chosen this topic for generating various causes of difficulty faced by diverse children in learning mathematics. I claim that, the topic is new and oriented in the research process.

Theoretical Literature

There are many learning and sociological theories, which can be used for the analysis and interpretation of data such as cultural reproduction theory, social learning theory, everyday life theory and cultural difference/discontinuity theory and so on. So, for the analysis and interpretation of data, I will use a Cultural reproduction theory, Cultural discontinuity/difference theory and everyday life theory.

Vygotsky's socio-cultural theory. According to socio-cultural theory, knowledge is the best constructed when learners collaborate together. Students supports one another and encourages new ways to form, construct and reflect on new materials. Social interactions and participations of group members play a key role in developing knowledge. Vygotsky believed that parents, relatives, peers and society all have an important role in forming higher level of functioning. Vygotsky's socio-cultural theory of human learning describes learning as a social process and the origination of human intelligence in society or culture. The major theme of Vygotsky's theoretical framework is that social interaction plays a fundamental role in the development of cognition. Vygotsky believed everything is learned on two levels. Strategies to Promote Equity in...¹⁰ First, through interaction with others, and then integrated into the individual's mental structure, every function in the child's cultural development appears twice: first, on the social level, and later, on the individual level; first, between people (interpsychological) and then inside the child (intrapsychological). This applies equally to voluntary attention, to logical memory, and to the formation of concepts. All the higher functions originate as actual relationships between individuals. (Vygotsky, 1978) A second aspect of Vygotsky's

theory is the idea that the potential for cognitive development is limited to a "zone of proximal development" (ZPD). A teacher or more experienced peer is able to provide the learner with "scaffolding" to support the student's evolving understanding of knowledge domains or development of complex skills. Collaborative learning, discourse, modeling, and scaffolding are strategies for supporting the intellectual knowledge and skills of learners and facilitating intentional learning. Vygotsky's Zone of Proximal Development "the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance."

Bourdieu's cultural reproduction theory. In this theory, Bourdieu suggests that the major role of education system of schooling is cultural and social reproduction of the culture of the dominant classes. He found that school holds the cultural capital of controlling class and transmits it unevenly to children. Bourdieu (1977); argues that cultural capital through education can be converted into health and power. Students who are from the middle class and above have advantages because school is adopting their culture. Therefore the children from upper class take more benefit out of school than lower class counterparts. The skills and knowledge which is transmitted in the classroom, is alien to the lower class children and hence, they usually fail. In other words, the achievement of the students responds to the cultural capital of the students, the rich have different cultural capital than the poor students. The poor and the working class children lack favorable situation and appropriate cultural capital. Thus, they fail in examination and never enter higher education. Therefore social inequalities are reproduced and legitimated. The main reason for under achievement of working class children are the education systems because it reproduced the culture of dominant class, which is based. This is way the children from the working class and the income poor do not understand more and learn specific skills. On the other hand, the school environment is comfortable for the middle class parents depend on the teacher to educate their children whereas lower class parents do not supervise and monitor educational progress of their children. It is also a part of culture. For parental background to engage in the social reproduction process via cultural capital, parental cultural capital needs to be transmitted inter-generationally.

But this requires four conditions: first, a strong association between parental and pupil's cultural capital must exist. Second, this cultural capital must persist over time. Third, parental cultural capital must exert significant effects, after controlling for other background factors, on an

offspring's initial occupational achievement. Finally, the effects of parental social class on offspring's occupation must be significantly mediated by offspring's cultural capital. For transmission to translate itself into stratified educational outcomes. We need to know whether the effect of parental cultural capital persists significantly on the offspring's educational outcomes before that offspring enters the labor force (Tzanakis, 2011).

Cultural discontinuity and difference theory. In the cultural discontinuity theory, Ogbu (2000) deals with the problems in children's learning caused by the differences and discontinuity between the culture at home and school. He says that those children whose home culture is much similar to the culture of school can cope easily with the system that may result in better learning achievement. Similarly, the children with unmatched and dissimilar home cultures with school cultures do not have enough attention in their learning and do not get much recognition of their cultures and they have to work harder to achieve learning outcomes compared to the children with good matches. Ogbu emphasized learning not only the product of the culture and language differences but the nature of the relation between the culture and language of minority, disadvantaged and dominant groups. The dominant group controls the school system through implementing curriculum and using languages as the only means of instruction.

Ogbu (2001) has emphasized on two types of cultural differences i.e. the primary cultural differences of voluntary minorities and the secondary cultural differences of involuntary minorities. His study suggests, involuntary minorities face more difficulties in school learning, participation and performance due to a big gap between their culture and mainstream culture. For them, it is too difficult to cross cultural boundaries in school compared to the voluntary minorities with the primary differences. He further elaborated that primary cultural differences may create problems in interpersonal and inter-group relations as well as difficulties in academic work for several reasons. Among them, the most important reason is that children with different cultural backgrounds start schooling assuming different cultural worlds and human relations in school but they get a vast different reality in school. Next, lack of necessary concepts and skills in their own cultures may obstruct their learning.

Finally, differences in teaching style and learning strategies may be an important reason that affects their learning. Ogbu (2001) argues that the secondary cultural discontinuity is evolved after members of two population groups with distinct cultural backgrounds have been in touch or they have started to participate in an institution like school which is controlled by another group,

the dominant one. The dominant group sets school system in accordance to their own convenience and benefits e.g. their norm, value and aspirations in the curriculum, medium of instruction, and teaching/learning approaches that suit to them. But the dominated group gets on unfamiliar and unrealistic curricular content and their cultural resources do not match with overall education system so that they face difficulty in learning and participation that leads to their failure, dropout and exclusion. Due to collective institutional discrimination and display like school system, they tend to exclude from the mainstream with social and economic problem that leads their lives to miserable condition.

In addition such subordinate groups under caste stratification with discrimination do not have opportunity and accesses to privileges, reward or positions considered as prerogatives of dominant group because of already fixed socio-cultural systems or legal mechanism which are made by the dominant group. Therefore, the children from disadvantaged caste tend to develop coping behavior and attitudes that are different to school culture that obstructs their learning. Secondary cultural discontinuities have difficulties to identify, point out and locate in school due to their diffuse nature with a deep root in the society. They are generally developed as a response to a contact situation involving the domination of one group by another subordinate group. The features of secondary cultural discontinuity are less specific, more diffuse and stylistic that creates difficulties in identifying and comprehending them. There are always dilemmas that the dominant group does not know or does not want to know about the cultures of subordinate group by saying difficult to know because of the multicultural existence of children in school/society. It is just an escaping trend and nature of the dominant group, the higher caste people from including the subordinate group or disadvantage group into the mainstream.

Everyday life cultural theory. Everyday Life and Cultural Theory provides a unique critical and historical introduction to theories of everyday life. Since every individual is member of a family/society, s/he willing or unwillingly performs certain action and activities that determine her/his everyday life through which s/he learn to adjust her/him in this society. Although the activity of everyday life of people either is obligatory or optional, people learn to arrange/adopt strategies for learning, knowledge building and to derive meaning in their life. The study of everyday life can be useful for understanding and deriving meaning from the actions and activities of every individual in their everyday life accomplished through spontaneous and taken-for-granted mode. Madsen (2001; cited in Adhikari, 2006) conceptualizes everyday life as

everyday works of individual that give certain meaning. In addition, Madsen (2002), further illustrates, Everyday life is to be understood as a large number of heterogeneous activities human beings deal with every day. Everyday life provides framework for individual works that guides to bring and sustain meaning from variant and manifold activities. Everyday life is what people perform and how they perform that activity in a taken-for-granted manner. Since children also learn from their everyday life that determines the learning strategies of children, it is worth the effort to link the educational activities with their day to day experience so that the needs and demands of children can also be considered through schooling. If children have different learning strategies, which they acquire from practicing their everyday life they may face difficulties in learning because their learning strategies are not emphasized or not known to teachers.

For example, if children have the habit of learning through observing activities and involving in the activities and if they get opportunity to involve only in listening activity, since lecturing is prime method in classrooms, learning does not take place. If teaching/learning activities in school are separated with the everyday life difficulties in learning children, they have to learn alien knowledge, feel difficulties in learning and the knowledge gained through such learning will also be worthless for the children. In this notion, it can be argued that whose knowledge is worth for learning, other's or own knowledge? Or what is the meaning of learning if it has no meaningful implication to everyday life of children? In educational context, according to Madsen, everyday life has closely related to teaching, learning and schooling. The accounts of everyday life allow the capturing detail behaviors, practices and roles of teachers, students and other concerned people that would otherwise have been difficult to explore. Nonetheless, everyday life is also reflexive of socio-cultural prospect of particular place and people. In addition, everyday life in broader context gives continuity to the social order and culture.

Filling the gap

Overall review of related literature shows, cultural diversity is the major point in learning mathematics. Due to the different culture mathematical learning is affected. Socio-economic factors, difference languages, school environment, home and school culture, different learning strategies, teacher's professional skills and knowledge are the factors which affects in learning mathematics. The cultural background is the main pillar of learning. From the above review of literature, what are the causes of difficulties in learning mathematics of culturally diverse students at school? What is the relation between culture and learning mathematics? And how teach

effectively in culturally diverse classroom? It is important to explore about it. But there is few research to explore such a culturally diversity and difficulty in learning mathematics. There was a gap that the different cultural causes and factors on learning mathematics. So, through this research I was to identify the causes of difficulties in learning mathematics of culturally diverse students at school and the relationship between culture and learning mathematics.

Conceptual Framework

The study is on “Cultural diversity and Difficulty in learning Mathematics” was based on following conceptual framework.

