

PERCEPTIONS OF FEMALE STUDENTS AND TEACHERS ON
MATHEMATICS CLASSROOM PRACTICES

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A Dissertation

Submitted to

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Master of Education in Mathematics

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DECLARATION

I hereby declare that this dissertation has not been submitted earlier for the
candidature for any other degree.

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July 30, 2017

DEDICATION

This dissertation is dedicated to all female students, teachers, mathematics educators as well as my beloved family members.

ABSTRACT

An abstract of the dissertation of *Anita Shrestha* for the degree of *Master of Education in Mathematics Education* presented on July 30, 2017.

Title: *Perceptions of Female Students and Teachers on Mathematics Classroom Practices*

Abstract Approved: _____

Binod Prasad Pant

Dissertation Supervisor

As a student of mathematics, I have always been noticing low enrollment of female students in mathematics. It kept me provoking: made me curious about the perceptions of female teachers and students towards mathematics, which further led me ponder why there is less involvement of females in mathematics. The purpose of my research was to investigate how female students experience mathematics, and examine the various disempowering forces in mathematics through teachers' and students' perspectives. The research questions of my research are, "How do female mathematics students/teachers sensitize/perceive mathematics and what sort of disempowering forces arise in the context of females?"

Feminism was the major theoretical referents aiming to address the taken-for-granted social, economic, cultural, and political assumptions and concepts in the study. The critical ethnographic approach helped me to critically assess the issues, and land with some useful insights. In Nepal, mathematics is taken as the abstract subject

in school level, so only few students tend to like mathematics. In case of female students, the situation is even worse in terms of enrollment. To investigate the possible reasons behind this, one female teacher and three female students were selected as the principal research participants for in-depth interview and groups of students were selected for the focus group discussion. Trustworthiness, pedagogical thoughtfulness, praxis and critical reflexivity were the major quality standards.

The research aims to present how Nepalese female students and teachers experience school mathematics and what are the disempowering reasons for females in mathematics learning process. Two female students out of my research participants experienced mathematics as a difficult subject and consider to be learnt only by few “talented” students whereas rest two participants felt mathematics as an essential portion of our day to day activities so mathematics is considered to be practical subject. Various disempowering forces like negative beliefs about mathematics, math-phobia and role of parents/teachers played major role in formation of females’ perception on school mathematics.

A syllogism drawn through this research is that mathematics can be easy for some female students whereas difficult for other. Some strongly believe that females shouldn’t be considered to be inferior in mathematics. Female students are explicitly influenced by the environment provided by teachers and parents. They are the sturdiest factors who are responsible to dis/empower females in mathematics. In the present context, both parents and teachers should be able to address the interests of the learners so that they become able to explore themselves in the field of mathematics.

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July 30, 2017

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Master of Education in Mathematics Education dissertation of Anita Shrestha
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I comprehend and agree that my dissertation will become a part of the permanent collection of the Kathmandu University Library. My signature below authorizes release of my dissertation to any reader upon request for scholarly purposes.

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ABBREVIATIONS

| | |
|----------|--|
| B.Sc. | Bachelor in Science |
| CAS | Continuous Assessment System |
| CBS | Central Bureau of Statistics |
| DLE | District Level Examination |
| E- Class | Electronic Class |
| ICT | Information Communication Technology |
| M. Ed | Master in Education |
| M.Sc. | Master in Science |
| MOE | Ministry of Education |
| Ph. D | Doctor in Philosophy |
| PISA | Program for International Student Assessment |
| SLC | School Leaving Certificate |
| U. KG | Upper Kinder Garden |
| UK | United Kingdom |

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CHAPTER I

INTRODUCTION

Recently there has been growing interest regarding females and their performance in mathematics. Females and their performance in mathematics has been extensively studied in the last decades. Recent concerns on this topic has generated a considerable body of research. It is all due to my own experiences and concern on how female take mathematics that led me to conduct research on the topic “Perceptions of Female Students and Teachers on Mathematics Classroom Practices”. The aim of this research was to explore perceptions of females towards mathematics classroom practices along with disempowering forces that come on their way. I have gained insightful ideas through my research participants on how they feel about mathematics classroom in school. My research participants have raised genuine issues about various hindrances they needed to feel while pursuing their academic growth in mathematics.

I have divided my dissertation into six main chapters. Chapter I about introduction of my dissertation, chapter II reviews existing literatures in the field, chapter III describes research design, chapter IV explores perception of females on school mathematics, chapter V focuses on various disempowering forces faced by my research participants and finally chapter VI includes my final insights, conclusions and implications.

This chapter comprises of the reflection of my school days which, to a certain extent, articulated how my own experiences encouraged me to find an issue on female and mathematics. Besides my own experiences, I have been motivated by various

evidences of data and literature which I have gone through. On that basis, I have outlined problem statement, the purpose and significance of the study addressing two major research questions along with delimitations of my research.

Background of the Study

Influenced by my own experiences, regarding gender differences and its effect in mathematics learning and teaching, I have been inspired to undertake a research on the topic “Perceptions of Female Students and Teachers on Mathematics Classroom Practices”. Throughout my schooling, I noticed less number of females’ participation and inclination in almost all the class of mathematics. For example, from the total number of students of our SLC (School Leaving Certificate) batch, the females were only ten where as the number of males were fifteen. After my successful completion of SLC with distinction, I joined +2 in one of the reputed private college of Kathmandu in science faculty and mathematics was compulsory subject of study in grade XI. The scenario, here, further led me to another level of amazement as only few females were in science faculty in comparison to males. When we were promoted to grade XII, we could optional for biology or mathematics. Surprisingly more number of females chose biology. We were only six females among the thirty-five students in mathematics class. Later I joined B.Sc. where I chose PSM (physics, statistics and mathematics) for my studies. my experiences, I found vast difference in the participation of females and males in technical field, specifically, in mathematics and statistics, since the number of female students in mathematics were only Two.

Later when I enrolled myself in Kathmandu University School of Education for my master’s degree in mathematics Education, yet again, I was taken by surprise to know that there was only a female student, besides me, in the class. I was

astonished to observe the increasing gender gap in enrollment with increasing level of studies in mathematics.

While recalling my schooling, I remember the moment when I was in grade VIII. There used to be tough competition between six students: three males and three females. Whenever inter-school science and math quiz competition was held, our principal Sir used to let those three boys take part in the competition without defining the rubrics for participation so we were devoid of the opportunity to participate in the competition till grade VIII. This sort of incident made me feel bad about the biased nature of the concerned teachers at school, which was implicitly promoting gender differences. My promotion to Grade IX proved to be the turning point of my life: I topped the class. That was indeed a real milestone for me, which resulted in winning the faith of teachers and finally I was given opportunity to take part in most of inter-school competitions despite me being a female child. I had to convince myself with the fact that teachers do a lot of discernments based on achievement of students hence leading to the state of gender inequality.

Since our society is patriarchal, the role of females is constructed in such a way that they need to associate themselves with household works at any cost. Consequently, every female student is supposed to carry out both household work and study simultaneously. When female student is required to balance/ divide her time for work and study, it's obvious that she won't be able concentrate more in her study resulting in poor academic performance. In my case, I feel so lucky to get such understanding parents who never imposed me for any household works. Rather my parents always provided me favorable environment which helped me a lot to give more time to my studies without having to worry about anything. During my schooling, some of my female friends always needed to help their parents especially

their mom in household work due to which they couldn't give the required time to study which, perhaps was the reason, as I can relate, to distance them from mathematics. Mathematics was bound to be a tough subject for them, no doubt.

My experiences say that mathematics is such a subject where we need to spend a lot of time to gain insightful ideas. Unfortunately, those females who had to carry out both study and domestic work at the same time, could hardly prepare themselves for the prerequisite of studying mathematics. In this situation, is it justified enough to assume that females are poor in mathematics? When it is pretty obvious that the environment provided to male and female differ, how can similar judgment be the justified standard for measuring their achievement in mathematics?

It's high time that we advocate the gender equity and not only gender equality where females are admitted in school in name of providing rights for them. As Bajracharya (2009) has stated that in most of the cases, the trend of sending girls to school has been affected by the notion of making them literate in the first place, whereas, boys have special focus in educational activities as the evident patriarchal form of our society considers only the males to be invaluable and indispensable assets of both family and society. Female isn't considered to be worthy member of family and hence female is deprived of quality education creating the state of inequality.

Another issue which I would like to address is about the difference in attitude and investments carried out by parents for their sons and daughters. There is a tendency of considering son as the breadwinner of the family who takes care of the parents in future to come. This is the reason parents provide better education for sons with a dream of them having a lucrative job. On the other hand, daughters are devoid of good education because parents are of the opinion that daughter are bound to be involved in household work and so they may not be in need of any good education. It

is sad but true in most of the families of our country. Since parents don't need to pay more in public schools, they prefer to admit their daughters in public schools whereas sons are admitted in highly expensive and/or reputed schools with an intention that daughter is soon going to be other's property but son will be with them forever.

I have observed this sort of practice among my relatives and neighbors. Most of the daughters are admitted in public schools and thereby, tend to get poor results. According to the report of Ministry of Education (2014), result of SLC (School Leaving Certificate) shows that total pass percentage of students from public schools is just 29.73% (boys – 34.41%, girls – 25.33%) whereas it is 89.38% (boys - 89.17, girls – 89.65) from private schools. This scenario of public schools' results in disempowering the ability of female students of public schools, and hence their self-esteem is deteriorated.

Not only during the phase of my life as a student, but I experienced same even in my professional life. When I was appointed as a lower secondary level mathematics teacher in one of the private schools, where I have been working for eight years, I was only a single female teacher in lower secondary level in the starting year. Gradually the number of female teachers increased but, sadly, only the males in mathematics. I even observed the performance of top rankers of every class in mathematics during these seven years. Though the stereotypes exist that males are good than females in mathematics, I found similar enactments of both male and female in mathematics in lower secondary level. But as students move to secondary level, I noticed slight declination in the interests of female students in mathematics in comparison to that of male students. My own experiences made me conduct research on the topic “Perceptions of Female Students and Teachers on Mathematics Classroom Practices”.

When I went through the national report of Central Bureau of Statistics 2011, I found very less percentage of females who have enrolled for various educational program through CBS report 2011. Particularly in field of mathematics and statistics, there was enrollment of only 2,820 females out of 17,260 students which is only 16.34%. It clearly depicts that there is very less participation of females in mathematics. These reports have outlined fewer enrollments of the females in higher education particularly in field of mathematics and statistics. According to Buckner and Botcherby(2012),I have encountered the fact that the number of females obtaining degrees in Mathematical Sciences in Europe increased by 27% between 2008 and 2011. I find these ideas useful in my research to find out the root causes responsible for creating gender gap in mathematics. These datas can provide insights in my research since the situation of gender gap in mathematics hasn't remained same; rather the gap is is visibly, and to my amusement, been minimized with time.

Problem Statement

These all incidences which I have discussed above made me envision about existing gender differences in science and mathematics. The major questions arising in my mind are “Are females really inferior to males in terms of mathematics?”, “Why is the number of females less in the mathematics field?” As a female belonging to mathematics, my own experiences made me curious to find out why gender issues in mathematics exist regarding stereotype that it is masculine to be good in mathematics. This is the major reason behind my selecting the topic “Perceptions of Female Students and Teachers on Mathematics Classroom Practices” for my research so that I could be able to find out the valid truth and sensible reasons behind existing scenario regarding female teachers and students' perception towards mathematics.

Steele (2003, as cited in Lindberg, Hyde and Petersen, 2011) argues that during childhood, boys and girls are considered to have equal mathematical ability but during adulthood, men are supposed to be better at mathematics than women. Is it that girls aren't interested in mathematics? Is it about their interest or caliber? Is it just a stereotype or truth? This existing stereotype is being sturdier due to role of family members. Generally, this is evident even in my relatives and neighbors that regarding higher education, they mostly prefer their sons to be enrolled in technical fields whereas daughters in some non-technical fields. I think the major role is being played by society which is responsible either to narrow down gender gap or to extend it. Hyde, Fennema, and Lamon (1990) state that there were no gender differences in problem solving in elementary or middle school but then later, the differences appeared in high schools and colleges favoring male students. I can personally relate my experiences to this statement. This has been a major drive for me to find out the reasons behind the declination in enrollment of females in mathematics rather than the expected or perhaps the desired increment. Spencer, Steele, and Quinn (1999) advocated that when female students accomplish in math in different manner than that of male students, there is risk of being judged by the negative stereotype of having weaker math ability. In my opinion, females have low self-esteem in comparison to males due to several stereotypes existing in society which make them feel math as male dominated subject.

Regarding females' interest in the field of mathematics, CBS (2011) shows that only 12.32% of female students are enrolled in engineering which is considered to be highly mathematics based field of study. Thus, it is clear that participation of females in higher studies is extremely low. Even those females who opted for engineering for their further studies are mostly from the urban areas. In science and

technology, only 32,792 out of 128,793 students were females. This comprises nearly 25.46%. It shows a dim picture of the females' participation in mathematics field with very less enrollments of females in mathematics programs and depicts that there is not at all an equal access to educational opportunities.

Haylock and Thangata (2007) state that girls tend to perform better overall in school than boys, but they perform less effectively than boys in mathematics. With regard to this statement, my interrogation is that: If the overall performance of female is better than male but why is it not the same in mathematics.

Purpose of the Study

The purpose of my research is to explore the way female students experience mathematics. My research intends to explore the understanding of females with regard to mathematics and find out various disempowering factors from teachers' perspectives that lead in creating gender gap in mathematics.

Research Questions

There are two research questions in my research which are as follows:

- How do female mathematics students/teachers sensitize/perceive mathematics?
- How do disempowering forces arise in the context of females?

Significance of the Study

As a female belonging to mathematics subject, my research helps me in my professional development. It, in a true sense, strengthens me with insightful ideas on my research agenda. The considerable history of gender bias in education creates an institutionalized gender inequality, which, centuries old, has become all but invisible to the general population and educational policy makers (Hall, 2011, p.10).

Meanwhile, my research addresses this issue and adds one more brick to foster an

egalitarian society and a critical citizen. My research also helps other researchers in academia who want to conduct research under similar research area akin to mine. Researchers spend their time by reading papers associated with their issues so my research can also help those researchers who are interested in of my area to crop up similar ideas in thinking.

Chapter Summary

In this Chapter, I have initiated my research journey with my own past experiences and inspirations which led me closer to my research issue. In the patriarchal society, females have been directly or indirectly dominated just because she is female. She has to suffer male dominance to a certain extent whether it is her own home or her school or working place or wherever she happens to go. It severely impacts on their academic achievement especially in mathematics. Thus, she chooses to cease from exploring her potentialities. In order to substantiate my research agenda, I have tried to explore some related literatures that depict about connection between females and mathematics. Problem statement has provided me a space to explore real world scenario through multiple aspects within my research issue. Based on these understanding, I have formed research questions along with purpose and significance of study which has guided me throughout my research journey.

CHAPTER II

LITERATURE REVIEW

In this chapter, I have incorporated various reviews about various articles and studies carried out by several scholars including present context relating to the influence of gender in mathematics. Literature review is one of the important sections of research conduction as it incorporates the past and current state of data on the topic of research. While conducting research, researcher should be able to link his/her personal study with the existing literatures through various theories, reports, articles, education policies and programs to provide evidences of worthiness of the research. Since my research topic is “Perceptions of Female Students and Teachers on Mathematics Classroom Practices”, I have collected relevant literatures related to the achievement of mathematics by different genders. I have reviewed some themes under thematic review which are gender issues in mathematics, dis/empowerment of females in mathematics and gender equity and equality. Under theoretical review, I have explored some theoretical orientations like feminism and constructivism. Relevant empirical articles and dissertations are discussed under empirical studies to present research gap as a final knot.

Thematic Review

Some themes of my research issue are gender issues in mathematics, disempowerment of females in mathematics and gender equity and equality.

Gender Issues in Mathematics

The major theme for my research is Gender and Mathematics. According to Long (2011), gender is very complex term to be defined. It has a field of study which helps us to understand the depths and breadths of the impact of a gender binary system on our social systems including education. Here, binary refers to “male” and “female”. Gender is simply division of people into categories of male and female under a process of culture of society. According to Cuber et al. (2015), gender isn’t an attribute of individuals, rather it is a way of making sense of interactions and practicing a complex system as functioning on three levels: Sociocultural, interactional and individual. Roles, behaviors and some stereotypes are associated in the name of gender to define male and female under definition of deep-rooted tradition of society; whereas mathematics is an abstract representative system which is used to study about numbers, shapes, structures and alignment between these concepts. There is very strong orientation between gender and mathematics due to existence of gender stratification in society.

Gender stratification occurs when gender difference gives males greater privilege than females or vice-versa. In our context, males get greater privilege than females. Whether it is about education or responsible position of family, males are generally considered to more deserving than females regardless the caliber of females. Since a very long time, gender stratification has been taking place in almost every part of the world particularly, in field of mathematics. Gender stratification has high impact in performance of females in mathematics. Guiso et al. (2008) had focused on analysis of PISA results. It states that the status of gender gap in math scores varies as per country. Gender gap is being narrowed or disappearing to an extent, in countries

with a more gender-equal culture. It further explains that the gender gap in mathematics and gender status within the culture is highly correlated.

The state of gender equity corresponds to the status of gender gap in mathematics. The scenario is much more different in developed and developing countries. Cuber et al. (2015) states that despite the existence of gender attitudes about mathematics, the level of perception differs in a way that Australian students perceive mathematics in the form of gender neutral. Whereas there is a significant gender gap in achievement in mathematics in Arab and Israeli students.

In most of the developed countries where gender equity is in practice, females don't need to undergo gender discrimination. Thus, they can fully concentrate on their field as per their interest. So, Chronaki (2011) stated that the quantitative data gathered during the last decade informs us that male-female differences have started not only to disappear but even to reverse in some countries like Iceland and Cuba. But, in case of developing countries, females are confined, to some extent, in the name of deep rooted culture and tradition. So, they may not be able to explore their potentialities.

Disempowerment of Females in Mathematics

Ernest (2002), defines empowerment as the gaining of power by individuals or groups in particular field or activity that helps in fostering and facilitation of power. Whereas, mathematical empowerment is concerned with the gaining of power over language, skills and practices of using and applying mathematics over a relatively narrow domain like school mathematics. In term of school mathematics, Dweck (2007) had divided students into two categories: one who considers mathematics as gift and other who considers math as earned ability. Later, it was found that students who viewed their intellectual ability as something they could develop, maintained

their interest in learning and earned significantly higher grades than their peers who viewed intelligence as a gift. When he looked at those findings through gender story, there was a considerable gap between females and males in their math grades with regards to only those students who believed that intellectual skills are a gift. When he looked at students who believed that intellectual ability could be expanded, the gap is almost gone. So, dis/empowerment of females in mathematics depends upon the attribution of students towards nature of mathematics.

When there happens to be a discussion about mathematics empowerment, females are considered to be mathematically disempowered in the context of the prevalent patriarchal society. According to the report of Scotland Malawi Partnership (2011), it has been revealed that girls are more likely to take up art, languages, biology and humanities subjects, while boys take up geography, physical education, and information technology. These sorts of scenario are also vividly observable in the context of Nepal. In most of the colleges, we notice maximum number of female students in biology and literature field whereas very less in mathematics and technology.

Gender Equity and Equality

Equity is concerned with fairness in selection of various knowledges for the curriculum, applying learner-centered pedagogical approaches and adapting alternative assessment practices (Luitel & Taylor, 2005, p. 9). In this regard, Bavner (2004), added that gender equality policy should be for both females and males to have the same opportunities, rights and responsibilities in all areas of life regarding equal access to education and training and equal opportunities for developing personal ambitions, interests and talents. Atweh (2008) opined that equity projects aim at reducing group differences in participation and achievement and hence its ultimate

aim is to abolish group differences. It has been very important to maintain the state of equity rather than equality so that both females and males can have equal opportunities to access mathematics. For maintaining the state of equity, the factors creating the gender differences in mathematics should be identified at first. The factors creating gender differences in mathematics mostly rely on the way how females are treated by their parents/teachers.

Bailyn (2006, as cited in Chabaya and Gudhlanga, 2013) states that gender equality refers to a social order in which women and men share the same opportunities and the same constraints on full participation in both the economic and domestic realm. Equality just emphasizes on equal opportunities keeping aside the differences and conditions that these people may face due to which they can't get intended equal outcomes. Whereas gender equity recognizes differences and accommodates them in order to prevent the continuation of the disparity. In other words, equity emphasizes fairness in the process and outcome. Thus, the discourses of quality and equity have become a global concern in the field of mathematics education as reflected in most of policy and curriculum documents around the world (Atweh, 2008, p. 1).

Theoretical Review

The major theory that can document my research issues is feminism.

Feminism: A Perspective in my Research

The common misconception about females that they are logically and physically incapable in comparison to men had influenced their participation in educational field. Feminists stress on changes that should take place in equal opportunities with appropriate educational policies. Derycke (2010) states that the

passion of inequality exists in the discourse that binds people by their grip to the beliefs about the hierarchic distribution of positions in society.

Gordon (1994, as cited in Chabaya and Gudhlanga, 2013) states that females of all races in school were subjected to some sexist practices and conditions in Rhodesia allocating subject choices, extra curricula activities and sports different for males and females leading females into 'feminine' areas such as needlework and cookery. This sort of activities that take place at school disempowers females due to segregated curriculum. At the same time, even school textbooks play some roles in transmitting stereotyped images of males and females. Feminism believes that females and males have similar rational facilities which should not be detached in terms of sex and opportunity. So, the major part is to provide equitable environment where both males and females can enjoy opportunities.

Chen, Tang and Zhang (2010) had considered education as one of the main factors that results in the impression that males are more talented in knowledge regarding mathematics. Mathematical textbooks have been conveying this concept either implicitly or explicitly in the selection and organization of teaching content. The gender equality is one of the important aspects of educational fairness and education is the primary factor in shaping the children's gender role. Therefore, we need to cultivate an educational environment for students which could convey message of gender equality. The most important thing is that mathematics teachers and textbook editors should pay attention and reflect gender issues in the current textbooks. At the same time, even our culture is also adapting the same attitude giving privilege to males. So, it is an urgent necessity that existing culture must be reconstructed to cultivate the state of gender equity.

I have used the concept of feminism while constructing guide line questions for interview in order to make research participants think critically about research issue. Ideas of feminism have been used in various discussions as well to address the stakeholders who can make contribution in female mathematics education.

Empirical Review

Understandings gained through several literatures have provided valuable insights into my issue “Perceptions of Female Students and Teachers on Mathematics Classroom Practices”. Most of the literatures have addressed the differences in participation in mathematics as per gender: particularly males are more inclined towards mathematics in comparison to females: this I got to know when I went through an article “Women in Mathematics: An Historical Account of Women's Experiences and Achievement”.

From Huff (2011), I have come to know that women have been ignored, underappreciated and severely judged on the basis of their gender which hampers self-esteem of females. The first female mathematician Hypatia (355 - 415), who succeeded in mathematics, science and philosophy due to inspiration of her father was killed on her way home. The incident took place to stop Hypatia move ahead. This incident caused great loss in education in Alexandria. Subsequently, mathematics wasn't formally studied for next 1000 years.

These historical beliefs are responsible for restricting females on the road to mathematics. Apart from history, there exists various other variables that have been responsible to create gender differences in mathematics. As Li (2007) has described that the gender differences in students' beliefs about participation of females in math and science change as per the location of the school. I also feel that the perceptions

vary according to region since more gender discrimination is practiced in rural areas in comparison to that of urban areas.

Spencera, Steele and Quinn (1999) describe that when female students perform math different than men, there is risk of being judged by the negative stereotype that female students have weaker math ability. To disprove this stereotype, this research tries to explore the truth that females are equally able as males in mathematics if proper environment is provided. According to Hyde, Fennema and Lamon (1990), gender difference in mathematics performance is gradually declining these years. So, my research is based on the changes in gender differences in mathematics along with time; and I have also tried to explore how gender differences have an impact in mathematics performance.

Due to the patriarchal form of society, though females may have interest in learning mathematics in higher education, they need to invest their time in household works which creates distance between females and mathematics. Beilock et al. (2009) states that there is strong link between teacher's anxiety and students' achievement in mathematics because teachers may influence girls' gender ability beliefs creating an impact on girls' math performance. In the first place, the number of female mathematics teachers is very less and again, if students sense teacher's anxiety in teaching mathematics, it plays negative role on female students which could further lessen their level of performance.