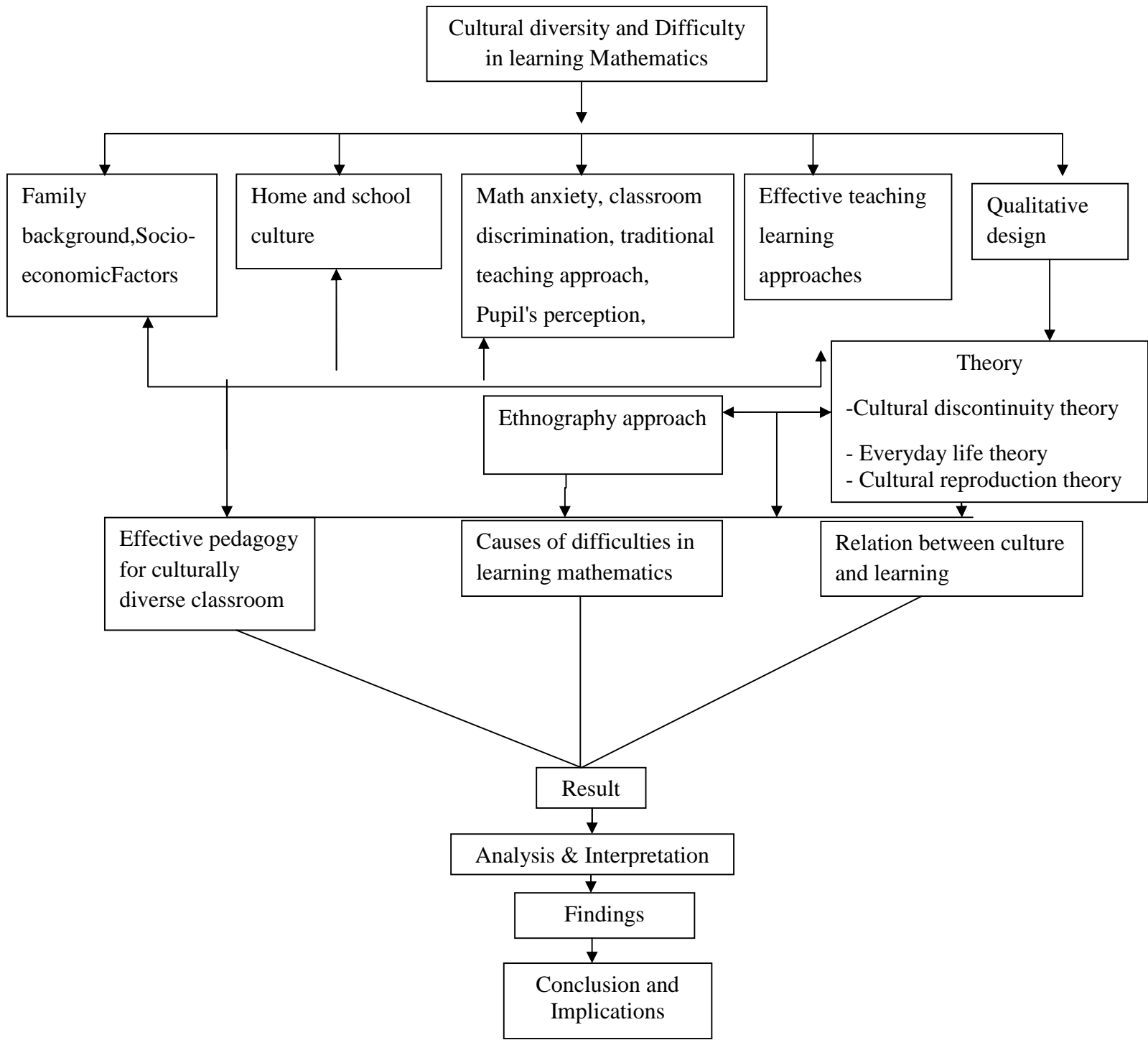


Figure:1. Conceptual Framework.

CHAPTER- III

METHODS AND PROCEDURES

The researcher was adopted the following methodological procedures to achieve the objective of the study.

Research Design

A research design is the document of the study. Research design is the framework that has created to seek answers to research questions. This study based on the qualitative research design with ethnography approach that especially concerns with exploring meaning and the way people understand things. Qualitative research is interpretive in nature and the theoretical base is subjective reality as truth, a real knowledge (Sharma, 2011, p.18). Qualitative research can be regarded as, naturalistic inquiry in a sense that it is conducted in natural setting by trying to avoid any intentional manipulation and distortion of the environment of the informants by the researcher (Tames W, Stigler & Michelly Perry, 1998; as cited in Creswell, 2007).

Qualitative research begins with assumption, a worldview, the possible use of a theoretical lens, and the study of research problems inquiring into the meaning individuals or groups ascribe to a social or human problem. To study this problem, qualitative researchers use an emerging qualitative approach to inquiry, the collection of data in a natural setting sensitive to the people and places under study, and data analysis that is inductive and establishes patterns or themes. The final written report or presentation includes the voices of participants, the reflexivity of the researcher, and a complex description and interpretation of the problem and it extends the literature or signals a call for action (Creswell, 2007).

Qualitative researcher study things in their natural setting attempting to make sense of or interpret phenomenon in terms as of the meaning people bring to them. Qualitative research involves the studies and collection of a variety of empirical materials- case study, personal experience, life history, interview, observational, historical, interaction and visual texts that describe routine and problematic moments and meaning in individual's lives (Dinzing & Lincoln, 1994; as cited in Adhikari, 2006). Since, human behavior was always bound to the context in which it occurs, the social reality, e.g. human cultures, cultural artifacts and institutions, through which human experiences derive its meaning from social, historical, political influences. Such human behaviors are difficult to reduce to variables in the same situations as physical reality. It needs qualitative inquiry that seeks to understand human and social behavior.

One of the important things in qualitative research is that the researcher has to perform a role of human tool of data collection that needs relevant and appropriate knowledge and skills about it. Qualitative research emphasized on inductive analysis of data that proceeds to find theory to explain the data.

Ethnography Approach. Ethnography is a specific form of qualitative inquiry. It enables us to research the realities embedded in a socio-cultural setting. It helps to understand the cultural world of the researched from their perspectives. Further, it intends to capture detailed and in-depth description of everyday life practice of people (Hoey, 2014; as cited in Rai, 2015). Ethnography focuses on an entire cultural group. Sometimes this cultural group may be small (a few teachers, a few social workers), but typically it is large involving many people who interact over time (teacher in an entire school, a community social work groups). Ethnography is a qualitative design in which the researcher describes and interprets the shared and learned patterns of values, behaviors, beliefs and language of a culture-sharing group (Harris, 1968; cited in Creswell, 2007). As both a process and outcomes of research, ethnography is a way of studying a culture-sharing group as well as the final written product of that research.

As a process, ethnography involves extended observations of the group, most often through participant observation. In which the researcher is immersed in the day-to-day lives of the people and observes and interview the group participants. Ethnographers study the meaning of the behaviors, the language, and the interaction among members of the culture-sharing group (Creswell, 2007). The central aim of ethnography is to provide rich, holistic insights into people's view and actions, as well as the nature of the location they inhabit, through the collection of detailed observation and interviews (Reeves, Kuper, & Hodges, 2008). Analysis of ethnographic data tends to be undertaken in an inductive thematic manner: data has examined to identify and to categories themes and key issues that emerge from the data. Through a careful analysis of their data, using this inductive process, ethnographers generate tentative theoretical explanations from their empirical work. To enhance the quality of their work ethnographers was often provide a detailed or thick description of the research setting and its participants, which was typically based on many hours of direct observation and interviews with key informants (ibid). In this study, I had chosen the ethnography approach because of my research objective and research questions. My objectives of this study will to identify the causes of difficulties in learning mathematics in culturally diverse classroom at school and to explore the

relation between culture and learning mathematics. I thought that only the ethnography approach could fulfill my objectives, so I had applied this approach in this study.

Population of the Study

Every research needs the population. Without population research cannot be conducted. It has the crucial role. So, the researcher made the population where studied. The population of the study consisted secondary level students in Arghakhanchi district.

Study Area/Field

The research area selection is also a very important task for the study in order to obtain easy access, establishing immediate rapport with informants and gathering data directly related to the research objectives. Every study needs study area; researcher was choose one public secondary schools of Arghakhanchi district the name of school is shree sarbajanik secondary school, chhatradev-5. I have a convincing reason for selecting the school that it is located where the culturally diverse students are studying. The school was established in 2015 B.S. At the present there were 20 teachers including head-teacher. The school had the classes from 1 to 10 with 350 students. The students of this school were from diverse community. Most of them were indigenous and some were from Dalit community.

Respondents.

First, I had visited the school and meet head-teacher. I told all about my study, and I gave my research proposal. After that, the head-teacher agreed to give permission for me. He inform for all teachers about my study. I was take permission to observe grade nine and ten. After continue five days class observation, I had selected two students from grade nine, among them one boy and one girl as well as two students from grade ten, among them one boy and one girl. Two mathematics teachers and head-teacher were also select from shree sarbajanik secondary school selected by purposive sampling. The selection of this particular group of students was based on their different social and cultural backgrounds, their willingness to participate in the study, their parent's interest and supports for the study and their different levels of mathematical understanding. I used the purposive sampling technique for the selection of participants.

Data Collection Tools

The study intends to find the affecting factors behind the cultural diversity in learning mathematics in governmental school. To fulfill the purpose of the study different tools was selected for data collection. Thus, the observation notes, in-depth interview and document analysis was be use as tools for the data collection

Observation. Observing in a setting is a special skill that requires addressing issues such as the potential deception of the people being interviewed, impression management, and the potential marginality of the researcher in a strange setting (Hamersley and Atkinson, 1995; as cited in Creswell, 2007). Observation is a kind of tools that help to seek knowledge through the use with sense i.e. eyes, nose, tongue, and skin. It has great importance not only in research work but also in our daily lives. (K.C, 2000; as cited in Adhikari, 2007) writes that direct observation has the advantages of putting researchers into first hand contact with reality. In this study, observation was used to capture the physical setting that is the physical environment of school and classroom, the human setting that is the organizations of students in the classroom and interaction setting that is the participation as well as interaction of teachers with students and vice versa.

Observation guideline was developing with reference to research objectives. The teachers would be pre-informed about the purpose of observation and their permission was taken before entering into the classroom. My roles during the observation was that of non-participant observer noting down the things as it occurred and making notes of the things that were noticed. Observation helped me in collecting detail information about respondents, their everyday practices and capture actual experiences of the participants. Since, the Nepalese classroom constituted by different socio-cultural forces because students from different background have their own lived reality and in the classroom they are not simply conform norms and values of the school. To get required information regarding mathematical concepts, I observed school overall as well as key respondents individually and collectively during their work at school, classroom, playing with peers, interacting with teachers and friends, school behavior, culture, and participation. I had also observe teachers collaboration and discussion in subject matter, participation of students in classroom activities as well as extracurricular activities in terms of gender, caste, religion etc., teacher's behavior towards students in teaching learning process, and teaching learning strategies of teachers and students.

In-depth Interview. Interview is a two-way interaction between researcher and researched as in the form of interviewer and interviewee in which interviewer creates situations that can attract the attention of respondents for a enough period of time in asking questions and answering the questions which interviewee puts his/her understanding and meaning (Wikipedia). Kerlinger (1986; as cited in Adhikari, 2006) describes interview as face to face interpersonal role situation in which one person, the interviewer, asks a person being interviewed, the respondent and questions designed to obtain answers pertinent to the purpose of the research problem. In-depth interview also known as unstructured interview could be regarded as informal interview. It was used to discover the in-depth understanding of people in the context under the study (Bailey, 1982; as cited in Adhikari, 2006). It can be done in a day to day conversational way in which interviewer does not know whether s/he had been interviewing or not. This interview helped to create a friendly situation that opens up a free feeling environment for both researcher and respondent.

In this study all, the required information was not possible to gather through the observation and documents. To go in-depth of the information interview was much more helpful. So, I carried out open ended interview to clear his/her difficulty regarding learning mathematics. Since some questions had raised according to the situation available. I took in-depth interview of all four key students using unstructured questionnaires. After the interview of the key students, I had also taken the interview of head-teacher and two mathematics teachers.