According to Pradhan, Shrestha, and Mission (2005, as cited in Luitel, 2009), Nepal has rich wisdom traditions that nurture holistic, relational and environmental thinking. In spite of this, the venerable social hierarchy which is based on caste, gender and ethnicity has contributed, to a great extent, to obstructive dualisms like male versus female; so, our existing cultures and traditions are responsible in

extending the gender inequality in society. Foley (2002) says that the denouncing discourses about inferior “cultural others” encourages inequality and steal people’s prejudice and humankind in the same way as laboring in commodity-producing factories does. Similar situation is noticeably in existence in mathematics particularly for females. In spite of the calibers of females, their rights are seized in name of various social and cultural aspects due to which many females are deprived of their higher education in mathematics. As a consequence, time demands for changes advocating “what the world could be?” and “what the society should be?” so my research methodology is guided by critical ethnography. I agree with Anderson (1989) that critical ethnography is the result of dissatisfaction with social structures like class, patriarchy and racism in which actual human players never appear. Some literatures that I have gone through made me draw a syllogism that although gender gap exists in mathematics, it is gradually decreasing with time. There are several variables which are responsible for creating gap but it doesn’t imply that females are weaker than males in mathematics. Although the literatures that I have revised don’t talk much about the potentialities of females in mathematics, these various literatures have motivated me to work more actively on my research project. My research tries to explore the attribution of female teachers and students regarding how they take in mathematics to ascertain that females aren’t inferior to males in mathematics.

Research Gap

Bajracharya (2009) conducted a study about achievement scores of grade eight students on the basis of gender. Bavner (2004) conducted a study on equity in education. Beilock et al. (2009) conducted a study about effect of girls’ math achievement due to teachers’ anxiety. Bista (2006) describes about status of female

teachers in Nepal. Chabaya and Gudhlanga (2013) explains about motivation to achieve gender equity. Chen, Tang and Zhang (2010) explains about the gender issues which are addressed in textbooks of primary level. Hannula (2009), focuses on effect of achievement on gender and classroom context. Hattie (2012) describes about historical account of women's experiences and achievement. Iiping (2014) emphasizes on socio-cultural factors that influence girls' participation in mathematics. Though these literatures that I have gone through address gender issues in mathematics, I couldn't find any research studies that has taken in consideration about how female sensitize mathematics. I came across many research papers about dis/empowerment in mathematics but not particularly on dis/empowerment of females in mathematics so my research addresses how females take mathematics and how they are dis/empowered in mathematics.

Chapter Summary

In this chapter, I have linked my research issue with several literatures through reviewing process which has given proper shape to my research. Literatures that I have gone through made me shape my research journey in proper way. This section helped me to see existing scenarios regarding issues of female and mathematics through multiple lenses. Thematic review has helped me to seek various themes associated to my research issue. Theoretical review has helped to link theory with my research issue. In the same manner, empirical review has helped me to find out research gap. This review section has motivated me a lot to work hard during my research journey so that I become able to dig out ground reality regarding my research issue.

CHAPTER III

RESEARCH METHODOLOGY

In this chapter, I have interpreted my research methodology to carry out my research. I have presented paradigmatic considerations in the form of ontology, epistemology and axiology. On top of that, I have presented four research participants from Kathmandu district to explore their experiences through narratives and interviews. I have presented critical ethnography design as a research design by establishing the ethical considerations in data analysis and interpretation procedures during the course of my research. I have explained the tools for data collection and procedures of collecting data. I have also elaborated quality standards of my research.

Research Paradigm

Regarding paradigm, my research is guided primarily by interpretive paradigm and secondarily by critical paradigm. For accumulating the perception of females on mathematics, I need to understand and interpret students' and teachers' perspectives critically by bringing their real-life experiences through interviews and deep prolonged engagement in the field for fulfilment of my study objectives. I have tried to explore disempowering factors behind less involvement of females in mathematics, addressing the existing state of inequality in society in terms of mathematics education. I advocate for fostering a democratic society and rational individuals who would lend their helping hands to females to understand their interpretations of the world around them.

My research method includes critical ethnography design. According to Apple (1993, as cited in Carspecken, 1996), critical ethnography in educational research

pursues to show how a critical attitude on the nature of power can be wedded to a process of analysis that tries to ask how power circulates in our day-to-day realities. Schwandt (2010) states that critical ethnographic studies about social practices and cultural institutions precisely aim to criticize the existing granted social, economic, cultural, and political concepts. My research is based on the life-world experiences of female teachers and students with regard to mathematics.

Philosophical Perspectives of My Research

According to Tuli (2010), the selection of research methodology relies on the paradigm that guides the research activity regarding beliefs about the nature of reality and humanity in the form of ontology, the theory of knowledge in the form of epistemology and how that knowledge may be gained in the form of methodology. Axiology is also one of the paradigmatic considerations that deal with the values and norms.

Epistemology

Since, my paradigm is inclined to interpretive and critical paradigm, world is observed as constructed, interpreted and experienced by people in the form of their interactions with each other as well as with wider social systems. Epistemology focuses on ways of learning about the social world by making knowledge personal, subjective and unique.

The epistemological considerations in my research are formed by the notion of interpretative and critical standpoint ingrained with notion of originality, uniqueness and independent belief that all knowledge and truth are comparative and they promote the views of multiple realities depending upon life experiences. My epistemology in relation to my research agenda is concerned with the way in which gender influences our concept of knowledge, values and practices.

Ontology

In term of ontological consideration, my ontology is based on multiple realities. As reality is not limited in the form of single text, significance of text might depend on the students, teachers and the strategies used by them in the classroom. In this study, I reserve a belief that there is no single reality since it may change per context and situations. Similarly, findings have incorporated females for various interpretations to find out their perceptions in terms of mathematics. Ontology of my research is affected by socially constructed values and subjective experiences.

Axiology

Axiology involves the values and belief systems of a paradigm comprising study of values and goodness. Values are humanly created, soften and personal which vary per the perspective of an individual. Since the research is value-laden, I appreciate experiential knowledge rather than the acquired one. I capture only those ideas which are essentially worthwhile for my research agenda. The voices of females under patriarchal system are valued and reserved without any manipulation. The diverse situations that females need to encounter are at the focal point of the subject matter.

Research Design: Critical Ethnography

I used “critical ethnography design” to conduct my research. Thomas (1993, as cited in Madison, 2004) stated, critical ethnography is straight forward ethnography with political purpose. It is a research for challenging unjustifiable practices, beliefs and values. Critical ethnography initiates an ethical responsibility to address unfairness within an existed domain. So, my research issue is also concerned about the acquaintance of domination and inequality in society mainly in the field of mathematics regarding females. I have tried to emancipate females towards their

empowerment and advocate for the maintenance of the status quo. My research demands for amendments in society to create better and justifiable state of equity in mathematics with regard to gender. According to Cohen, Manion and Mansion (2011), the focus of process of research are political at heart concerned with issues of power, domination, voice and empowerment so my research has located myself in the text to be reflexive and self-aware of my role as reflexivity is high in critical ethnography.

Study Location

For conducting research, I selected two private schools which lie in Kathmandu district. I selected one school located at New-Baneshwor, Shankhamool whereas another school is located at Gokarneshwar.

Participants of the Study

The major participants of my research are four females: one female mathematics teacher and three female students of different levels. In the beginning phase of my research, I planned for three participants (one female mathematics teacher and two female students) so that I could collect ideas of both female teacher and students. But I couldn't assemble enriched data so I added one more student as a respondent for my research. There are ten female teachers/students as participants of focused group discussion.

Miss Alia is secondary level Mathematics teacher who has been working for eight years in private schools in Kathmandu. She is not originally from Kathmandu Valley. Miss Alasha is one of the highly-gifted students of one of private schools of Kathmandu (Adore Academy). She is a class seven student who is both the class and school topper. Miss Anah is one of the less gifted students from the perspective of mathematics. She is student of grade VIII in Adore Academy. Miss Arika is student of

grade IX also from Adore Academy. She doesn't entertain herself with more of mathematics.

Selection of Participants

As my research is guided by critical ethnography, selection is done in such a way as to meet the needs of my research. For the fulfilment of research objectives, I selected individuals and sites to understand the central phenomenon that is aimed in research purpose. To get detailed understanding concerned with my research, I selected female students and teachers from private school of Kathmandu district to serve as participants.

It was really a difficult job for me to search mathematics female teacher with mathematics background. I got to meet one female mathematics teacher in one of the seminar of Mathematics University. I talked with her about my research agenda which was, to my delight, an area of interest for her. So, I made her one of my research participants. In terms of student participants, I randomly selected some students for focused grouped discussion. Based on the ideas shared by them, I selected three female students as my research participants.

Data Collection Tools and Procedures

I used guidelines for conducting interview. Meaningfulness insights which are generated from the qualitative inquiry should be more concerned with fruitfulness of the data to ensure trustworthiness of the tools.

While collecting data, it is very essential for a researcher to be engaged with participants. Meaningful data can be obtained only through prolonged engagement with the participants. The process of provoking participants frequently about the issue of my research and observing them, helped me to explore the truth. Some of the data collection procedures are mentioned below:

In-depth Interview

According to Boyce and Neale (2006), in-depth interview is major part of a qualitative research technique that involves in conduction of rigorous individual interviews with a small number of participants to explore their perspectives on a particular idea. Participants were asked about their experiences and thoughts concerned with the research program through prolonged engagement. To gain much more detailed information, I took help of open-ended guidelines to collect narratives of participants. Probing questions were also effective which made research participants think back and reflect on their personal experiences.

I visited my research participants frequently in their respective schools. I managed a separate room for conducting interview where no one could disturb us. Before conducting interview, I didn't have any idea about the duration of the interview. I was planning for around for 30 to 45 minutes. I conducted interview, at first, with teacher which lasted for around 1 hour 45 minutes. Later, after few days, I conducted interview with three students simultaneously. As the first-round interview with the students, wasn't fruitful in case of gathering meaningful data, I conducted interview twice with three students.

Observation

Observation helps to examine people in naturally occurring situations. Kawulich (2005) states that participant observation is the process that enables researchers to learn about the activities of the people through study in the natural setting by observing and participating in those activities. Participants were observed indirectly throughout my research process. Observation helped me a lot to collect data by capturing the context of whole setting of field in which my research participants

work. Mulhall (2003) states reason of using observational method as to ascertain whether what people say regarding they do is the same as what they do or not.

Focus Group Discussion (FGD)

According to Krueger and Casey (2000, as cited in Masadeh, 2012), focused group is defined as carefully planned series of discussions which is designed to acquire perceptions on a defined area of interest in non-threatening environment with the permission of research participants. FGD has become a popular tool for research across a wide range of sectors so I preferred to conduct FGD with a small group of female students to generate qualitative data using a set of open ended guidelines on the topic of my research. I separately collected some female teachers and students of my school where I have been working. I made them seated face to face. At first, I introduced the topic of my research for discussion. I created environment for discussing their interest and achievement in mathematics assuring them that the information they provide will remain entirely confidential. Everyone started sharing their experiences: the interaction continued.

As Cameron (2005) states, the focus groups can be both terrifying and exciting with participants regarding the ideas and viewpoints expressed by them. It introduces the researcher and other group members to new ways of thinking about their research issue. It eventually helped me a lot to gain meaningful ideas and information regarding my topic.

Field Notes/Memos

Van Manen (1988, as cited in Wolfinger, 2002) states that field notes are short hand renovations of events, observations, and conversations that take place in the field of research. I made brief notes on participants' answers on a computer which worked best for me. Wolfinger (2002) states that field notes serve as a vital role of connecting

researchers and their topics in the writing of an ethnographic report. At first, I tried to write while I was in field but it didn't seem to work properly so after I returned home the same day, I prepared field notes. I visited participants for considerable time for field visit to interact with them and collected data and information through fieldnotes.

Working with Data Texts

According to Creswell (2012), the following steps can be used in the process of data analysis and interpretation which are described as follows: The first step is to prepare and organize the data for analysis. At first, management of data takes place through organization of the data, transcription of interviews and typing field notes. The second step is to explore and code the data. Words and phrases that capture important aspects of the data are explored in initial review to immerse oneself (researcher) in the data and gain a sense of their possibilities. The next step is to represent and report qualitative findings. Findings are reported in narrative discussions comprising many forms like chronology, questions and comments about any changes that the participants experience.

Finally, findings were interpreted. Meanings are interpreted through findings and reports made. Interpretation consists of personal views, making comparisons between the findings and the literature, and critical analysis about the finding against existing beliefs in case of critical ethnography.

Keeping these steps in consideration, I analysed and interpreted the data and findings in a critical manner as my research methodology is critical ethnography. The reviewing of literature has indicated that the participation of females in mathematics in higher education is relatively very low. This research has analyzed and described the perceptions of female teachers and students about school mathematics.