Documents Analysis. The review of documents is an approach, which researchers use to gain a detail understanding of the setting analyzing the content of a given document (Bajaracharya, 2009). Document analysis is an inquiry, which review yield experts, quotations or entire passage from records; memorandum, publication are reports (Best & Kahn, 2004; as cited in Bajaracharya, 2009). In my study, research reports/dissertations (as stated in reference), various journals and articles were help me to identifying the guideline for observation and components for interview as well as arriving at the research objectives.

Quality Standard

After completing the construction of the research tools, it is necessary to maintain quality standard. For quality standard, I used cross match, triangulation, member checking, prolonged stay in the field. For quality standard, I followed the following ways:

Credibility. This concept replaces the ideas of internal validity, by which researchers seek to establish confidence in the truth of their finding. To maintain credibility of my research I tried to spend as much time as the observation needed and engaged with different people with their work. After getting information I wrote notes, I had asked similar types of questions to others people and tried to find real practices from those information.

Transferability. Transferability replaces the concept of external validity. This criterion refers to the applicability of finding in one context (where the research is done) to other contexts or setting (where the interpretations might be transferred). To maintain transferability I was explain mathematical practices found in different community students briefly. I tried to capture most of scenario by using thick description of observation, interview and my meaning making.

Dependability. This concept replaces the idea of reliability. This is the third standard for judging qualitative standards and refers to stability or consistency of the inquiry processes used over time. To maintain it I was present the logic used for selecting people and events to observe, interview and include in the study. I would try to maintain credibility and transferability to ensure dependability standard.

Conformability. A fourth standard is conformability, which refers to the quality of the results produced by an inquiry in terms of how well they are supported by informants who are involved in the study and by events that are independent of the inquiry. This is sometimes referred to as the audit trail (a record of how decisions were made throughout the study). I am also the part of students, so, to maintain conformability before concluding information I reviewed that information myself several times and sometimes I conform that information to my other students/friends before concluding information as well.

Data Collection Procedure

Data collection refers to gathering information from vivid sources through the application of multiple data gathering methods to attain the objectives of the research under consideration (Niure, 2014). For this study, the data and information was collected using tools as observation, in-depth interview and documents analysis and so on in order to collect information the respondents. To collect the primary and secondary data, class observation would be done regularly during teaching learning activities. I observed, listening, interaction and recorded the essential data from the information on the basis of observation from classroom behavior, interest, and needs in mathematics learning. With the help of semi-structured interview schedule and

questionnaire, the in-depth interview was taking with key students, mathematics teacher and head teacher. The interaction with the respondents was carefully listened and recorded properly. Related documents also reviewed and analyzed on the basis of need. The data from interviews consists of direct questions to people about their experiences, opinions, feelings and knowledge. The data from observations consists of detailed description of people's activities, behavior, actions and the full range of interpersonal interactions and organizational processes that of observational process, human experiences. And data from document analysis consists of expert's quotations, program records, memorandum and correspondence, and reports, personal diaries and open-ended written responses to questionnaires and surveys (Creswell, 2007).

Method of Data Analysis

Data analysis in qualitative research consists of preparing and organizing the data for analysis, then reducing the data into themes through a process of coding and condensing the codes and finally representing the data in figures, tables or a discussion (Creswell, 2007). In this study, the data collected through above mentioned tools from different respondents and sources were processed in different steps. First, the data from interview in the tape recorder will be translated in English. The writing and reading of transcripts allowed me to generate common codes and themes as well as the issue that have anticipated. Further, this coded sentences that expressed similar meaning would be segmented into common categories. Finally, after revising those categories, smaller specific themes in line with the research questions was generated.

For the purpose of analysis, the themes were analyzed for answering the research questions. The important paraphrases with same meaning would bring together and summarized to support the argument whereas less relevant passages with same meaning skipped for the ease of analysis. Cross match or triangulation adopted to maintain the validity and reliability of the results of the study. Mainly the three sources of the information was triangulated in classroom observation, teaching learning styles of mathematics, and interview with head-teacher, mathematics teacher and key students in addition with field notes. Then after, with the help of theories the analyzed texts interpreted and summarize. Thus, analysis of the statements from the specific themes was done and theories would use to interpret the meaning, values, experiences, opinions and behavior of respondents from the analyze themes and answer the research questions. The data analysis and interpretation part divided in three sections on the basis of research questions. The first section discusses about the cultural diversity in Nepal and causes of

difficulties in learning mathematics of culturally diverse students at school. The second section explains the relation between culture and learning mathematics. The third section discusses about effective pedagogy for culturally diverse classroom.

Ethical Considerations

If any kind of research involves the person, special attention should be paid to the person's rights, dignity, freedom, and privacy (Khanal, 2019). The ethical considerations of my study where I observed the classroom only to take the permission with the subject teacher of related school, interviews was conducted only after giving all the prior information to the participants about the study and getting their approval, data has not been collect for my personal gain and my personal benefit, respecting the diversity in school the data collected in a biased manner, comfortable language was used in the data collection process for easily understandable to the participants, and at last name & address of participants have been published in the statistics only with their approval.

Chapter-IV

ANALYSIS AND INTERPRETATION

This chapter deals on the sorting out and establishing connection of the different concepts and theme. The word „analysis means breaking of a whole into meaningful parts/components (Sharma, 2011, p.61). In qualitative research, long interview text, observation notes, documents, photographs etc. are the data and a systematic arrangement and categorization is the first phase of analysis (ibid). Different researches are used to make the analysis and interpretation understandable. During the study, I conducted different observation and interview. Direct observation was done every day in classroom and classroom activities. Interview had taken with key students, teachers and head-teacher with the help of semi-structured interview schedule.

The method used in this study was basically interpretive because this study analyzes and describes the cultural diversity in mathematics classroom. My objectives of this study were to identify the causes of difficulties in learning mathematics at culturally diverse classroom at school, and to explore the relation between culture and learning. In addition, research questions of this study were what are the causes of difficulties in learning mathematics of culturally diverse students at school? What is the relation between culture and learning mathematics? How teach effectively in culturally diverse classroom? In this regards, this chapter divided in three sections. The first section discusses about the cultural diversity in Nepal and causes of difficulties in learning mathematics of culturally diverse students at school. The second section explains the relation between culture and learning mathematics. The study mainly related to analyze and discuss about the different cultural background of students and their learning style, opportunities and difficulties in learning mathematics. The study also focused on relation between culture and learning mathematics and effective teaching learning activities.

Section I: Causes of Difficulties in Learning Mathematics of Culturally Diverse Students at School.

Cultural Diversity in Nepal

Nepal According to the Census Report 2021, the population of Nepal has reached 29,192,480, which is an increase of 2,697,976 compared to a population of 26,494,504 ten years ago. Since 2011, Nepal's population has grown by 10.18%. However, the average annual growth rate is 0.93%, a decrease from the data reported in the Census Report of 2001-2011, which presented a growth rate of 1.35%. The decrease in the population growth, the lowest in 80 years,

is the result of several factors including decreasing fertility rate, increasing migration, public health, and urbanization. The fertility rate in Nepal has declined over the years, from 2.516 in 2011 to 1.853 in 2021. Additionally, the decision of families to have fewer children with the average family size being 4.33 compared to 4.88 from the last report, due to increasing living costs and employment of parents is believed to have contributed to this decline. The official language is Nepali, which is spoken as a first language by 44.6% of people, followed by Maithili with 11.7%, Bhojpuri with 6% and Tharu with 5.8%. There are ten religious groups reported in the 2011 census. The majority in Nepalese people, more than 81% are Hindus, followed by 9% Buddhists, 4.4% Muslims and 3% Kirants (ibid). Nepali society has deep roots with the Hindu caste system, with a hierarchy of different groups of people within the system since ancient times.

According to the CBS, 2011, the literacy among Nepalese over six years of age has increased from 54.1% in 2001 to 65.9% in the 2011 census. Male literacy is 75.1% compared to female literacy at 57.4%. It shows that more women are illiterate than men, displaying extreme gender disparity and inequality in education. Culture reflects all norms and values of human. Nepal is a multicultural nation; many people who are living in this country have different religions, languages, belief, norms and values. Due to the different geographical regions and unequal development, they have different economic status. Some of them have high economic status and some of them are under the poverty line. Dalits are defined as the castes of people of Nepal who were categorized as untouchables in the purano Muluki Ain.

They are most marginalized caste groups in Nepal. A number of studies in Nepal in the past have shown that disadvantaged groups, particularly Dalits have comparatively lower access to governmental institutions and organizations involved in development. Dalits as a whole are the poorest community in Nepali society. Dalits in Nepal are not only economically marginalized but also discriminated by the high caste and Janajati groups in many areas of social, cultural and political life.

Causes of Difficulties in Learning Mathematics of Culturally Diverse Students at School

Some causes of difficulties in learning mathematics, which I have found from my collected data are presented as follows;

Students Weak Perception on Mathematics

From the study it can be concluded that students' perception towards mathematics has no influence or effect on their academic performance in Shree Sarbajanik secondary school, chhatradev-5, Arghakhanchi. However, the fact that students have indicated a positive perception towards Mathematics is an indication that if more concern is channeled towards students learning by classroom teachers, students will feel motivated to put in enough efforts in their learning. This suggests that a teacher with a sound knowledge in the Mathematics syllabus and good pedagogical knowledge will help to develop good perceptions towards Mathematics. Pupils have different attitudes towards mathematics. Most of the students found this subject different from other subjects in terms of its nature and difficulty level. Some of them are taking this subject as not too hard, but most of them are taking this subject as too hard subject. I found that, students have different views on mathematics at school. Some views of them are presented as follows;

In the interview of students, I had asked a question, *what your view is on mathematics subject?* In this question, Ujan (students of class nine) replied that,

“Mathematics is most important subject, but it is difficult than other subject, we can use mathematics in our daily life as counting things, electricity bill, phone bill and buy goods. We use this to solve mathematical problems of our daily life. Geometry is difficult than other parts i.e. arithmetic, algebra, statistics etc.”

This shows that students are taking mathematics subject as a hard and important subject. They have only known general use of mathematics. In the same question, Anita (students of class ten) replied that,

“Mathematics is too hard subject for me. Geometry is very difficult for me, because there are many definitions, rules that I cannot do. We use math in count, to addition, subtraction, multiply and divide, we also use this in paybill.”

I also asked this question for others students but they also gave same answer as Ujan and Anita. From this view of students, it can be said that views of school students about mathematics is weak, they are taking mathematics as difficult subject and they don't know about mathematical scope in other subjects. However, they know use of mathematics in their household work. Mathematics is essential for understanding any other disciplines like economics, physics, and chemistry and so on. Without the knowledge of mathematics, it is very difficult for better managing and solving any kind of daily problems of human being.

In this regards, Goff and Futter (1982); as cited in Acharya, (2015) states Knowledge of mathematics is indispensable to our daily life; counting objects, reading and writing numbers are tasks most people perform in their life. A strong background in mathematics is necessary for almost all technical careers in society; competence in mathematics has been identified as a critical skill directly related to educational and occupational choice. Mathematics is taught and learned all over the world. Different people have different views on its nature and its use. People have different beliefs on it and they have different images about mathematics. But, the students of school are out of this knowledge. Due to lack of sufficient knowledge about mathematics, students cannot do better in mathematics. They are also unknown about connection of their everyday life and mathematics. Thus, they are feeling difficult in learning mathematics.

The interest of students should be heightened to ensure that they desire the study of Mathematics to improve their academic performance. Cooperative learning should be encouraged among students of Mathematics so as to enforce understanding of the concepts and topics in the Mathematics syllabus and also to develop the interest of learning Mathematics and erode negative perception.

Lack of Culture Friendly Curricular Materials

Culture is an important factor in curriculum planning and drives the content of every curriculum. This is because the essence of education is to transmit the cultural heritage of a society to the younger generation of the society. Curriculum is a veritable tool for attaining the educational goals of a nation. Teaching materials is the basic needs of teaching learning activities. Teaching materials help learning to make efficient use of the resources in order to facilitate self-discovery (Wrights, 1993; as cited in Acharya, 2012). Tolman (1993) said that teaching learning materials and aids include any materials programme or machine that can be used to help teacher present or explain his/her lesson better. Thus, teaching materials are the ones that contain the contents of the subject of the teaching, so teaching aids are any things audible or visual which help students learn the mathematics faster with full interest (Acharya, 2012, p. 126).

Culture friendly materials reflects that materials which are directly related to students' everyday life and culture. Students seem excited when they use that material which was friendly for them. In this research, I have seen that the school has insufficient curricular materials. Teaching learning activities will be effective when, we teach the students by using student's friendly materials.

In interview of students, I have asked a question, *what kinds of materials are using by your teacher in teaching mathematics?* In this question, Mukesh (students of class nine) said that, *“Our mathematics teacher uses marker pen for make some figures in whiteboard. Sometimes he shows some mathematical figures in chart paper. He does not shows solid figures but sometimes, he told us to make a cone, prism and triangle by folding paper. He teach us mostly by writing on whiteboard and he also told us to understand more than write in copy.”*

In the same question, Krishna (students of class ten) said that,

“Our Madam always teaches us by writing on whiteboard. She never shows us any kind of materials in teaching mathematics. However, she makes related figure in whiteboard and tried to give more knowledge but we cannot understand clearly by this teaching. We want to learn by doing our self but we don't have materials”.

By this reality, I found that teaching materials are the basic needs for teaching learning activities. Students always want to learn by using solid and printed materials but they are out of this facility in mostly government schools in Nepal.

In the class observation period, I never seen that teacher used teaching materials in teaching mathematics. So, I asked the teacher *why you do not use teaching materials in teaching mathematics?* In this question, teacher A (secondary level mathematics teacher) said that,

“Materials is the basic needs in teaching mathematics at school level but we don't have sufficient materials. We have few materials but that are not useable. Our class is occupy by diverse students, they have different home environment. If I teach them, by using student friendly materials, they will be clear on content but I am unable to do this because we have lack of sufficient resources. I always want to use that material which is available with us”

This answer shows that, insufficient teaching materials suffer mostly government schools, which is most important for teacher and students.

In this regards, Madsen (2002) in everyday life theory illustrates that, everyday life is what people perform and how they perform that activity in a taken for granted manner. Since children also learn from their everyday life that determines the learning strategies of children. If children have different learning strategies, which they acquire from practicing their everyday life they may face difficulties in learning because their learning strategies are not emphasized or not

known to teachers. Hada (1998 as cited in Devkota, 2001 & Acharya, 2072) also states that, quality education depends on the knowledge, skills and attitude as well as the teaching skills of the teacher. Materials create the situation to the activities by themselves to the students which inspire them to learn and know. So due to the lack of culture friendly curricular materials, students are feeling difficult in learning mathematics.

Mathematics Anxiety

Mathematics anxiety has been defined as feeling of tension and anxiety that interfere with the manipulation of numbers and the solving of mathematical problems in a wide variety of ordinary life and academic situations math anxiety can cause one to forget and lose one's self-confidence (Tobias, 1993; as cited in Curtain-Phillips, 2015). People who feel tension, apprehension and fear of situations involving math are said to have math anxiety. And, perhaps not surprisingly, math anxiety is associated with poor math performance in school. Students with a high degree of math anxiety perform worse in math from elementary school through college, relative to their less math anxious counterparts (Beilock & Willingham, 2014).

In the data collection period, I observed the class and taken interview from students. While taking interview I asked a question, *why do you feel math difficult?* In this question, Urmila (student of class nine) answered that,

“Mathematics is very difficult for me but why I don't know. I am not good in mathematics, geometry is very difficult for me, I feel bored to proof theorem, so I cannot do this truly. My mother is uneducated; my father is far from we for his job. So, there is no one to help me in my home while I am reading mathematics. I do not ask some question to the teacher because when I ask question, teacher also told me say yourself. I am feeling fear with mathematic teacher”

In same question, Bikram (student of class ten) replied that,

“Mathematics is not too hard for me but I feel it is more difficult subject. All friends are weak in math as well as me, because we do not give more attention in classroom. I had listened that math is very difficult subject in higher level, so I do not want to study math in higher level. Our madam always teaches by using lecture method so, I do not understand clearly. I feel difficult in geometry more than other parts because there are more rules.”

From this answer, I can say that more students are feel mathematics as difficult subject. Most of the students at school level are weak in mathematics. There are many reasons to be

creating this situation. Traditional teaching learning methods is one of the main causes for this. Most of the teachers use lecture method in teaching mathematics, which is not relevant for students. Students learn best when they are active rather than passive learners.

In this regards, Furner & Duffy, (2002); as cited in Smith, (2004) state that, Math anxiety is caused by poor test grades, inability/unwillingness to complete difficult assignments, negative predispositions of parents, and even that mathematics teacher. Teachers and parents that are afraid of mathematics pass that on to their students and children. It could be very difficult for students to like mathematics when their parents did not do well in mathematics themselves, and thus do not understand it or do not think it is important. Students could see their parents as having a job and doing well without a great love for mathematics as well. If the teacher does not value mathematics, his/her students certainly cannot be expected to value mathematics either. Another major source of math anxiety is the teaching approach of “explain practice-memorize” (Steele & Alfred, 1998; as cited in Smith, 2004).

The Mathematics teacher needs to be creative in his/her teaching methods, so students do not lose interest. Furthermore, Bourdieu (1977), argue that the main reason for underachievement of working class children are the education systems because it reproduced the culture of dominant class, which is based. This is way the children from the working class and the income poor do not understand more and learn specific skills. Ogbu (2000), also argue that the children with unmatched and dissimilar home cultures with school cultures do not have enough attention their learning and do not get much recognition of their cultures and they have to work achieving learning outcomes compared to the children with good matched.

Traditional Teaching Learning Activities

In a traditional group, a teacher will give an assignment like a shared worksheet, and then allow the students the time to finish the work. The teacher does not really observe and intervene in group dynamics because this is not the purpose of this type of activity. On the other hand, cooperative learning is all about teamwork and group dynamics. Because of this and the project rubric that is used to assess the students' work, teachers are more directly involved in observing and if necessary intervening to help ensure effective teamwork within each group. The traditional teaching methods are teacher-centered and include the use of lectures and discussions while the problem solving element is presented by and/or discussed with the instructor, the syllabus, the teaching materials and the student assessments are determined by the tutor and transmitted to

students in various lectures (Cotel & Millis, 1993; and cited in Dimitrios & et al. 2013). Still now, we can see that, most of the teachers of Nepal are using lecturer method and rote learning while teaching mathematics. This method is not relevant to the students who are from different cultural groups.

In the class observation, I have seen that, the mathematics teacher mostly used lecture method. He/she given less chance for students in classroom, teacher doing problem on whiteboard and students are copying on their copy. However, sometimes they told for students to do yourself. But this is not enough for effective classroom teaching. I had asked to the teacher *why you do not give opportunity for students to do problem themselves*. In this matter, teacher B (secondary mathematics teacher) said that

“I always want to give more opportunity for the students to do problem on whiteboard, but by this process I won't finish course in time so it's make the problem for me. However, I am giving chance sometimes”.

This shows that, still teachers have traditional belief on teaching learning activities. They feel easy to teach by using lecturer methods, but it is injustice for students. The traditional methods cannot give equity in classroom. In the classroom occupy with diverse students need multicultural classroom teaching. For this, teacher needs to understand the different views of different students who are come from different cultural groups. If possible teacher needs to teach mathematics by connecting daily life of students.

In this regard, Vygotsky's (1978), as cited in Acharya, (2015) voice that the child's understanding of how knowledge develops requires and understanding of social and historical origins of knowledge and of changes in that knowledge. In this matter, Acharya (2015), also argue that the human knowledge originates in socially meaningful activity and is shaped by language. Banks & Banks (1995); as cited in Acharya, (2012) suggest that, teaching mathematics requires addressing diversity because it is needed for the people of different cultures. Multicultural education is a field of study designed to increase education equity for all students. Moreover, the pedagogy which the teachers use to teach multicultural students should be made students culture friendly. Through acculturation students will have the chance to socialize and maintain peace and harmony in the country (Acharya, 2012).

In the context of Nepalese schools, there is a vast gap between their practices and the theory of culturally responsive teaching in the school. To maintain this gap teachers need to play

important role for maintaining delicate balance between cultural identity and contents so that there is equity, equality as well as excellence in content knowledge (ibid). Khanal (2015) also found that secondary school mathematics teachers in Nepalese school used traditional teacher-centered approach for teaching mathematics without encouraging students to participate in the classroom activities. Teachers teaching strategies have a significant role in promoting learning strategies. Classroom practices play significant role in promoting students learning strategies. Children can be successful in mathematics when their understanding of it is linked to meaningful cultural referents, and when the instruction assumes that all students are capable of mastering the subject matter. The role of pedagogy is to help learners by moving from a traditional role of teacher as knowledge given and students as knowledge receiver to a complex teaching learning system (Ladson-Billings, 1995; as cited in Acharya, 2072).

Family's Socioeconomic Status

Socioeconomic status (SES) affects overall human functioning, including our physical and mental health. Low SES and its correlates, such as lower educational achievement, poverty and poor health, ultimately affect our society. Inequities in health distribution, resource distribution, and quality of life are increasing in the United States and globally. Society benefits from an increased focus on the foundations of socioeconomic inequities and efforts to reduce the deep gaps in socioeconomic status in the United States and abroad. Socioeconomic status (SES) is an economic and sociological combined total measure of a person's work experience and of an individual's or family's economic and social position in relation to others, based on income, education, and occupation.