Quality Standards

I have set the following quality standards in my research. I now mention what they mean for me and how I assured them:

Trustworthiness

“Research findings should be as trustworthy as possible and every research study must be evaluated in relation to the procedures used to generate the findings” (Graneheim & Lundman, 2003, p. 109). I maintained trustworthiness of my research by going to the real field and appreciating social state, understandings and perspectives of participants by conducting research in personal, social and natural setting. I maintained credibility through prolonged engagement by visiting each of the participants frequently for interview, sharing and discussing my research topic and reinterpreting the situations.

For maintaining reliability, I included guidelines during the process of my research so that there could be a space for plenty of description (feelings, beliefs and judgments about mathematics) from the participants. With regards to maintaining transferability, my research makes itself convincing enough to make females aware of the fact that they can do better in mathematics and aren't inferior to male what-so-ever. It helped in adaptability of my research aspect into a new context: To make readers confirm about my data is to maintain conformability. For this, I mentioned the data which can be accessed even by readers.

Pedagogical Thoughtfulness

Koul (2008) defines pedagogical thoughtfulness as the quality of research that implicitly engages both the reader and the writer in thinking about educational issues. According to Manen (2008), the means and methods used in research have pedagogical value as well as consequences for teaching and learning process along

with the objectives of education. It is maintained by increasing prospect of females for the awareness of the deep-seated assumptions that is responsible for guiding their beliefs. I maintained this quality standard in my research by generating reminiscent texts through the stories that keep on provoking readers to question, reflect and examine their own pedagogical practices in a rational manner.

Praxis

According to Taylor and Wallace (2007), praxis is concerned with the differences between natural constructs and human invention which makes the researchers take a critical approach to the phenomenon of their research by taking the power relationships in consideration. Since praxis is alignment between theory and practice, I brought real life experiences of research participants and tried to see those practices through various theoretical lenses which explicitly addressed the notion of praxis. It could help readers to reflect critically about their practices.

Critical Reflexivity

According to Denzin (2003, as cited in Luitel, 2009), the idea of critical reflexivity demands the notion of exposing oneself and being self-conscious regarding own subjectivity. So, I critically reflected upon my assumptions and explored my personal issues concerned with research. Critical reflexivity as a quality standard examined my false consciousness regarding chosen epistemology, methodology and referents.

Ethical Considerations

According to Cohen, Manion and Mansion (2011), ethical issues may rise from the nature of problems investigated by social scientists and also the methods they have used to obtain valid and reliable data. Each stage of research raises ethical issues. The major ethical concerns in qualitative research are informed consent,

protection from harm and confidentiality. Informed consent represents that participants are well-informed about the conduction of research through their participation. The nature of field and participants might bring changes to pre-decided form of events to be conducted so respecting research participants and sites is very important for conducting research. Protection from harm is one of the most prominent ethical concerns in qualitative research concerned with both physical and emotional harm. Though most of the researchers promise confidentiality to the participants of their studies, the question arises whether this promise can be fulfilled, so it is very essential to assure participants about their confidentiality.

Chapter Summary

In this Chapter, I visualized my overall methodological roadmap which I have followed throughout my research journey. My research paradigms have been interpretive and critical. Subjective realities have been well represented by interpreting both: my own experiences as well as of my research participants. Furthermore, I have elaborated about my research approaches in the form of critical ethnography. Critical ethnography has helped me a lot to critically reflect my own and research participants' feelings along with broad socio-cultural dimensions. I have clarified about my research field area and selection of my research participants along with their details. Additionally, I have described the way I collected data along with the quality standards which I have maintained throughout research journey. They have crucial substantiation in my research followed by ethical consideration.

CHAPTER IV

FEMALES' PERCEPTION ON MATHEMATICS

In this chapter, I have developed experiences, stories and feelings of my research participants in an organized manner. I conducted interview/s with my participants spending considerable amount of time. I have merged opinions and experiences of research participants one by one, and, hence I have formed the sub-headings of this chapter participant wise. I organized this chapter on the basis of research participants' voice. While doing so, I narrated their experiences and also kept some direct quotations. Later on, I discussed on the basis of my experiences and available literatures.

Mathematics is Made Difficult: Miss Alia

This section is based on the interview with one of my research participants – Miss Alia. She is secondary level mathematics teacher who has been involved in teaching mathematics for the last eight years.

It was one of the day of January in 2015, I was struggling to find female participant teacher for my research. I suffered a lot, since I was in search of lower/secondary level female mathematics teacher. A single question was frequently striking my mind “Are females really not interested in mathematics?” The objective of my research was to find how females perceive mathematics. The initiation of my research regarding the search of participants gave me some clues about my research. My strenuous hunt for female maths teacher finally came to an end on the day when we conducted seminar regarding mathematics issues in education in our college, Mathematics University. Every participant was from mathematics background.

Among 30 participants, there were only 5 female participants. I requested one female mathematics teacher, Miss Alia to be the participant for my research. I was victorious: I got my research participant. Miss Alia is one of teacher participants of my research. In my case, I loved mathematics since my childhood. And I always presumed every mathematics teacher loved mathematics. During my interaction with Miss Alia, I came to know that she didn't use to love mathematics in her past. *"I didn't use to love mathematics. Once when I was in grade IV, I had even secured a 'Zero' in exam. I always tried to avoid math book. Until my DLE (District Level Examination) of grade V, I knew nothing about math so I failed in grade V in mathematics"* Miss Alia shared. It is common scenario in most of the schools. Those students who obtain less marks during exam in mathematics think that they are weak in mathematics so they suffer from math-phobia. Some students are able to confiscate weakness whereas some accept to be poor in mathematics and always try to maintain distance with mathematics subject. In case of Miss Alia, she had been able to confiscate her weakness in mathematics through various efforts.

I would also like to recall my schooling when I was in grade VI. There was optional math subject which was introduced in grade VI for the first time. Those days are still fresh in my mind. That particular day of trigonometry class is really memorable. *"It wouldn't be possible to understand and remember formulas of trigonometry for you at this moment. So, I will solve all 26 problems of this exercise"* our math teacher said. We were all happy because we thought we wouldn't be getting homework. But He further continued, *"Repeat all problems of exercise as many times as you can till you know it properly"*. We were shocked because we hadn't understood anything. Then how could it be possible to remember. After all it was homework, so I practiced the whole night. No, no... How could I say it was a

practice? It was just the process of copying the solution as per the direction of teacher. According to Mayor (2002), when teachers focus only on rote learning and assessing, only on remembering fragments of knowledge, teaching/learning process remains in isolation to context. Rote learning may keep learners away from context due to which learning process won't be meaningful.

After copying many times like parrot learning, I was able to remember. At that moment, I was so happy. But now when I recall that incident, I laugh at myself. How can that rote learning be math? It is teacher, who is responsible for clarifying the concepts of math to the students so that students find mathematics interesting, easy and useful in real life. Otherwise, students may consider mathematics subject just as a burden for them which becomes major reason for creating distance between mathematics and learners. Sharma (2012), states that mathematics was considered as a difficult subject in our context just because of our teaching/learning practices. Mathematics is considered to be difficult subject by most of the students and it is believed that hard labor is required for the students for mathematical solutions.

“Mathematics is difficult subject for one till one doesn't give time. Math is no longer difficult if one gives proper time to practice but if individual runs away from math without giving time, math becomes more difficult” Miss Alia said. Time is really the important factor for working well with mathematics. It was my schooling of grade IX and X, when I used to practice mathematics for a long time with one of my close friend, Miss Sarah. We used to compete to complete the exercises from the Practice Set Book. So, we used to invest a lot of our time in doing mathematics. As a result, we were more interested in mathematics and to some extent good in solving problems as well. Whereas other friends didn't used to give time due to which they found mathematics very tough.

Few years ago, there was a sort of workshop during initiation of new session in the school, Wonderful Academy, where I worked. Teachers were divided as per their department. There were 4 teachers in our Math department. The first question we were asked by our trainer was *“How can you start teaching any topic of mathematics by making proper link with the things that exist around us?”* We were puzzled by the questions. Till that time, I used to think that Mathematics is all about formulas. Then, how could it be possible to link math with things around us. Later, our trainer made us realize that mathematics did exist around the room by showing how angles, parallel lines, perpendicular lines and various geometric figures are formed within the room. We convinced ourselves that mathematics isn't an isolated subject it is rather a discipline which is grasped along with many other disciplines.

Mathematics isn't a single discipline. It is related with society and its culture that helps learners to understand the world through eyes of mathematics as mathematics is everywhere. *“I believe that beauty of mathematics lies on its application in real life. Students feel more comfortable with mathematics when they are able to see mathematics around them. Teachers should be able to make proper alignment between school mathematics and real life mathematics”* Miss Alia said. Mathematics is indeed a subject which covers almost every aspect of the world so students must have right to get opportunity to learn mathematics practically. Orey and Rosa (2015), explain that the process of learning mathematics doesn't only mean to receive or memorize ready-made concepts in passive form. Miss Alia further continued, *“Teachers shouldn't pour down formulas in the mind of students rather they should let students feel mathematics around them so that they become able to see mathematics everywhere. It even helps to convert abstract aspects of mathematics into*

discrete form. They gain invaluable insights when they can use their school mathematics in their real life”.

Miss Alia further explained, *“From the beginning of my childhood, I grew up with the sense of inferiority and discrimination compared to my brothers. They were allowed to play outside and learn while I was confined with a doll in a room”*. It was indeed heart touching statement. She believed that her brothers could have a proper learning through interaction with environment whereas she was unconsciously enforced to be submissive, humble and emotional. Her parents believed that those feminine qualities make a female an ideal girl. When females are in boundaries, they are not able to explore their potentialities.

From the above discussion, I came to realize that my research participant’s thinking is largely guided by the notion of constructivism. She believes that learners actively construct new knowledge when they are given more opportunities to interact. As she frequently raised the issues of connection between time, effort and achievement, she focused on the saying, *“if learners take part actively in learning, then they can surely succeed”*. She has made this concept clearer through her experiences.

Alia has also raised the issue of making mathematics difficult for learners. Generally, students hate mathematics in junior level since they need to learn abstract concept through rote learning. Perhaps, school administration doesn’t feel responsible to appoint mathematics teachers with mathematics background in junior level. Therefore, students of junior level may be deprived of quality education. Learners consider mathematics subject as burden because they need to accomplish large number of problems from their course book every day. The number of problems to be

solved are so big in number that learners' concentration is more focused to the completion of exercises rather than meaningful learning.

Miss Alia has also advised mathematics teachers to teach mathematics in such a way that learners are able to feel mathematics everywhere. Since mathematics is merged with other disciplines as well, teachers can associate mathematics with real world activities so that learners can see application of mathematics in real life. Such teaching/learning process becomes possible through constructivism. Constructivism is a theory that explains how learners learn and gain knowledge. When "learning by doing" concept takes place in teaching/learning process of mathematics, learner can learn through meaning making process along with ownership of learning. According to Glasersfeld (1989, as cited in Ernest (n. d), Knowledge is not to be received passively rather it is actively built up by the cognizing subject. Idea of individually constructed knowledge makes learners academically strong.

Miss Alia has also raised an issue of feminism. Since our society is male dominated, environment provided by parents, teachers and society determines educational status of a female. Various disparities take place on basis of gender which play major role in defining perception of females towards school mathematics. Gender difference existing in society has become a factor which pushes female behind males especially in societies which are all patriarchal. Nicolaides (2015) states that it is important for feminists to remove all those obstacles that come on the way to female's liberation in the social, economic and political arenas. If the state of equity could be maintained everywhere whether it is at home or outside, it will certainly discourage the prevailing unequal treatment on basis of gender and promotes women empowerment.

I Cannot Learn Mathematics in a Large Group, I Learn Alone: Miss Arika

It might be any day of June, 2016, I was in search of new participant for my research since the data and information I have collected wasn't meeting expectation of my dissertation supervisor. He told me to re-interview all three participants of my research. I did so, but still I wasn't getting sufficient data. It was any day of late June, 2016 Miss Arika stroke in my mind. She had joined Wonderful Academy in 2015, where I had been working. The year she joined Academy, I was her class-teacher so I have a sort of personal attachment with her. She used to come to me whenever she found herself in problematic situation. One day, she was explaining the problem she had been facing in classroom. It made me feel that she would serve my purpose the best as my research participant.