All people have not same socioeconomic status in society. Some people have high socioeconomic status and some have low socioeconomic status. In context of Nepalese society, there is diverse socioeconomic status. More than half of people are in under the poverty line. Due to the low economic status, they are unable to give good learning environment for their children. I have found that children whose family socioeconomic status was poor are studying in government school. In my research work, I visited mathematics classroom and I took interview from sample students. I was asked them about their family's economic status; in this matter Shyam (students of class nine) said that

"I am from chhatradev-5, Arghakhanchi, my parents are farmer. They are uneducated, they work hard, but they have low income. I am studying in this school from nursery

class. Our economic status is no good, so I am studying in government school. My result of mathematics is medium because of parents' economic situation I cannot get chance to read tuition. I respect my parents a lot they gave me chance to read."

This reality shows that, due to the low family's socioeconomic status students cannot get more chance to read in private school where students can get good learning environment. They are unable to take tuition class and other curricular activities. In the same matter Ishwori (student of class ten) said that,

"I am from Chhatradev-7, Arghakhanchi, I am studying in this school from nursery class. My family's socioeconomic status is weak, my father is ill and he does small kirana shop. My mother has job in garment. She has low income from her occupation, which is not enough for household work and father's treatment. Due to the low economic situation I cannot get chance to read tuition, study of school is not enough for me, mathematics is too hard for me, I cannot solve any mathematical problem myself. My result in mathematics is not good so teacher always scold me. They always told me to do more practice in mathematics but I cannot give more time in home. I have to make food in home, and I have to help my father. I have no more materials for read".

This shows that, students whose family's socioeconomic status has not well are suffering in their schooling. Due to the low economic condition they could not get chance to study in good environment; they have lack of time in home for their study, they have a responsibility to care their parents, so they have poor achievement in mathematics.

In this regard, Sirin, (2005) argue that socioeconomic status is not only directly linked to academic achievement but also indirectly linked to it through multiple integrating systems, including students' racial and ethnic background, grade level and school/neighborhood location. For example, family SES, which will largely determine the location of the child's neighborhood and school, not only directly provides home resources but also indirectly provides "socio capital", that is, supportive relationships among structural forces and individuals (i.e. parent-school collaborations) that promote the sharing of societal norms and values, which are necessary to success in school (Coleman, 1988, Dika & Singh, 2002; as cited in Sirin, 2005). Schmid (2001; as cited in Ford, 2013) believed that the influence of family income, the occupations of parents, and the general family structure contributed to students' school achievement. Therefore, parents' socioeconomic status had a strong and

positive effect on children's achievement. Bourdieu (1977) also argue that, the achievement of the students responds to the cultural capital of the students, the rich have different cultural capital than poor students. The poor and the working class children lack favorable situation and appropriate cultural capital.

Hartas (2011) concluded that the effect of socio-economic disadvantage on children's development have been explained through parent's decisions about how to allocate arrange of resources, for example money, time and energy (investment model). The amount of money parents spends on children (e.g. purchasing books, toys) and the time they spend with them in joint activities (e.g. reading books) are considered investments that have the potential to enhance children's cognitive skills and language and emergent literacy. Students from higher socioeconomic status, experienced greater parent involvement in their education, which enabled these students to receive the necessary skills, knowledge, behavior and values that were needed by their children for academic success. Children whose parents were better educated made more money, had higher-status jobs, and lived in two-parent families tended to attain higher levels of education than do other minorities (Ford, 2013).

Pangeni (2014) found that there are negative relationship between family size and student's mathematics learning achievement. Students with smaller families outperformed children in larger families. The availability of additional books at home and the possession of certain items e.g. Radio, bicycle, water tap, cassette player, television, telephone, gas stove, computer and motorbike, which reflects a family socioeconomic status (SES) is significantly related to students' academic achievement.

Discrimination in Classroom

At this context due to various reasons and efforts flexibility (improvement) is being taken places against caste-based discrimination at school in the name of inclusivity, encounters aged-long concept of social exclusion, in present days. It is, perhaps, because of transformative educational approach for a few decades. Transformative education is one of the best means to address Dalit issue with the advocacy of equality and equity. It is significant green signal of transforming ranked society into democratic one. Discrimination is defined as distinguishing differences between things or treating someone as inferior based on their race, sex, national origin, age or other characteristics. The classroom discrimination refers that, discrimination

between boys and girls, discrimination between talented and weak, discrimination in personality, discrimination in their achievement etc. I am also felt that there is discrimination in Nepalese school, when I was observing mathematics classroom. Mostly, teachers give a chance for talented students on solving mathematical problem in classroom. They are ignoring those students who have problem in learning mathematics in classroom. I have seen that, students who are weak in mathematics are seating in last bench, and talking with each other. They had not given attention towards whiteboard, while teacher is doing problem in whiteboard. After finished the class, I asked to the students of class ten, *why you was not giving attention on mathematics classroom? Do you have any problem in mathematics classroom?* In this question Hari (Students of class ten) answered that,

“I have no interest in mathematics class because madam never gives chance for me, I am weak in mathematics, I don’t understand anything. Madam always gives chance for first and second students, she always scolds us. She just told us to do homework daily but she never checks our homework”.

From this answer, we can say that there is discrimination in classroom. It shows that teachers ignoring weak students in classroom and they give more attention to talented students. Weak students are dominated by teachers and talented students as well. Therefore, their achievement in mathematics is decreasing. In the same matter Anita said that,

“I am medium in mathematics, I want to make good in mathematics but cannot doing. Sometimes madam gives me chance to do problem in whiteboard but boys makes noise in classroom and they also told that I cannot do problem well. So, I feel uneasy in classroom. The boys always does debate with us in small reason, they always wants to be upper than girls”.

It shows that, there is an inequality between boys and girls students in classroom. The boys always dominate girls in classroom, and they are not ready to give position for girls. They always want to be upper than girls in every area. This is the effects of traditional culture where girls were always in second position. In the classroom observation, I have also seen that mostly teachers gave a chance for boys. If do some problem in white board, s/he calls boys first, so the girls rarely gets chance to do problem on board, which is decreasing the active participation of girls in classroom. It shows that, there is inequality between boys and girls. May be s/he have no intention to do like this but it is clearly showing by their activities in classroom.

In this regards, Richman & Leary, (2011; as cited in Carter, 2013) argue that, the reactions that a teacher or peer might have can affect the student's perception and feelings towards themselves, their perception of others, and the quality of interpersonal relationships. Previous research has shown how fundamental attribution errors, and cognitive errors in general are due to stereotyping and prejudices, which can cause discrimination that can negatively influence the classroom environment, the student's academic performance, the students' academic achievement and the student's self-concept (Frontline, 1985; Schneider et al. 2012; as cited in Carter, 2013). Ogbu (2001) also argue that, due to collective institutional discrimination and display like school system, they tend to exclude from the mainstream with social and economic problem that leads their lives to miserable condition. So classroom discrimination is the big cause of difficulty in learning mathematics.

Home-School Mismatch

The role of home-school match is important because of its possible implications for children's early adaptation to and success at school. In recent years, this issue has become even more compelling as a result of the growing ethnic and cultural diversity of students in our public schools and the lack of corresponding diversity in a teaching. It is widely accepted that the home environment contributes significantly to student achievement in school. For culturally diverse students, considerable inquiry has focused on whether there are significant mismatches between their home and school environments that may also influence achievement. These mismatches are often attributed to a lack of social or cultural capital- the various linguistic and cultural competencies that schools require for educational success. However, these competencies are not explicitly taught in school, and children may or may not acquire these skills at home (Terry & Irving, 2010).

In the data collection period, I had asked a question for a key student that does *your home environment affects you in school?* In this matter Mukesh (student of grade nine) replied that;

“My grandfather come from Kathmandu district, all members of my family are speak Newar language. I have also habit in speak Newar but in school all friends and teachers speak Nepali. So, it is difficult to understand for me because I have been confused in sometime.”

From this view, I felt that there is language problem between home and school for some students. In the same question Bhupendra (student of grade ten) answered that;

“My father works in private office and my mother is in Malaysia. I have no more time to read in home, I read two hours in home. I have to help my parents in household work. I feel mathematics too hard because there are no one for help me on mathematics in home. Teachers never want to know my problem about home and my interest on mathematics. Because of unmatched environment of my home and school I am suffering by the problem of mathematics.”

This shows that there are different cultural background between home and school. The school is the community of culturally diverse students. Students are come from different cultural background, which have different languages, different socioeconomic status, different norms and values. But the school has following culture of dominant groups, but the minority groups students are suffering by this culture. Some culturally diverse students have their own mother tongues, they speak their own language in their home and society but in school they have to speak common language Nepali, so they are feeling difficult in learning in school.

In this regards, Terry & Irving (2010) argue that, In school, students typically are taught to use decontextualized language to tell stories independently, by either retelling events that have occurred or relating their tell stories to other more familiar stories. Schools typically do not place high value in this form of cultural capital. This mismatch in narrative styles may be reflected in classroom and on assessments.

Pangeni (2014) found that, numbers of family members, fathers and mother's education, numbers of books at home and presence of certain household items were significantly related to student's mathematics learning achievement in Nepal. Acharya (2013) also found that the school environment was not suitable for the mathematics learning for culturally diverse students. There were communication problems between teachers and students at mathematics classroom. The teachers were found incompetent in teaching mathematics in multicultural situation as they were not trained for this purpose. Further, the pedagogies they were found mono-cultural using Nepali language. Mathematics has been conceived as a difficult subject and hence this hegemony may have contributed to creating problems in mathematics teaching learning activities in the classrooms.

In this matter, Bourdieu (1977) suggests that the major role of education system of schooling is cultural and social reproduction of the dominant classes. He found that school holds the cultural capital of controlling class and transmits it unevenly to children. Students who are come from the middle class and above have advantages because school is adopting their culture. Therefore, the children from upper class take more benefit out of school than lower class counterparts. The skills and knowledge which is transmitted in the classroom is aligning to the lower class children and hence, they usually fail. Ogbu (2000) deals with the problems in children's learning caused by the differences and discontinuity between the culture at home and school. He says that those children whose home culture is much similar to the culture of school can cope easily with the system that may result better learning achievement. He also says that, the dominant group sets school system in accordance to their own convenience and benefits e.g. their norm, value and aspirations in the curriculum, medium of instruction, and teaching/learning approaches that suit to them. But the dominated group gets on unfamiliar and unrealistic curricular content and their cultural resources do not match with overall education system so that they face difficulty in learning and participation that leads to their failure, dropout and exclusion.

Madsen (2002) says that, everyday life provides framework for individual works that guides to bring and sustain meaning from variant and manifold activities.

Everyday life is what people perform and how they perform that activity in a taken-for-granted manner. Since children also learn from their everyday life that determines the learning strategies of children, it is worth the effort to link the educational activities with their day-to-day experience, so that the needs and demands of children can also be considered through schooling.

Section II: Relation between Culture and Learning Mathematics

The notion of mathematical learning and understanding involve student's construction, deconstruction and reconstruction of their knowing through the process of cultural participation, social interaction and contribution to their local activities of the community. In this sense, mathematics is the study of patterns and relationships where people learn by doing (Cobb & Yackel, 1996; as cited in Martins, 2005; Adhikari, 2007). Construction of knowledge is inherently cultural and experiential. Here, I have discussed about the cultural background, and mathematics learning of key students, which supports to explore the relation between culture and learning mathematics.