Miss Arika is less interested in mathematics subject. Whenever she was asked about her opinions regarding mathematics, her response in single word was "*NO UNDERSTANDING*". I didn't wonder on her response because Miss Arika isn't a single student who finds mathematics difficult. There are many students who try to learn mathematics just to pass in exam. It was an incident of some days before, I met my cousin sister. She was explaining me how she had taken up the responsibility of teaching mathematics to her needy friends. I was totally awestruck by her words, she explained me about her friend's opinion regarding mathematics. Her friend's opinion was, "*Why should I work hard in learning mathematics? It is just sufficient to pass in math. I don't want to work hard because once our SLC (School Leaving Certificate) is over, there is nothing to be done with mathematics subject*". I was really astonished to know that how can some students of grade X not see application of mathematics in real life! It may be because the present trend of grade X in most of the private schools

of our country is to complete course within half of the session and the remaining session is used in preparing students for exam, exam and exam.

“Whenever my brother teaches me mathematics alone at my home, I feel it easy to understand but as there are many students in my classroom I find it difficult to concentrate among many friends due to which I am unable understand mathematics and thus it has become difficult subject for me. Until my teacher teaches, I do feel that I understand but later realize that I am nowhere” Miss Arika said. For Miss Arika, Mathematics is a solitary activity which is done by individuals in isolation. She feels disturbed in classroom so she couldn't concentrate in class. The same content, when taught at home, becomes more comprehensible. It has been a major problem of most of the students. Due to the pressure of number of students as there may be around 40 students in a classroom, the time allocation per period in traditional approach based school is about 40 minutes due to which teacher may not be able to address individual students.

Miss Arika further continued, *“Whenever I thought of discussing my problem with my teacher, I was scared of his scolding so I most often did not approach him/her; however, I used to complete my homework of mathematics only if I knew it. The teacher used to ask us to solve the remaining problems in the same manner as he did in the class as an example, so I did most of homework on basis of the examples given on book and followed the way my teacher has done in class”*. This is common scenario of most of the students in mathematics subject. There are large numbers of problems in every exercise. In the name of homework, students were required to complete exercises so the first easy job that the students found was to copy from friends, second to follow the process and steps that the teacher used to instruct in the class and third can be going through examples of the book. Mathematics for students

has just become a tough task of completion of homework assigned by teacher.

According to Gunderson et al. (2012), first and foremost idea about teaching/learning process is that students need to have the opportunity on a reliable basis to develop problem solving skills in mathematics without focusing exclusively on practicing a rote procedure so teacher should be able to create learning environment where students gain problem solving skills on their own.

“Sometimes, I feel sleepy in mathematics classroom. At that particular moment, I don’t understand anything”. When students don’t get any concept regarding the topics taught by teacher, students often do not concentrate in the classroom. Hence, gradually students start developing negative attitude towards mathematics. Some students believe that they couldn’t understand mathematics so, though they are physically present in class, they were mentally absent during teaching/learning process.

Students prefer to learn with friends rather than teachers. As per my experience, I have observed that more number of students enjoy to learn with their friends rather than from their teachers. Therefore, they feel comfortable to discuss with friends and find the solution rather than with teachers. Miss Arika further stated, *“When teachers allow us with some collaborative work, we feel happy and become active in taking part in discussion with friends. Very rare classes of mathematics take place under collaboration otherwise it is just about formulas and exercises. But then collaborative activities are indeed so fruitful”*. Collaboration is very important for new learning and thinking. I agree with Hattie (2012) that students always need to know that they are safe to share with their teachers when they do not know and have belief that teachers will always be fair when they interact with peers.

I do have experience that if we (teachers), behave with the students in the way they are behaving, they feel themselves so close to us. It makes them share any problem to us without any hesitation. It creates positive vibes in classroom which is crucial part of teaching/learning process. To prepare successful learners, collaboration in classroom is very important and that includes an interaction among materials, students, teachers and context. “The constructivist teachers help the students through problem-solving and inquiry-based learning activities with which students formulate and test their ideas, draw conclusions and inferences, and convey their knowledge in a collaborative learning environment” (Khalid & Azeem, 2012, p. 171). Collaborative teaching/learning does not believe in examining a student through rote learning to check memorization power and written presentation. Learning in group is always more effective than an individual so collaborative learning process makes a lot of difference in teaching/learning process.

Regarding importance of mathematics in our daily life, Miss Arika doesn't see more of its importance. She elaborated, *“Algebra isn't used in our daily life so I don't think it's important to study. I don't see the use of algebra in our real life so I think 'why I should study algebra in mathematics only through rote learning of formulas'.* *Other portion of mathematics like profit and loss, percentage and simple interest are used in our daily life so I feel comfortable while addressing exercise of such topics”.* It is indeed true that when students are able to see application of mathematics in real life, they find it interesting and feel easy to work with mathematics. But, in most of the cases, they are unable to see the application of mathematics in real life leading them to math-phobia.

Next factor Miss Arika thinks, the reason behind mathematics being a difficult subject is frequent change of teachers in private schools. *“We need to face more*

difficulties when there is a constant change of teachers. It takes around 2 to 3 months to be habituated with way of the new teacher which makes us more negative towards mathematics” Miss Arika expressed. It is normal phenomenon of private schools to change teachers in regular interval of time due to various circumstances. As a result, students need to face a lot of difficulties. According to Noor al et. (2012), frequent change of teacher during the session is very harmful for students. Situation becomes more acute when a teacher is transferred during the academic session and his/her replacement takes long time to be filled in future. When such situation takes place, students need more time in adopting the way new teacher teaches so it hampers learning process of learners.

Students have different level of understanding, learning abilities, attitudes and responses to certain classroom environment and instructional practices. Since every student is unique, teacher should be able to address every type of student as per their need. “The more thoroughly instructors understand the differences, the better chance they have of meeting the diverse learning needs of all of their students” (Felder and Brent, 2005, p.57).

A single class constitutes of both gifted and less gifted students. Since less gifted students need more attention, teacher should be able to determine their students’ individual learning attributes and in the manner best suited to those attributes. Miss Arika said, *“There shouldn’t be discrimination between less gifted and highly gifted students from teachers’ side. It discourages us. When teacher makes us feel that we are weak, it increases more negativity towards the subject. Teachers should address students in the way they understand because teachers are familiar with the needs and nature of students”*. It is the fact that no one wants to be identified as incapable. A good teacher never points negativity of a student in a mass. Rather,

teacher may counsel him/her in privacy. But if it is a matter of praise, it might be done publicly. The job of teacher isn't just to teach rather teach with passion and a desire to reach every student. Students learn better from teachers who care and motivate them to learn.

Miss Arika continued, *“Teacher should focus more on less gifted students because more gifted students don't need more attention since they can prepare for themselves. I hate math because of negative learning experiences but if teachers look for positive point in me and make me feel good through success oriented activities, I may start loving math. Good motivation produces good learning experience so we need to feel the joy and purpose of learning”*.

Miss Arika admits that it isn't only the fault of teacher rather it is due to 40 minutes time allocation per period. According to Hongboontri and Keawkhong (2014), one of the participants opined that teachers give lecture and assign homework. Though teachers know that many students find their teaching boring, teachers just try to teach since they need to cover all the contents for the exams. If teachers don't take initiation in bringing change in classroom, then successful teaching/learning process doesn't take place. So as per the possibilities, a teacher may try his/her best for creating fruitful teaching/learning process. Hattie (2012), states that the utmost effects on students' learning is not only when the students become their own teachers but it is when the teachers become learners of their own teaching.

Miss Arika further continued, *“It isn't possible to address individual students since there are around 40 students in a classroom. It would be better if there would be 3 periods per day instead of 8 periods. If time allocation for one period will be around 1.5 hours then only teacher may be able to establish positive classroom atmosphere and we may get proper environment to learn”*. This issue is indeed most

happening issue at present context. Most of the schools keep large number of students in a single classroom by allocating short time for one period. Students need to attend around 8 periods per day with 8 different subjects due to which they feel monotonous and become lethargic. On the one hand teachers are forced to complete whole exercises of such thick mathematics books, on the other hand, they are expected to create effective learning environment within time bound of 40 minutes period. In such situations, it may not be possible to address each student so the expected outcome or objectives of teaching/learning process couldn't be fulfilled.

From the above discussion, I came to realize that the opinion of my research participant is explicitly guided by the notion of traditional approach of teaching/learning process. She believes that the classroom is teacher centered teaching, where teachers actively take part and learners are just passive receivers. Belbase (2013), states that teaching/learning mathematics is explicitly guided by drill, practice and copy from the board due to which there is severe impact in students' understanding of mathematics as well as achievement.

Arika has raised genuine problem of large number of short periods in a day. She believes that few extended fruitful periods can provide fruitful and quality education to learners. Till date, many schools have already started system of delivering few extended periods/ sessions like three periods per day then why not make all schools follow that process too. In such system, teachers conduct few periods with more planning and assessing the students. Farbman (2015), states that an individual simply cannot be advanced in any given area of study without devoting a certain amount of time to grasp new content, harnessing knowledge and skills. Investing more time is very essential to enrich classes and activities that helps in expanding students' educational experiences.

It sounds good when we get to know about various pedagogies of teaching/learning process like constructivism and collaboration. But, it is quite unmanageable in current system that exists in most of the schools. A period is allocated for just 40 minutes so sufficient activities and interaction may not take place. But if a period is allocated for around 2 hours, then teacher can enter classroom with more effective planning where wide coverage of contents takes place along with proper sharing between teachers and students. It may bring immediate radical improvement in teaching/learning activities. It makes learners academically strong since learners can get enough time for thinking in wider environment and participate in open and meaningful learning activity. It helps learners to construct knowledge since teachers can address the will, interests and experiences of learners.

Teachers can conduct class through group formation where meaningful learning can be accomplished and solutions of problems take place in a better and smoother manner than individual work. Successful, creative and critical learner can be founded through proper communication and collaboration in classroom. Collaboration between teachers and students helps in setting goals, creating options for classroom activities and assignments. Lai (2011), states that collaboration is the reciprocated engagement of participants with a harmonized effort with an aim to solve a problem together. Such phenomenon makes learners feel “ownership of learning” due to which they don’t feel pressure. Learners are prepared in such a way that they can assess themselves and make correction as well. Teacher can also assess students properly and individually whether one has learnt what is intended to be learnt or not. It makes assessment less threatening to students. In this way, effective teaching/learning process may take place that strengthens both teachers and students. So, it would be

better if a few extended sessions in a day can be made mandatory for every school to apply such pedagogical approach.

Mathematics is a Practical Subject: Miss Alasha

Miss Alasha is highly gifted students through multiple perspectives. Miss Alasha is the topper of her class as well. I would like to name her as perfect personality with multi-paradigmatic approach. She is swift learner who puts thoughts together quickly. She is gifted with excellent memory along with abstract, logical and insightful thinking. Her interest of learning is through experiments and enjoys doing things differently to make her life more valuable and diversified than the rest. She makes sure that happiness is her prime goal.

Alasha said, "*Mathematics is a practical subject*". Yes, of course, mathematics is such a subject which is widely used in our day to day life. It has profound connections with every activity that takes place around us. Despite existence of mathematics around us, it depends upon teachers' role and environment provided by school, family and community to make students realize about mathematics as a practical subject. When learners alone go through text book of mathematics, they may not be able to connect content and context of mathematics in real world. It can be teachers who need to bring real connection of real life activities through various projects while teaching mathematics. Meaningful projects energize both teachers and learners since they engage in meaningful reflective dialogue about what worked well and what didn't.

For learners, the enthusiasm and curiosity to learn becomes contagious. Apart from teachers, it is also environment provided by family, school and community who can make children able to see mathematics in their daily activities. By providing favorable environment, children become critical learners who can see

events taking place around in a critical manner. So, schools, parents and community should provide space for children to enhance their learning more practically.

Miss Alasha shared that mathematics was difficult in her junior level of schooling.

Since it was difficult for her, she didn't have affection with math at that moment. Her achievement determined her attitude towards mathematics in a negative aspect. The

attitude towards mathematics became directly proportional to achievement in

mathematics. According to Helgeson (2009), individuals who scored high in

achievement had positive feelings regarding their caliber so motivation were found to

continue for longer period of time and reach higher levels of achievement. So, attitude

towards mathematics is formed in their mind as per their achievements. In course of

conducting interview with Miss Alasha, she shared, *"I remember about my math*

study since I was in grade UKG. I used to feel math difficult so my mom always used

to help me with math homework. When I reached grade III, I became topper of my

class with good score in math which encouraged me to focus on my study to resume

my success." Achievement is really important factor for dis/encouraging students. At

this very moment, I remember an incident of my students' result in my own school. In

one of the sections of grade VIII there was a tough competition among six students

for better grades. Three students always used to stand at position of 1st, 2nd and

3rd whereas remaining six students at 4th, 5th and 6th. There used to be very negligible

marks difference despite the position. On the day of DLE result, the student who used

to secure 5th position became the topper of class. She was so happy about her

achievements, so as a result, she started working harder. She had a sort of fear

whether she could be able to maintain her top position. Due to her continued and

tireless effort, she reserved the seat of topper till end of her schooling, i.e. SLC

(School Leaving Certificate).

Miss Alasha further stated, *“The teaching style of teacher made me feel that mathematics isn’t just about solving problems rather it’s about own understanding. My interest rose towards mathematics when my teacher taught me mathematics practically. I don’t wait for teachers to solve any new problems rather I try it for myself. A different type of satisfaction, is what I feel, when I am able to solve any mathematical problems before the teacher himself does. Now, mathematics is my favorite subject since I can feel math everywhere. A single effort of teacher can change the concept of student towards mathematics. It is said that the mind of child is like clay which can be molded in any shape depending upon teacher. It is now no more true. At present context, the future of students may not be determined by teachers and parents. It is all about learners’ capacity and interest to select the proper future for themselves so the role of teachers and parents is just to create favorable environment for learners.*

According to Sarma and Ahmed (2013), Mathematics is only the subject among all that we study which is used in every sphere of our lives. Mathematics is used all over the world as an indispensable tool in many fields. Miss Alasha considers mathematics as a part of her real life. She explored relationship of mathematics with real life as, *“It isn’t that mathematics can be learnt only by literates. Even our illiterate grandparents know well about mathematics. Mathematics is very important in our practical life. Every activity that takes place in our real life is associated with mathematics”*. Even those who are illiterate about mathematics are using mathematics daily in their life, oftentimes, unknowingly. For an example, we can see involvement of our parents at home. Though they are illiterate, they can exactly estimate the amount of food to be added when there is guest at home. They don’t realize there is mathematics but unknowingly they are using unitary method.

Teachers have to teach mathematics providing real concepts in association with mathematics illuminating the world. Mathematics education has strong impact in an individual's life. One having mathematical knowledge is always confident in dealing with various real-world situations. According to the view of Gravemeijer et al.(2017), mathematics education should continue in such a form that it prepares students for applying mathematics in all sorts of their everyday-life situations. Mathematical teaching should take place in such a way that it creates a learning student and responsible citizen who should be able to see the positive and negative aspects of every situation of the real world. Miss Alasha further stated, "*Mathematics focuses on practical knowledge beyond theoretical knowledge. When I encounter with real mathematics in my life, I use mathematics that I have learnt in school to work in an interesting and authentic way. It has been proven fruitful as well*". Mathematics is indeed a subject which covers almost every aspect of the world. That's why it has been very essential to create learning atmosphere that encourages learners to explore their learning in their real life.

It is the fact that whole world is controlled by technology in the present era. Everything can be done perfectly within short period of time through the use of technology. According to Rosa and Orey (2015), it is all due to the increasing presence of technological instruments in all areas of life that has led to a growing claim for higher-level cognitive skills. The moment that I joined mathematics university is still fresh in my mind. The main reason behind it is one of the best course i.e. Computer Application in Mathematics Education. The main objective of the course was to update ourselves with recent technologies and software to be used in the process of teaching/ learning mathematics.

Most of the participants of the course were teachers so the course was designed to train us in such a way that we were capable to apply our learning explicitly in our teaching process. We were very happy and satisfied when our students were able to learn along with their interest through the use of different software of mathematics. In case of school students, incorporation of graphic calculators, use of software like GeoGebra, Maple, Google sketch and Microsoft calculators can empower students to visualize different mathematical concepts along with the interest of students in mathematics. Sinclair et al. (2016), states that technology has become the most appropriate way of teaching in geometry education so the role of technology is rapidly changing the world around us and the classroom as well.

Students can benefit through a variety of teaching styles and classroom activities. ICT is one of the strongest tools to raise the interests of students in mathematics subject. Miss Alasha stated, *“ICT has made Mathematics joyful, interesting and fruitful. Whenever we get chance to learn mathematics through ICT, visualization of abstract concepts through diagrammatic approach allows us to be more creative with deep understanding. In mathematics, it tends to become more and more interesting”*. Furner and Marinas (2013), state that most educators of today support mathematics classrooms where students are involved and actively construct their own understanding of mathematical ideas by using the latest emerging technologies.

ICT facilities vary enormously from school to school, yet teachers need to take steps to facilitate mathematics classroom through an appropriate use of recent technologies. “The use of technology allows students to be creative and utilize alternative forms of intelligences” (Orey and Rosa, 2013, p. 45). It encourages the use

of visual clues to build up self-esteem in students. Boaler (2008), explains teaching mathematics is indeed very fruitful through pictures and photography i.e. by using real world pictures.

Forgasz et al. (2010), states that children have habit to form their self-perceptions through interactions with their senior members of community so parents greatly influence their children's belief systems and contribute to their children's positive or negative self-image. Children should get opportunity to feel that their parents are always ready to help them in any difficulties and show them right path. Burnett and Wichman (1997, as cited in Haylock and Thangata, 2007), states that young children generally pick up views about mathematics from everything that happens around them through their parents, society and school.

Miss Alasha expressed, *"I always get inspiration from my family. My father's favorite subject is Math so he always motivates me to be better in mathematics. My father always tries to make me feel the importance of mathematics in real life. He associates mathematics with the daily activities that takes place while going to market. Such incidences bring me closer to mathematics. Whenever I go home, my mother asks me if I need any sort of help from her in solving mathematical problems"*.

Parents are indeed essential factor behind involvement of children in learning process. Whenever children get favorable motivating environment at home, children can build up their confidence level to meet the challenges that come on the way of learning. It raises positive attitude of learners towards their learning.

According to Weiss and Krappmann (1993), home is the backbone for personality development of children that influences both directly and indirectly through relationship of the family members with themselves. Children are highly influenced by the environment which they get to face every day at home. For

developing positive attitudes in children, parents may let children feel that every family member is always ready to help them in their learning process. In some cases, parents need to give their opinion by sharing their experiences so that their children will be motivated in learning. Miss Alasha further continued, *“My grandmother shares about her past regarding why she couldn’t continue her study. She says that she wants to compensate her loss through me. She always makes me feel that I am one of the disciplined members of my family who can contribute to keep up the name and fame of my family in my society. This makes me feel so good that I am encouraged every time to enhance my learning so that I can keep up my family name.”* The attitude of teachers towards mathematics has an important influence on developing students’ math attitudes. Butty (2001) explains that reformed instructional practices create positive effect on mathematics achievement of students and motivate learners through significantly higher achievement score. Students learn about various aspects of mathematics through teachers at school. Miss Alasha said, *“When I reached grade V, there was change in teacher. I found his teaching style different than previous teacher due to which my interest towards mathematics increased. Again, in grade VII, I got new mathematics teacher. She focused more towards practical knowledge of mathematics so I got more attachment with mathematics subject”*.

Students are highly influenced by the way teacher teaches. Therefore, it’s a must that teachers are well aware of what they teach and how to teach it because they can bring favorable outcomes in terms of students’ positive learning. Thus, most of the mathematical operations and their interconnections are learnt, in practice, at school, it can be concluded that school produces significant added value for the pupils (Metsamuuronen & Tuohilampi, 2014, p. 152).

Everyone adores getting recognition for things done well, so praising and appreciating the work of students can encourage female students to promote positive beliefs regarding females' abilities in math and invalidate existing stereotypes. Miss Alasha shared, *"I am proud of my grandmother. She always praises about me in front of others which always motivates me to do better in my study so that I can keep faith of my grand mom alive"*. Marx and Roman (2002, as cited in Gunderson et al., 2011) states that competent female role models are very important to encourage female students for high levels of math achievement. As students are highly influenced by teachers, Miss Alasha is also inspired by her female math teacher. She thinks that if her teacher, being a female, can be so good in mathematics, then why she herself couldn't be.

According to Bista (2006), there is presence of less female role models in schools due to lack of female math teachers. This is considered to be one of the contributing factors to lesser participation of girls and gender-based discrimination in education. Miss Alasha further said, *"Teachers and parents are great inspiring source for me. The strong support and belief that I get from my parents and teachers is the biggest influence on how I work hard to meet the challenges that come on my way. It helps me to prepare myself more to compete with others and prove myself better"*.

From the above discussion, I came to realize that the belief of my participant is explicitly guided by the notion of fallible nature of mathematics. As she frequently raised issues about feeling mathematics around the environment, she believes that mathematics is inseparable part of life which helps to construct knowledge in learners' heads including mathematical knowledge. I agree with Makonye (2013) who defines fallibilism as the socio-cultural and historical development of mathematics to explain the nature of mathematics.

Alasha has expressed her view about learning mathematics against traditional approach of teaching. She thinks the delivery of knowledge by teachers to learners is passive process. She advocates that there should be some space provided to learners by teachers so that they are able to construct knowledge on the basis of their ideas. It is because teachers solve some abstract mathematical problems and students are expected to solve rest of the problems likewise, the students find it difficult to understand what they need to know. When I went through Ferguson (2010) about inquiry based mathematics, I loved the ideas of instruction which can take place in the classroom that opens the doors for discussion on the floor by exploring meaningful, real-life problems. By this, the students can develop positive aspects towards mathematics and are capable enough to make mathematics an integral part of their life.

Alasha has also discussed about favorable environment provided by teachers and family who could help in showing nexus between mathematics and other various elements of real life activities like culture, language and day to day activities. The National Council of Teachers of Mathematics (2005, as cited in Pant & Luitel, 2016), suggests that all students have right to learn challenging mathematics through a well-qualified teacher who can make connections between the background, needs and cultures of all learners.

Alasha believes in hard work which has always been her scaffolding. It is all due to her hard work that made her totally different from other in a sense that she had sense of fairness and justice at her early age. She grew up being more gifted along with intense concentration. It happened because her teachers, parents and community had strong faith on her. Whenever she is praised by her seniors in front of others, it boosts up her confidence more and more to keep others' faith on her alive.

Henderlong and Lepper (2002), states that it is very important to praise children for their accomplishments and success because our praise helps to enhance their motivation and boost their self-esteem.

Mathematics is a Boring Subject: Miss Anah

It might be any day of July 2015, I was thinking about my research participants for my research. I was planning to make heterogeneous collection of my research participants so that I would be able to gain a richer data for my research. So, I thought about one of the students from my own class of Wonderful Academy where I was class teacher. I chose Miss Anah as my next student respondent.

Miss Alasha is less gifted student from mathematics point of view. She feels mathematics difficult. Miss Anah opined about mathematics as, *“I remember about my math since I was in grade IV. Math was easy for me until I was in grade IV. But as I was upgraded to grade V, I started feeling it difficult for me as I needed to recall formulas to solve the problems. It became more difficult for me in higher classes because I just hate to remember formulas”*. According to my experience of teaching, in different level of schooling, less gifted students find math more difficult in senior level than that of junior level. The mathematics of primary level isn't much difficult but as less gifted students reach lower secondary level, they start feeling it more difficult. Merrill (1918), states that mathematics emphasizes on the difficult approach for the average youthful mind. Once students feel mathematics difficult, low self-esteem and negative attitude develop in them.

I agree with Sterenberg (2008) that the long thread of struggle of students in teaching/learning mathematics in schools create different images of mathematics due to which many learners unfortunately form negative images. It may be due to teachers who couldn't address those less gifted students in constructive way. It is all up to

teachers to encourage learners to learn by creating such an environment where they can learn well and remove negative images of mathematics.

Miss Anah further continued, *“Honestly speaking, I feel mathematics difficult as I need to recall a lot of formulas. It is so boring to learn formulas. I know I find it difficult to remember formulas because I don’t try and I don’t give time as well. I give up before trying to learn mathematics. I admit that I don’t try to learn math so it is difficult”*. Miss Anah considers mathematics as time consuming subject. Due to abstract nature of mathematics, students are notable to be familiar with mathematics. Luitel (2012) argues that exclusive use of curriculum perspective is not helpful for many Nepali students to connect mathematics for use in their present and future lives. If teacher teaches mathematics, addressing on more abstract concept, students find mathematics more difficult. Teachers solely may not be responsible behind making mathematics difficult; if curriculum designers prepare curriculum focusing more on practical part of mathematics rather than theoretical part, then changes could take place in mathematics teaching/learning process.