Krishna Pun Magar.

He is studying in this school from childhood. He is the student of class ten. He is belonging from Magar community and his family has belief on Hindu religion. His father worked as farmer and mother worked in garment. He has six family members. His family's economic status is low, so he has problem in his study. He has not enough materials for his study. His father and mother are educated; father has passed SLC and mother has passed eleven classes. He is the regular student of the class, and he always does his homework and class work. He has following view about culture and mathematics.

“There is good relation between mathematics and our culture because we use mathematics in our daily life. Mathematics helps us to solve our mathematical problem. We use mathematics for pay phone bill, electricity bill and for change money etc. We can also find use of mathematics in historical heritage”.

In the classroom observation period, I have found his behavior good in school; he stayed calm with his friends. He has good relation with his friends and teacher. He wants to do more practical in classroom if possible. He has no interest in lecture method in mathematics class. He has belief on learning by doing.

Kamala Nepali.

Kamala Nepali was the student of class nine. She entered in this school from nursery. Her father has a small winnowing fan (*Nanglo*) shop, her father was ill and her mother worked in garment. The economic condition of her family was not good. Her father and mother were uneducated so she could not get any support from her parents for her learning in home. She must work all household work and she had to care her father also. In the classroom, she used to sit in second last bench with her *Shrestha* and *Magar* friends. During classroom observation, she seemed not active in classroom. She knew to read mathematics but mathematics subject is very hard for her. There was nobody in her room for help her mathematical problem. Therefore, she completely depended on classroom for mathematics study. She expressed her view on culture and learning mathematics as follows;

“I think mathematics is so important subject. I do not know about the relation between culture and learning mathematics. However, mathematics is useful for our daily life, it has relation with science, economics, account etc. Mathematics is very difficult for me, I felt difficult in all parts of mathematics subject”.

In the school, she wants to do more practice but she is unable because there is not enough time. She has good relation with friends, they help her if possible. She likes teaching style of mathematics teacher but never do cross-question because she felt fear with math teacher. Her parents have no any idea about mathematics. They can count money only therefore, they never motivate her for study mathematics.

Urmila Shrestha.

Urmila Shrestha was students of class nine. She entered in this school from eight classes. She came from Bardiya with her family. Her father worked in photo studio and mother worked in office as a helper. Her mother was uneducated and father has passed SLC. Her family's socioeconomic status is not good. She has an enough time in home but she gave few time for mathematics because there was no one for help her. She felt difficult in mathematics; geometry was more difficult for her because she could not get any good idea to read geometry yet. In the classroom, she always sit first bench. During observation, she seemed active and serious for her learning. Sometimes she did cross-question to mathematics teacher. She has good relation with friends. She said that, sometimes boys dominate girls in classroom. They did not want to give more chance for girls in classroom. They did not provide equal opportunity for daughter therefore, her mother did not get chance to study. Her mother was uneducated but she has positive concept for study of her daughter. In her views,

“Mathematics is important subject. It is difficult as well, we could use math in counting, measuring, for pay bill etc. In classroom teacher should give equal emphasis to the weak students as that of talented students. Environment of our school is good, all the teachers and students are helpful. We have lack of curricular materials in school; our mathematics teacher mostly used lecture method”.

Anita Panthi

Anita Panthi was students of class ten. She entered in this school from class six. They have low economic condition. Her Father owner provided learning opportunity for her in this school. She has to work in morning and evening at home. She always come school but she seemed tired. She has no enough time for study at home. Therefore, she could not complete her homework. She has to make food every morning and evening, she has to do clean house usually. Due to hard work, she always seemed tired. She felt mathematics is more difficult. There is no one for help at home on her learning. She has not enough reading materials. Her learning achievement fully depends

on school. She has good relation with friends. She said about culture and learning mathematics as;

“Culture and mathematics are connected each other. I listened that mathematics has guided by culture but how, I do not know. We are using mathematics in our daily life, for calculate electricity bill, for measure thing. I want mathematics class to be practical but teacher mostly used lecture method”.

Bhupendra Poudel

Bhupendra Poudel was the student of class eight. He has four family members. His father worked in private office and his mother has gone to Malaysia for work. They all do work hard in their area. He has not enough time to read in home, he reads two hours in home and he helps his parents household work. He has good opportunity at school for his study. He has good relation with teacher and friends. The teacher motivates him by telling story and giving example. He takes a mathematics subject as hard, medium and easy. His parents always support him for learning. His parents always tell him to read books. His family's economic condition was not good so his mother had gone to foreign country to earn money. In the observation period, I have seemed he is active and energetic student. He does cross-question in class and he always want to do problem on whiteboard. He wants to be extra than other in classroom so he always seems active. He likes teaching method by using teacher but he wants it to be more practical. Geometry is very difficult part for him than others. He always participates in extracurricular activities held by school. His view on culture and learning mathematics as follows;

“I speak local language in home but I need to speak Nepali and English at school, which affects me for understand. My family's economic condition is not good, so I am unable to take tuition class. I have not enough materials related to mathematics for do practice in home. Mathematics is important subject; it is most useful in every area”.

Home Environment and Learning Mathematics

Parents are encouraged to provide mathematically relevant talk to young children to foster their math development given the implications of the use of such future academic outcomes. The main challenge is conveying this message to parents to create a home math literacy movement equivalent to the home literacy movement. Concerning on the opportunities for children at home, most of the children's home environment were not conducive for learning. From the above presented data about key students, I found that most of the children's were from

economically marginalized family and low educated parents. Most of students are living in rented room with their family. They have to adjust in narrow room so they do not have separate study room, which mostly affects their study in home. They could not read in peace and clean room so their mind cannot give attention on their study. The level of thinking and educational level of parents has found low. Only the little number of parents has found guiding their children in learning. In regards to learning opportunities provided by parents were directly related with their cultural, caste, economic and educational backgrounds. The above reality of students and discussed evidence shows that the students of higher socioeconomic status and educated parents have more opportunities to learn at home than the other cultural group.

Mathematics is conceived as a cultural product, which has developed as a result of various activities (Bishop, 1988; as cited in Bush, 2002). This cultural product includes counting, locating, measuring, designing, playing and explaining (ibid). Stiger and Baranes (1988; as cited in Bush 2002) also view mathematics as “an assemblage of culturally constructed representations and procedures for manipulating these procedures”. This viewpoint certainly suggests an internal view of the nature of mathematics because culture is inherent in persons. Culture and mathematics education also have strong relationships. Cultural values affect teaching learning and curriculum. Formal mathematics teaching, learning and curriculum can provide a reflection of culture. Clearly, mathematics education can affect the political and social dynamics of culture (Bush, 2002).

School Environment and Learning Mathematics

Students actively construct mathematical knowledge through everyday interactions with their environment. It should provide access to objects and materials that encourage children to experiment and learn about key mathematical concepts through everyday play. The environment of school and students' learning achievement has linked each other. There is correlation between good school environment and achievement of students. Learning opportunities for the students in classroom ultimately reflects the whole school teaching and learning environments. A class can never be homogeneous because students of different types by gender, class, ethnicity and language minority etc. are in class. How successfully the diversity is addressed and how effectively students are engaged in learning is the main concern for learning opportunity in classroom practices in general. In the observed class the mostly used teaching methods and strategies were lecture/expository in teaching mathematics with much focus on drill exercise.

The mathematics teacher said, *"I apply all the teaching methods, which are in use"* unfortunately, I did not get except lecture/expository method. There were no sufficient opportunities to develop the ability according to the student's aspiration. The class seemed teacher dominated and whole class was under the teacher control. Teacher selected the problem solved himself; the problems had given to the students according to teacher's views. But in solving the problem teacher used to ask question individually regardless of caste, ethnicity, gender and class. However, teacher had given more opportunity for first, second and third students.

Classroom Observation Episode 1

I observed the mathematics classroom of grade nine. The class was clean and enough light. There were some posters hanging on the wall and benches had managed in two column. The boys and girls students were sitting on different column. On this day, math teacher entered the class and what he was going to teach that day was taken from the textbook. The topic was Circle, which was the new chapter. First, he asked for students about circle, some of them had answered themselves. After that he wrote the definition of circle on whiteboard, and explained about it. He had made the figure of circle on board and explained himself. He defined about chord, diameter, radius, central angle, circumference etc. He used English language for teaching and writing, which seemed difficult for some students. He was using lecture method mostly. The classroom was little a bit noisy and students were talking each other. He did not use any kinds of materials of circle. He was just telling about characteristic of circle orally. After describing about lesson, he said to students for read the book. After that, time finished then he went out.

Classroom Observation Episode 2

I observed the mathematics classroom of grade ten. The class was not clean, there was dust on desk, there were some posters hanging on the wall and benches had managed in two column. Boys and girls students were sitting on different benches. On this day, mathematics teacher entered the class and told to turn yesterday's homework. The homework was about parallelepiped. She asked for students about unsolvable problem than she did one problem on whiteboard. She had not any materials related to parallelepiped. She just made the figure on whiteboard and explains about base and height. First, she calculates the area of base than applied the formula $V = A.h$ for calculate volume of parallelepiped. Where, $V =$ volume of parallelepiped,

A= area of base, and h= height of parallelepiped. After than she told toone student for do problem on whiteboard. She was using lecturer and discussionmethod. The classroom was little bit noisy, and then she did three different problems.After that time finished then she gave some problem as homework and went out.

Hence, the above expressed realities and observation indicated that there were no sufficient chances to teach students themselves. The teacher has belief that studentscan learn from forced exposition and adequate drill and practice. Mostly teacher areusing lecturer method for teaching mathematics. Teaching materials are not using,which helps students to understand the content knowledge.

From the above realities, I found that diverse culture and learning mathematics has mutual relation. Learning mathematics has affected by the different cultural factors; i.e. home environment, school environment, family socioeconomic status, discrimination in home and school, languages etc. However, culture and learning mathematics has inter-relationship. Mathematics was for a long time regarded as a neutral and culturally free discipline removed from social values (Bishop, 1993; D'Ambrosio, 1990; as cited in Rosa & Orey, 2011). It was always taught in schools as a culturally free subject that involved learning supposedly universally accepted facts, concepts, and contents. This means that western or academic mathematics consists of a body of knowledge of facts, algorithms, axioms and theorems (ibid).

In this regards, Rosa and Orey (2006; as cited in Rosa & Orey, 2011) argued that, the ethno-mathematics program was developed to confront the taboos that mathematics is a field of study that is universal and cultural. Classrooms and learning environments cannot be isolated from the communities in which they are embedded. Classrooms are part of a community with defined cultural practices. In this perspectives Bara (1993; as cited in Rosa & Orey, 2011) stated that classrooms might be considered environments that facilitate pedagogical practices, which are developed by using an ethno mathematical approach. When students come to school, they bring with them values, norms, and concepts that they have acquired in their socio-cultural environment.

According to Bishop (1993) some of these are mathematical concepts of the school curriculum are presented in away that may not be related to the students' cultural backgrounds. Moreover, Rosa & Orey (2011) argued that including cultural aspects in the curriculum will have long term benefits for mathematics learners that is cultural aspects contribute to recognizing

mathematics as part of daily life, enhancing the ability to make meaningful connections and deepening the understanding of mathematics. This mathematical approach is presented as a cultural response to students' needs by making connections between their cultural background and mathematics (ibid). This approach supports the view that mathematics is conceived as a cultural product which has developed as a result of various activities. The objective of this perspective is to make mathematics more relevant to students because every culture is assumed to have mathematical responses with valid content for a mathematics classroom (Rosa & Orey, 2011). So, all of the above realities and views show that, culture and learning mathematics has strong connection. Most of the cultural factors have shown as causes of difficulties in learning mathematics. So, it is clear that mathematics creates culture and culture creates mathematics.

Effective Teaching Approaches in Culturally Diverse Classroom

There are many school factors that affect the success of culturally diverse students: the school's atmosphere and overall attitudes toward diversity, involvement of the community, and culturally responsive curriculum, to name a few. Of all of these factors, the personal and academic relationships between teachers and their students may be the most influential. This relationship has been referred to as the "core relationship" of learning: the roles of teachers and students, the subject matter, and their interaction in the classroom. Culture is the way in which a group of people make meaning of their experiences through language, beliefs, social practices and the use and creation of materials and objects (Bank, 2006; as cited in Acharya, 2012). Teaching mathematics requires addressing diversity because it is needed for the people of different cultures. Multicultural education is a field of study designed to increase education equity for all students (Banks and Banks, 1995; as cited in Acharya, 2012). To maintain this purpose, we have to study mathematical contents, concepts, principles, theories along with paradigms from history, the social and behavioral sciences, and ethnic studies (ibid).

Culturally responsive teaching has been defined as an approach to teaching that uses student's cultural knowledge as a conduit to facilitate the teaching learning process (Ladson-Billings, 1994; Villegas & Lucas, 2002; as cited in Ukpokodu, 2011). NCTM (2000; as cited in Ukpokodu, 2011) recognizes the role and importance of culture and learning as a socio-cultural process. Consequently, the organization has developed standards that include teacher's understanding of how students' cultural, linguistic, ethnic, racial, gender and socioeconomic

background influence their learning of mathematics and particularly, the role of mathematics in society and culture, and the contribution of various cultures to the advancement of mathematics. Additionally, the NCTM standards suggest pedagogical practices that include the use of inquiry-based and cooperative learning, which are aspects of culturally responsive teaching.

In this research, my third research question was how taught effectively in culturally diverse classroom? From the collected data the revealed themes are as follows;

Integrate Culturally Relevant Content and Social Issues

Integrate Culturally Relevant is the pedagogy that recognizes the importance of including students' cultural references in all aspects of learning. Traditional teaching strategies emphasize the teacher-student dynamic: The teacher is the expert and adheres strictly to the curriculum that supports standardized tests while the student receives the knowledge. Integrating culturally relevant content into mathematics teaching is very challenging for teachers. In his description of multicultural education, Banks (2005; as cited in Ukpokodu, 2011) explains integration of multicultural content to mean the use of examples, metaphors, and perspectives from different cultural frames when examining concepts, theories, paradigms, etc. Doing culturally responsive teaching involves integrating culturally relevant content into the mathematics curriculum. The research identified specific ways to integrate multicultural or culturally relevant content. These include: using word problems that are culturally familiar, integrating social issues relevant to the students' community, and evaluating instructional materials and resources for hidden curriculum and bias (Ukpokodu, 2011). In this perspective Head teacher shared her views as;

“My long experience as a teacher that teacher need to be familiar with students. We need to be like a friend with students in teaching learning activities, and we have to share our cultural perspective, also we need to know students' cultural and social background. When we teach by knowing students' cultural background than students can do their problem easily. For this, teacher needs to provide several examples relevant to culture and social norms. If we teach by collecting different content relevant to students' culture and social values than the teaching learning activities will be effective. By collecting and connecting with culturally relevant content and issues we got succeed. That creates the suitable environment for teaching learning”.

This view provides that, teacher is not only the teacher s/he is also the friend and family of students. So, teachers need to teach by connecting students' family background, linguistic

background, social activities, job opportunities of parents, leadership positions, sports and businesses in their community. In this regards, Ukpokodu (2011) noted that mathematics presents a great opportunity to teach and help students learn about issues of social, political, and economic justice, especially as an analytical tool for examining and understanding community and societal issues and inequalities in an unjust world. Examples of using data about disparities between racial groups and women were identified as powerful ways to help students understand social stratification, inequality, exploitation, and oppression. Banks (2004; as cited in Acharya, 2012) also argue that more opportunities exist for the integration of ethnic and cultural content in other subjects than in mathematics. While teaching mathematics, there are students from various cultural groups. Therefore, while giving the examples, they must link with their culture. In this way it is easy to learn mathematics, there are also opportunities to integrate the mathematics and science curriculum with ethnic and cultural contents. Acharya (2015) argue that teaching learning mathematics is to be linked with the culture of students, associating it with the real life situation, mitigating the existing dilemma of making culture unfriendly curriculum and promoting multiculturalism as well as culture friendly assessment is to be the other important aspects to make mathematics education culturally relevant. Excellence in mathematics education requires equity- high expectations and strong support for all students.

Achieving this goal requires raising expectations for students' learning, developing, effective methods of supporting the learning of mathematics by all students, and providing students and teachers with the resources, they need. All students, regardless of their personal characteristics, backgrounds or physical challenges, must have opportunities to study and support to learn mathematics. Technology can assist in achieving equity and must be accessible to all students (Vaugh & Schumm, 1995; cited in McAllister, 2002). Another way Ukpokodu (2011) identified for doing culturally responsive mathematics teaching is to use multicultural literature or stories to capture and engage students' imagination, emotion, motivation, and thinking as well as help them understand concepts and ideas better. Most successful mathematics teachers who view mathematics as communication arts have used this approach to help their culturally diverse students learn mathematics successfully. Integrating cultural or multicultural content into the mathematics curriculum adds meaning, values, and connection for minority students.

Utilize Culturally Responsive Instructional Strategies

Culturally-responsive practices involve recognizing and incorporating the assets and strengths all students bring into the classroom, and ensuring that learning experiences, from curriculum through assessment, are relevant to all students. Many scholars and studies have reported that mathematics instruction has not been „user unfriendly“ for minority students because of the unresponsive student teacher relationship and interaction, classroom environment, and content presentation (Tobias, 1990; as cited in Ukpokodu, 2011). Culturally relevant pedagogy is an effective instructional practice and theoretical model that promotes students' achievement, supports students' cultural identity, and helps students to develop the critical perspectives needed to challenge inequalities in school and society (Ladson-Billings, 1995; as cited in Terry and Irving, 2010).

In Nepalese schools there can be found lack of culturally responsive pedagogy. Most of the mathematics teacher uses teacher-centered methods i.e. traditional lecturer method, rote learning. This method is easy for teacher but students unable to understand and do response. So, to maintain the problem faced by students and teacher, Subedi (2010) suggest that,

“Teachers to do address such situation in the classroom. So, the teachers should prepare their students feel for real multicultural world by drawing the world of students. The teacher should foster students' attitude of understanding, expectation, and respect and to discuss differences and similarities in cultures with students openly but stressing the similarities helps to integrate heterogeneity into unity. Teachers in multicultural classroom must be open to the students and put forth the effort needed to get to know their student's insight and outside of the class. Teachers need to pay attention to their verbal and nonverbal language when s/he responds to students who speak differently. The teacher must evaluate the cultural diversities by building multicultural programs to show appreciation of differences avoiding stereotypes, acknowledged differences in children and discover the diversities within the classroom”.

In this regards, Gay, 2000; Ladson-Billings, 1994; as cited in Ukpokodu, (2011) argue that culturally responsive mathematics instructional practice must first begin with teachers setting high expectations for all students, holding themselves personally responsible if their students are not achieving, creating motivation by demystifying mathematics as culturally neutral, and scaffolding students learning to ensure their success. Ukpokodu, (2011) suggest that teachers

engage in self-critique by asking and personalizing questions that allow them to gain insights such as: Who is learning mathematics in my classroom and who is not, and why? What is my expectation for each of my students in mathematics learning? How am I scaffolding instruction for student mathematics learning? Do I use word problems that are familiar to my students? What social and community issues am I integrating into mathematics curriculum and instruction? Do I allow students to contextualize their thinking when practicing and solving mathematics problems? Do I look to understand students' strategies and logic when they engage in mathematical problem solving? And how was I responsive to each of my student today?

Acharya (2015) found that the existing pedagogical practices were less appropriate to address the multicultural classroom environment. There was a huge gap between the practice and the theory of culturally responsive teaching learning process. How to teachers become culturally responsive? According to Villegas and Lucas (2002), there are six characteristics that culturally responsive teachers possess. These six characteristics as cited in Ragoonaden (2010) are summarized as follows; first of all, culturally responsive teachers must have a socio-cultural consciousness, so that they are able to recognize that there are multiple ways of perceiving reality and that these ways are influenced by one's location in the social order (p. 20; cited in Akehurst, 2012) as well as by one's upbringing and world view. Secondly, culturally responsive teachers understand how learners construct knowledge and capable of promoting learner's knowledge construction. Next, culturally responsive teachers view students of culturally diverse background as a resource for rather than a hindrance to learning. Culturally responsive teachers also learn about their students' lives and use this knowledge to adopt culturally responsive teaching practices in order to design, instruction that builds on what (students) already know while stretching them beyond the familiar.

Finally, culturally responsive teachers also believe that they are both responsive for and capable of bringing responsive to all students (ibid). Terry and Irving (2010) argue that culturally relevant pedagogy is a healthy model of education that allows children to utilize their strengths (e.g., home language skills, personal interests) as the mechanism for overcoming challenges. For example, many students love to music. They learn about their peer culture through music and use it as a lens to understand their world themselves. A teacher might employ culturally relevant pedagogy by incorporating music into the classroom (p. 121). This would allow the students to inject an aspect of their developing intent into their classroom experience, and also allow the

teacher to use something the students have interest and expertise into develop knowledge about mathematics, science, and other traditional academic subjects. Teaching is most effective when the teacher and learner have a healthy relationship. The foundation of a healthy relationship is built as teachers take time to learn about students. By learning about student's interests, cultures, and experiences, educators will be in a position to develop lesson plans that are exciting, fun, relevant and most important, highly educational. Allowing students to infuse aspects of their culture and home language in the classroom will contribute to some students feeling more connected and comfortable with their learning process and assignments (Terry & Irving, 2010, p. 121).