It isn’t that every student finds mathematics difficult but in every class, there are many students who find it difficult. Until they get concrete concepts, they feel mathematics difficult, since most of the concepts in mathematics books are abstract. It has become a major reason that students feel mathematics difficult. They won’t be able to see every concept of mathematics present in real world which discourages them to learn mathematics and lead them to math-phobia. When students come to believe that every individual is different from each other, they are encouraged to convince themselves that they can learn mathematics in different ways. For this, different teaching process may help both teachers and learners.

According to Pogoy, Balo and Chiu (2015), it depends upon huge extent of students' mathematical knowledge with mathematical concepts on using mathematics or reasoning about mathematical situations. So, it is very important to enrich students with mathematical knowledge and its application so that mathematical concepts can be developed on students. I feel that mathematics achievement and attitudes towards mathematics are highly correlated. One who can achieve well in mathematics will certainly have positive attitude towards mathematics whereas one who can't achieve well in mathematics tends to have negative attitude towards mathematics. A single individual can have both positive and negative attitudes towards mathematics at different phases of time according to his/her achievement in mathematics.

According to Ahmed (2013, as cited in Brown, 2008), student-centered learning approach provides feelings of ownership to the students over their learning which helps learners to make necessary decisions and respect the content and the methods of teaching. So, it has been important to implement different approaches for making mathematics teaching effective. Miss Anah further expressed, "*When our math teacher takes us to E-class, we get opportunity to learn through new technologies of math. It motivates us to learn more when we can study in visualized form. We enjoy more in E-class rather than our usual class*". Students at present have been more familiar with technology. They enjoy more with technology, so teachers may guide students about use of various technologies of mathematics so that they could invest their valuable time in using technology for study not only for fun.

One of the factors that make mathematics difficult is regular process of solving problems of books. It makes mathematics class monotonous and difficult as well. According to Kyriakides, Creemers and Antoniou (2009), the role of teacher isn't just to be instructor for providing knowledge and skills but also an environment

creator who applies various teaching styles to acquire more effective learning process. Teachers are more accountable for students' learning so that children can achieve optimum learning. Whatever the reasons, questions are always raised regarding teaching process that the teachers use, either by parents or by school administration so it isn't an easy profession to be a teacher. It needs a lot of hard work and dedication towards own profession.

In the present context, teachers should be familiar with recent technologies of mathematics so that the students' interest in mathematics can be taken to a higher level. Mathematics and ICT is perfectly blended to intensify interest of students in mathematics. Miss Anah further expressed, "*Class becomes more interesting when we play different types of mathematical games. Later, we come to know that it wasn't just a game rather it is more a part of our course. I never felt bored while learning mathematics through ICT*".

Before trying to improve achievement of students, teachers should be well-trained for making them able to teach students through multi-perspective ways. In this age, use of modern technology enhances the teaching level by addressing interest of students. According to Yenitepe (2003), Computer Aided Mathematics Teaching in classroom teaching/learning process gives much better learning environment which assists learners to understand abstract concepts.

Rubio (2009), explains that it isn't great matter to be a teacher but the important issue is whether many people can be an effective teacher or not. This is indeed heart touching issue to be felt by every teacher. Teachers need to be able to fulfill the demands and challenges that come within the diverse circumstances in the teaching. An effective teacher needs the capacity to be persistent, flexible, and innovative in such a way that students feel comfortable to be familiar with teachers.

Rubio (2009) stated that effective teachers believe the fact that all students can learn but in different manner as per individual. Under effective mathematics teaching, teachers should be able to assure students that they can come up with any of their queries any time with teachers.

Miss Anah shared, *“Whenever I have some problems regarding mathematics, I don’t feel comfortable to ask my teachers. I always maintain distance with teachers: I am not friendly with teachers”*. If teachers have authentic dictators’ personality, students are usually afraid to ask anything in the classroom. The proper communication between teachers and students play key role in establishing good relationship between them. When good relationship along with humor takes place between teacher and learner, it increases students’ academic self-concept and interest in the subject. Miss Anah further expressed, *“Teachers should be friendly with students so that students feel free to share their problem with teachers. It helps to raise interest of students towards mathematics and hesitation of students towards teachers could be removed”*.

So, teacher-student relationship play important role in developing positive attitude in learners towards the subject. According to Knoell (2012), students really appreciate when their teachers actively listen to them and encourage them by providing supportive and challenging environment where the entire class could be able to learn. In the present context, students love teachers who are friendly and understand their feelings as well. If teachers try to be authoritative, students just have fear which creates wall between teacher and students.

Rubio (2009, p. 36) states, “An effective teacher has been considered, sometimes, as a perfectionist, encouraging, approachable and caring; at other times, as intelligent, but above all, as enthusiastic, funny, clever, affective and understanding,

open, and with a relaxed style while teaching”. Students love the teachers who are filled with humor and fun. If teachers create effective learning environment that meet interest of learners, students create desire to learn and accept the challenges of thinking. Teachers should be able to prepare good planning of classroom management and organization beyond the content or knowledge of the subject to achieve fruitful learning.

From the above discussion, I came to realize that belief of my research participant is largely guided by negativity about mathematics. She frequently raised an issue of not being able to concentrate on the concept of mathematics. She feels tedious to learn formulas of mathematics. She thinks mathematics is just about those abstract formulas due to which she couldn't see any link between content of mathematics and various contexts where mathematics is applied. This is the major reason she doesn't try to learn. For many people this negative image of mathematics is also associated with anxiety and failure in mathematics (Belbase, 2013, p. 232). If she could see application of mathematics in real life, then she could construct the concepts of mathematics. For this, teachers should go beyond the content of mathematics books. Teachers can focus on activity based classroom so that students would get fruitful mathematics classroom.

Anah has also addressed on use of technology in mathematics class. She finds lecture based mathematics classroom monotonous but if, in the same mathematics classroom, she gets opportunity to learn through the use of latest software of mathematics, she enjoys and has a meaningful learning experiences. Use of mathematical software enhances the teaching/learning process of mathematics by converting abstract concept into concrete one. Galligan et al. (2010), states that technologies should be used to foster good teaching and effective learning for students

regardless of whether they are in large groups or small groups. Therefore, it creates positive impact on students' proficiency. Goos (2010) states that when technology becomes part of mathematical environment, it isn't just replacement for mathematical work done with pen and paper since it makes students engage in more active mathematical practices. It creates profundity to their learning and encourages learners to ask questions rather than only look for answers.

Miss Anah tries to maintain distance with teachers as she has a sort of fear with teacher. She frequently said that teachers should be friendly enough that students don't hesitate to share their problems with teachers. United Nations Educational, Scientific and Cultural Organization and UNESCO Bangkok Office (2015), states that children generally behave and learn in different ways because of hereditary factors like the environment they live in, their own personal and psychological needs. So, teachers need to understand why children behave as they do, so that we can guide their behavior in a positive manner. When learners feel comfortable to share with teachers, classrooms become inclusive, welcoming, and enjoyable places.

Chapter Summary

This chapter reflects the perceptions of my research participants regarding mathematics. I have narrated their experience as well as mine. My research participants have different perceptions regarding mathematics. Two of my research participants found mathematics is easy whereas two of them found it difficult. The reason behind different perceptions is obvious reason i.e. every individual is unique. Due to individual differences, if they aren't addressed in different way it is quite obvious that they couldn't explore their ability to the utmost. Consequently, differences in performances starts being visible. Mathematics isn't inborn talent rather it depends upon interest and dedication towards the subject. Though subject may be

difficult for an individual, if s/he is devoted with hard work then success is certain. In case of some learners, feeling of devotion comes itself whereas for some learners, pushing factors like parents/teachers/colleagues are needed to build up their confidence regarding their caliber. It also depends upon environment provided at school and home. If learners get favorable learning atmosphere at home and school, they receive positive vibes. Therefore, they are certainly going to view the world through the eyes of success. But in some cases, learners lose their hope regarding their caliber resulting in poor confidence level.

CHAPTER V

DISEMPOWERING FORCES IN CONTEXT OF FEMALES

This chapter is accumulation of unpleasant experiences of my research participants as well as my own regarding research issue. I have attempted to explore more on hardships faced or experienced by participants at home, school, working area or elsewhere. Hardships have been explored from multiple aspects as it goes on in everyday life.

Perception of my research participants towards mathematics has been guided through various disempowering forces. Disempowering forces deprive them of their power and authority making them weaker and incompetent in their teaching/learning process in mathematics. Such forces give rise to many disempowering results like work-load, school's pressure, parents' high expectations and anxiety. Some disempowering forces that have been explored through opinions of my research participants are negative beliefs about the nature of mathematics, exam-phobia, role played by parents/teachers, ego aroused by humiliation and existing patriarchal society.

Negative Beliefs about the Nature of Mathematics

Mathematics depends upon both logic and creativity. Students construct beliefs about nature of mathematics as per their interest and ability. Some students create negative beliefs about nature of mathematics in the form of its absolute and abstract existence. They believe that the pedagogy of mathematics is rigorous

memorization and testing of their standards. The rigid content of curriculum of mathematics makes some students see mathematics as a very difficult subject. Lerman (1990), states that mathematics is a subject that is considered by most people as the paradigm of knowledge in the form of certain, absolute, value-free and abstract. Students having negative belief about nature of mathematics think that only some people are able to deal with mathematics whereas some cannot, despite many years of learning mathematics. Ernest (2008) states that the widespread public image of mathematics in the West is believed that mathematics is difficult, abstract, theoretical and important subject, as well as largely masculine.

Miss Arika said, *“Mathematics classroom is boring. Teacher teaches us mathematics in difficult manner. Math teacher make us solve abstract problems on board so I feel unwilling to participate. Before I try to understand, pessimistic feeling arises that I wouldn’t be able to deal with mathematics. My math teacher solves problems directly on board and directs us to follow same process to complete exercise. I practice the same method time and again on many questions trying to gain confidence”*. It has become a major trend of mathematics classroom. Teachers solve problems on board and on the same basis students just solve problems of exercise book due to which abstract concept of mathematics is formed in the mind of learners. The question is on the way of teaching style of teacher. Why should teacher focus only on the abstract concept of mathematics?

Generally, students don’t enjoy being called by teachers to use board. Mathematics has become absolute form of knowledge for students which is incorrigible, universal, certain and isolated. Teacher is considered as superhuman of knowledge seizing the creativity of students by following the trend of teaching as memorization of facts rather than construction of knowledge. “In my secondary

education, the ideology of singularity of mathematics as a body of pure knowledge was further strengthened via mathematical tasks with muted symbols and mechanical algorithms that every student was required to perform, exactly in the same way as prescribed by the teachers and the textbook” (Luitel, 2012, p. 6 – 7).

“Mathematical problem solving is a complex topic in mathematics education and difficult to concretize”. In this line, Yee (2017, p. 149) has addressed the problem of students regarding mathematical problem solving. Due to abstract nature of problem solving, they couldn’t get concrete form of the concept. *“Mathematics problems have only one right answer so I find myself in problematic situation when I need to mug up all the mathematical formulas”* Miss Ahah expressed. Miss Anah hates memorizing formulas. She thinks she won’t be able to rote all the formulas of mathematics so she gives up even before trying. For Miss Anah, there is the belief that if problems can’t be solved almost immediately, they are impossible. Who is responsible for these all? Again, the answer is same... “The Teacher”. Teacher can make students think out of those abstract concepts of mathematics and bring them close to real world problems to link with mathematics.

Clarke and Clarke (2003, p. 1), states “Ordinary students cannot be expected to understand mathematics; they expect simply to memorize it and apply what they have learned mechanically”. Most of the students try to memorize the mathematical process rather than understanding through meaning making so they think there is only one correct way to solve any mathematics problem i.e. the rule which the teacher has most recently demonstrated to the class.

Epistemological clarification is needed to minimize misinterpreting students’ perceptions of problem solving. If students get concrete concept about mathematics through proper teaching/learning process, working together, sharing their findings,

and allowing time for possibilities to emerge, then there is a hope that such beliefs will gradually decline.

Exam Phobia

Educational system is a body comprising all of curriculum, teacher, students and examination. It has been trend of testing fulfillment of objective of teaching/learning process and assessing learners in the form of examinations. There are various forms of examination but since a long period of time, written examination is more in practice. *“I get prepared for exam but as I sit for exam I find my mind totally blank due to nervousness and fear of examination”*. Miss Anah said. Most of the students don't enjoy written exams. *“A significant number of students answered that their mind go blank before the examination begins and they could not depict their knowledge on paper due to limited time pressure (allowed for paper)”* (Khatoon & Parveen, 2009, p. 129).

Fear of examination distresses the academic performance of the students in the examination and they cannot often perform according to their knowledge thus it is termed as “Exam Phobia”. Parveen (2015) states that exam phobia is excessive worry about exams especially negative thinking, self-criticism, studying styles, fear of being evaluated by others and is experienced by many normal students. *“There should be teaching/learning activities but there shouldn't be exams”*, Miss Arika said.

Anxiety of exam is one of the major factors that contributes to the negative outcome in academic achievements. Students have a sort of fear regarding consequences of exam that they would score low grades. So, written exams shouldn't be the only way of assessment for learners. Continuous assessment may take place for healthy competition among learners. For CAS (Continuous Assessment System), a complete portfolio of each student can be prepared including class attendance, class

behavior, class tests and co-curricular activities and certain % can be awarded through terminal written examination.

Ministry of Education and Sports (2003), states that the underlying principle of CAS is that the teacher needs to know each of his/her pupils in the class all the time. Teachers need to know how well students have understood the ideas which are being taught. Therefore, it supports and ensures effective learning process.

In case of grade VIII, IX and X, students are compelled to prepare everything that has been taught from very beginning of the session for the whole year. So, students feel pressure to prepare chaotic syllabus during exam. Its remedy can be semester system comprising six months in each semester to maximize students learning. In case of low grade achievers, remedy classes should be provided to accelerate their learning process. "Students may be given frequent tests so that they may take examination as routine work" (Khatoon & Parveen, 2009, p. 129). When students encounter written exams in long interval, they may suffer from anxiety but if they are habituated of regular exam like once a week, they may not suffer from low self-esteem and negative attitudes.

Ego Aroused by Humiliation

I still remember one teacher who humiliated me in front of all 75 students saying "go to graze cattle" just because I scored 0 in mathematics" Miss Alia said. It is indeed discouraging factor for students from teachers' side. Teachers are like second parents for students so students expect the bond of intimacy from teachers. If teachers start humiliating students instead of making students feel comfortable, students won't be able to have positive feelings towards the subject and subject teacher. Perhaps due to this reason, most of schools have started the mission of counseling students rather than punishing students physically and mentally.

But, sometimes same humiliation can also play vital role in bringing change in students.

Same happened to Miss Alia. She prepared herself well for responding the humiliation by teacher with her. *“Due to misbehavior done by my teacher, my ego was hurt so I was determined to improve my math at any cost. I started my mission by iterating the formulas of algebra even when I used to carry load of grasses for cattle. Then gradually I started to be a tough competitor for the topper of my class in mathematics. The moment was ‘WOW’ and glorious for me. In this way, positive attitude towards mathematics developed in me and made me feel that mathematics is easy and interesting if we give time for math”* Miss Alia said.

Mathematics is indeed a subject which depends on an individual to make it either difficult or easy. As Li (2012), says that the more effort the learner puts into the subject, the higher he/she will surely achieve more academically. In the same manner, effort of Miss Alia worked and helped her be academically stronger. Miss Alia is very proper example to prove that mathematics itself isn't difficult or easy. It is all about how you take and make it.

At this moment, it takes me to flashback to few years ago. It was the moment when I was searching college for M.Sc. after completion of my B.Sc. Since I was engaged in full time job, I couldn't try for day shift so only one option was left for me that was to join college with morning shift. Till that moment, I didn't have idea of college that provides evening class. I joined Science University with major math with full of enthusiasm to complete my master degree. It used to take around 1.5 hours to reach college since it was very far from my home. I needed to change three public vehicles to reach college. After reaching college, I was desperately waiting for

teachers. Unfortunately, one hour passed but no one came. One of my friend opined, *“It has been trend of teachers of public college not to come college on time”*.

I recalled my classes of Bachelor’s level where we needed to wait long for teachers. Sometimes, teacher didn’t come and we had to return without attending classes. I was worrying if it would happen in Science University as well. I continued going college for about two weeks. Situation was the same. Sometimes, there used be only a single period till 8:30 am; whereas sometimes we used to return without attending class. The school that one attends is the institutional environment that sets the parameter of a students’ learning experience (Korir & Kipkemboi, 2014, p. 240). Due to irregular classes in college, I was discouraged to continue college so I quitted my study.

It was after a couple of years of quitting college, I was going through newsfeed in a social site. I got to see my college mate of Bachelor level who just completed master degree scoring more than 90%. I couldn’t digest that news. I don’t know whether that particular feeling was good or bad but I remember that moment was so intolerable for me. A sort of ego developed on me that if my friend can do, why not me? I was just thinking and imagining that if I had continued my study, I would also have completed my master degree in same manner. Then only one aim was taking place in my mind frequently was the aim of not only to complete master degree but to complete it with best grades. Fortunately, I came to know about Mathematics University where evening classes are offered to students. Without any delay, I joined Mathematics University which was one of best decision of my life, since, this university has played a major role in nurturing my potentialities. And finally, I was able to continue my master degree just because of that single automatic subconscious process that took place in my mind which was perhaps *“EGO”*.

Role played by Parents/Teachers

Parents play a vital role in developing attitudes of children towards mathematics learning. The support of parents matter a lot in creating learning environment for children. *“My parents never discriminated me despite being a daughter in terms of education. Along with the opportunity to study, I needed to do household work at my home along with grazing cattle. When there used to be work at home, my father didn't use to send me school so I used to run away from home to school. I didn't use to get more time to study due to household works”*. Miss Alia said. It is general scenario of rural areas. Work division takes place in family in such a way that females won't be able to manage time for their study. But scenario is little different in urban areas. Though daughters are expected to do household work, they are given time for study as per their need. In spite of this, cooking, washing and nurturing works are automatically assigned to female as it is totally a female domain.

Miss Arika further associated herself as a member of her family in very heart touching manner. She expressed, *“I am treated well at my home but I am given a secondary role in decision makings of my family. My family believes that as a daughter I shouldn't interfere in household matters so I don't see my important role in my family”*. She was unconsciously expressing about herself as per defined by patriarchy. How can patriarchy be so unfair with females?

Miss Alia further said, *“After the completion of bachelor degree, I told my father that it would be very difficult for me to study master degree so I asked for a favor from my father to continue my study. I was but disappointed since my father told me if I was to continue studies, either I should get married or to continue study on my own and so have to take up a job. I had no option than to quit my study for one year.*

But later I continued my study at my own earnings". There are various examples where parents make daughters feel a sort of discrimination when it comes to investing money in their education. "In most cases, parents would rather spend more money on boys than on girls; therefore, girls are conditioned from an early age that they are inferior to boys" (Dorsey 1989, as cited in Ipinge, 2014, p. 51). This sort of behavior from parents may negatively affect the motivation and achievements of girls.

Along with parents, teachers are also responsible in the formation of academic attitudes of students. The quality of teacher is also a major factor behind students' performance in mathematics. Hannula (2009), states that students' belief about their teacher's quality is generally shared among students so it is likely to be generated through shared experiences in the classroom. Miss Alia also thinks in the same manner. She said, "*During my schooling, students with good score can only study optional math so teacher selected me for optional math. But, teacher didn't use to provide proper solutions for us. One who offered for tuition could study well with teacher at his home but those who didn't offer, they couldn't learn well in class since teacher didn't use to teach well in class*". These types of incidents give rise to the negative attitudes of students towards teachers. It isn't that every teacher is same but due to such behavior of a single teacher, negative image of teacher is printed in mind of the students.

At the very moment, I would like to recall my intermediate level where I encountered with our mathematics teacher, Mr. Alex who had a boring personality. He used to take our class but none of us were interested in attending his class since we weren't satisfied by the way he taught us. He used to enter class in lousy manner which discouraged us to pay attention in his class. As a result, we complained about him to our Principal Sir. Who said, "*I am so surprised to know about Mr. Alex. It is*

really being difficult for me to believe you all. He is one of the reputed math teachers. Due to his effective math teaching, many students go to his tuition center to tuition class.” It was none of our concern about Mr. Alex’s tuition class because our concern was all about our regular classes in our college. He might be good tuition teacher but we needed good math teacher for us. So, we said to Principal Sir, *“If you aren’t going to take action against Mr. Alex, we aren’t going to attend his class”*. Principal Sir was compelled to take action so Mr. Alex was fired from his job.

“Whenever teacher asks any question to whole class, I feel as if the answer I am thinking may not be right. It reminds me of the punishment of the teachers so, I refrained from answering the question asked by teacher to avoid his hit on my head. I don’t enjoy the mocking behave of teacher”, Miss Arika said. Intentionally, teachers don’t try to hurt students but sometimes teachers may be doing so unconsciously. Teachers might be thinking that they are just trying to be friendly with students but students may perceive that behavior in different manner. Instead of being close with students, such behavior rather increases distance between students and teachers. According to Jones et al. (n. d), classrooms are complex societies where students and teachers live and interact with each other. Teachers are the leaders of these societies whose leadership abilities greatly leave an impact in the quality of interactions that takes place between teachers and students.

So, teachers are the ones whose behavior can have great impact on academic and social growth of the students. Miss Arika continued, *“My math teacher is very strict. When we say something to him, he says, “Who is teacher, me or you?”*. It discourages us to ask if we have any problem. He is so horrible. Sometimes, when I score low mark in exam, I get scolded by my teacher. He says, *“You have useless*

brain filled with cow dung so don't use it anymore. You are good for nothing". I don't feel good to hear such words though I am mistaken".

Miss Arika further expressed, *"In school, teachers treat us, girls with kindness. I loved that at first. But psychological consequences turned out to make us submissive to the authority"*. Such incidents play key role in lessening the confidence level of female towards study. It makes females feel that they should be ready to conform to the authority or will of others.

Encouragement is one of the strongest factors in order to enhance girls' beliefs about their abilities. Teachers should be able to explicitly teach students that academic abilities are expandable and could be improved. I still remember those precious moments of my schooling when my teacher used to praise my work in front of all. I used to give a lot of time for trigonometry so I was good in solving problems to some extent. If my friends had any problem, he used to let me solve the problem on board in the class. He used to tell my classmates to be hard working like me. I just used to love that moment of my appreciation. To be praised by teachers in front of others is indeed a glorious moment. It motivates students to work hard so that s/he will always strive towards maintaining own image tirelessly. Apart from motivation, feedback is also one of the important factors. Teachers should provide frequent feedbacks to students regarding their performance so that they can improve their performance.

"One student of first batch of my school failed in optional mathematics due to which negative and disempowering image was formed regarding optional math subject. So, Principal discouraged students to study optional math. As a result, there were only four students in optional math. In spite of this, I always encouraged my students to study optional math convincing them that one can achieve success easily if one practices persistently. I even shared my own experiences with students so that

they could learn that “Practice makes one perfect”. My effort worked to some extent in creating positive attitudes towards mathematics”, Miss Alia said.

Miss Alia further continued, *“There can be both boys and girls who are weak in mathematics. It isn’t that only girls are weak. Highly gifted students don’t need more time from teachers so that more time can be given to less gifted students to encourage them. Teacher can play strong role to encourage female in mathematics by sharing their own experiences and presenting herself as a female role model to students so that they stop believing in existing stereotypes”.* It was some day of last week in my working place. Some female students of grade X asked me a question, *“Ma’am, were you talented in mathematics when you were student of school”?* I answered with a smile, *“To be familiar with mathematics doesn’t mean that one is talented in mathematics. It is just about passion and interest towards the subject. I had passion about mathematics since my childhood. I had one best friend in my school life. Both of us used to compete each other regarding mathematics so we used to be involved a lot in mathematics activities. Interest and passion towards mathematics made me successful”.*

After my sharing, I noticed a sort of motivation and encouragement in students. They even shared that the lens of understanding and thinking that I have is quite different from other teachers. I didn’t exactly comprehend their compliment but what I got to know is our sharing can have positive impact on their way of learning process.

According to Halpern et al. (2007), teachers can foster long-term interest of girls in math by selecting activities such that mathematical activities are connected to careers in ways that do not support existing gender stereotypes. It can play major role in boosting confidence of female students to be an integral part of mathematics.

Otherwise, stereotypes can play negative role in attitude of females towards mathematics. Therefore, we shouldn't let existing stereotypes hinder females' attitudes.

Existing Patriarchal Society

Our society is based on patriarchal system so discriminatory values and norms against female are deeply rooted undermining the importance of educating girls. The social and cultural perceptions regarding the expected roles of men and women in society are major weaknesses to the educational advancement of girls (Iiping, 2014, p. 22). Although the law has guaranteed equal rights for both gender, the inequalities are still prevailing. The social and cultural barriers often