Successful learning requires an inter cultural approach when students are responsible for listening and reading and experiencing to understand both the perspective of others and for understanding their own perspective and to know how they acquire them (Subedi, 2010). They should try to understand the diverse culture influences impacting school, community, state, country, world etc. Students are to be involved in thinking critically, solving problems, questioning and creating increased sensitivity to an awareness of different cultures. Students must be engaged in the teaching and learning process transcends the banking method and facilitated experiences in which students learn from each other experiences and perspectives (ibid).

Use Cooperative Learning in Mathematics

Collaborative learning method better motivates students to learn, helps students to understand and perform better in achievement test over traditional method in teaching learning mathematics. Collaborative learning has its significant role for the students to understand the contents or subject matter or different issues/problems in learning process. For the meaningful result, proper practice of collaborative learning is required. Even though, there are challenges of practicing collaborative learning. Cooperative learning is described by Slavin (1984; as cited in Andersen, 2009), one of the learning developers of cooperative learning as, a set of instructional methods in which students are encouraged and required to work together on academic tasks. Cooperative learning methods may be as simple as having students sit together to discuss or help one another with classroom tasks, or they may be quite complex. They may use group rewards, as in group contingencies, or may not do so.

Leikin & Zaslavsky, (1999) propose four necessary conditions that together constitute a cooperative-learning setting:

-) Students learn in small groups with two to six members in a group.
-) The learning tasks in which students are engaged require that the students mutually and positively depend on one another and on the group's work as a whole.
-) The learning environment offers all members of the group an equal opportunity to interact with one another regarding the tasks and encourages them to communicate their ideas in various ways, for example, verbally.
-) Each member of the group has a responsibility to contribute to the group work and is accountable for the learning progress of the group.

To be cooperative, a learning setting should ensure the existence of all these conditions (ibid). Cooperative learning can be used with any class, and just about any objective can be taught through a cooperative group activity. In cooperative learning, while the group may be working together, each individual within the group is still accountable for learning the material.

Heterogeneous teams almost always characterize cooperative learning organization, and the groups are usually very carefully planned to include all levels of learners (Andersen, 2009). Salvin (1987; as cited in Andersen, 2009) reviewed so many different studies that compared the achievement of students taught in cooperative learning classrooms to the achievement of students taught in traditionally organized classrooms.

He reported that 89% of the students in 50 different studies earned higher scores on achievement tests when they had participated in cooperative learning. Cooperative learning helps to improve racial relations in school. Salvin and Cooper (1999; as cited in Andersen, 2009) reviewed the research regarding the eight most popular forms of cooperative learning and found that all eight types promoted positive race relations in classrooms.

They found that students in traditional classrooms usually made friends of the same race. Students in cooperative learning classrooms, however, had friends of all races, and their friends were usually the students from their cooperative learning groups.

In the action research Andersen (2009) investigated the impact of cooperative learning on the engagement, participation, and attitudes of her students. She also investigated the impact of cooperative learning upon her own teaching. She discovered that her students not only preferred to learn in cooperative groups but that their levels of engagement and participation, their attitudes

toward mathematics and their quality of work all improved greatly. Ukpokodu (2011) noted that all the text heread suggested that minority students are more responsive to learning contexts with communal structure that emphasized cooperative learning. Therefore, he concluded communal learning must be a dimension of culturally responsive mathematics teaching. He also suggested that culturally responsive instructional strategies begin with the teacher setting high expectation and caring enough about them to challenge them to the highest level. This is so important for urban and low-income students who have been told directly and indirectly that they are incapable of learning hard subjects like mathematics.

So, from above mentioned study, I concluded that mathematical communications can play an important role in learning mathematics. Exchange of knowledge one another is the basis of cooperative learning in mathematics. Cooperative learning strategies is the effective culturally responsive pedagogy in mathematics. When communicating mathematically, students enhance their understanding of mathematics, establish shared understanding of mathematics, become more active learners, learn in a comfortable environment, and assist the teacher in gaining insight into their thinking. Teaching is most effective when the teacher and learner have a healthy relationship.

Chapter- V

FINDINGS, CONCLUSION AND IMPLICATION

This chapter concludes my study, which I had drawn from chapter I to chapter IV. Besides finding and conclusion, it has some educational implications for further studies.

Findings

This study entitled “Cultural Diversity and Difficulty in Learning Mathematics” is the emerging field in mathematics education in Nepal. The main objectives of this study were to identify the cause of difficulties in learning mathematics of culturally diverse students at school, and to explore the relation between culture and learning mathematics. The design of this study was qualitative and ethnography approach. Observation, in-depth interview, and documents analysis were used in collection data. The respondents of the study were eight key students from grade eight and nine, two mathematics teachers, and head teacher. The following were the major findings of this study;

-) There was cultural diversity in Nepalese school and classroom.
-) Causes of difficulties in learning mathematics were: Cultural diversity, pupil's weak perception on mathematics, lack of culture friendly curricular materials, mathematics anxiety, traditional teaching learning activities, family's socioeconomic status, discrimination in classroom, and mismatch culture of home and school.
-) It is found that there was mutual relation between culture and learning mathematics. Mathematics is the study of patterns and relationships where people learn by doing. Construction of knowledge is inherently cultural and experiential. Mathematics is conceived as a cultural product, which has developed as a result of various activities. Classroom and learning environments cannot be isolated from the communities in which they are embedded. Classrooms are part of a community with defined cultural practices.
-) Schools culture was not favorable for culturally diverse students. There was lack of equity in Nepalese classroom.
-) The main effective teaching approaches in culturally diverse classroom are: Integrate culturally relevant content and social issues, utilize culturally responsive instructional strategies, and use cooperative learning in teaching mathematics.

Conclusions

Cultural diversity in mathematics education is a widely used expression to discuss questions around why students from different culture, ethnic, social, economic and linguistic groups perform differently in their school mathematics. Mathematics like a language is a basic tool of communication. Daily communication involves the frequent use of mathematical concepts and skills so for understanding of every discipline, mathematics is essential. There are different causes of difficulty in learning mathematics of culturally diverse students at school.

In this study, I have found that pupil's weak perception on mathematics, lack of culture friendly curricular materials, mathematics anxiety, traditional teaching learning activities, family's socioeconomic status, discrimination in classroom, and home-school mismatch are causes of difficulty in learning mathematics of culturally diverse students at school. Due to lack of practical knowledge of school mathematics, students do not find the connection between their real life and the mathematical knowledge they have learnt. So, they do not see the importance of mathematics in their future and do not study mathematics in higher level.

I have also concluded that mathematics teaching and learning ways from the schooling is not good. Existing school mathematics teaching learning practices seem failing to address social and cultural needs of the students. There is lack of use of effective teaching learning activities in mathematics classroom. School mathematics is totally based on rote learning and lecture methods. Teaching learning process fails to connect the link between mathematical theoretical knowledge and the student's real life.

Culture and learning mathematics has mutual relation. Culture of home and school directly affect in learning mathematics. Most of the schools are following culture of dominant group in society. So, it is difficult to adjust for the minority group students. Achievement in mathematics of children has affected by family's socioeconomic status. There are effective teaching approaches in culturally diverse classroom. Integrate culturally relevant content and social issues, utilize culturally responsive instructional strategies, and use cooperative learning in mathematics are effective teaching approaches in culturally diverse classroom.

Educational Implications of the Study

Every research has implications in different sectors. The study entitled “Cultural Diversity and Difficulty in Learning Mathematics” also has educational implications, which are as follows;

-) It is concentrates to identify difficulties in learning mathematics of culturally diverse students at school.
-) It is helpful for every teacher to understand cultural diversity in classroom and to apply culturally relevant teaching learning activities.
-) It supports for understand difficulties in learning mathematics like as; pupil's weak perception on mathematics, lack of culture friendly curricular materials, mathematics anxiety, traditional teaching learning activities, family's socioeconomic status, discrimination in classroom, and home-school mismatch.
-) To explore the relation between culture and learning mathematics.
-) To improve the performance and participation of the culturally diverse students in classroom.
-) It is helpful for teachers, students, researchers, institutions, educationist and policy makers.
-) The teacher should be culturally responsive to accommodate students from culturally and linguistically diverse classroom.
-) To enhance cooperative learning in teaching mathematics at school.
-) To promote the student-centered approach in classroom.
-) For the development of friendly relation between school and home.
-) It helps to teach by using culturally relevant approaches.
-) To enhance equality and equity in mathematics classroom.
-) For the development of inclusive mathematics classroom.

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APPENDIX-A**Observation Area**

-) Observation of school as well as classroom.
-) Resource available in the school for classroom purpose.
-) Interaction between students-students, teacher-students in classroom.
-) Teacher collaboration and discussion in subject matter.
-) Participation of students in classroom activities as well as in extracurricular activities in terms of gender, caste, religion etc.
-) Learning environment in home especially of key respondents.
-) Teachers behave towards students in teaching learning process.
-) Teacher's teaching style.
-) Student's and Teacher's cultural values.

APPENDIX-B

Interview Format for Head Teacher

Name:.....

Date:

Qualification:

Gender:

Experience as a principal:

Religion:

Experience as a Teacher:

Caste/Ethnicity:

Interview Guidelines:

-) Condition of school: physical facility, number of teachers, number of students, successes/failures stories of the school, community participation.
-) Ways of planning and decision making.
-) Educational activities of teachers and students.
-) Professional development of mathematics teacher.
-) Learning opportunity for cultural deprived children.
-) Perspectives on cultural diversity.
-) Evaluation of student's learning difficulties and progress.
-) Instructional leadership.
-) Relation with students.
-) Policy of school.
-) Views on teaching pedagogy.

Interviewer:

Date:

APPENDIX-C

Interview Format for Teacher

Name: Gender:

Qualification:Cast:

Training: Experience:

Religion:

Interview Guidelines:

-) Teaching methods.
-) Use of homework and class work.
-) Relation with students.
-) Impact of culture in learning mathematics.
-) Learning opportunities.
-) Languages problem in instruction process.
-) Special treatment provided to culturally deprived students.
-) About individual differences.
-) Problem in teaching mathematics.
-) Motivation to learn mathematics of different caste, cultural and religious students.
-) Role of teacher in increasing the good learning culture in classroom.
-) Students learning habit.
-) Reward and punishment.
-) Relation between culture and learning mathematics.
-) Effective teaching methods.
-) Classroom discrimination.
-) Factors that influence the learning mathematics.

Interviewer:

Date:

APPENDIX-D

Interview Format for Key Students

Name:

Permanent address:

Temporary address:

Age:

Roll No:

Gender:

Religion:

The interview with the key respondents was taken in terms of following main points:

-) Personal history (birth place, first school, habit etc.).
-) Family background (members, education, social values, economic status, occupation, participation in social works).
-) Reading opportunity at home.
-) Learning opportunity at school.
-) Views about mathematics.
-) Views about school environment and teacher's behaviors.
-) Parent support in learning.
-) Mathematics learning style.
-) Teaching methods.
-) Views about peer group.
-) Homework and classwork.
-) Difficulties in learning mathematics.
-) Cultural perspective.
-) Participation in extracurricular activities.
-) Expectation from school.
-) Implications of mathematics.

Interviewer:

Date: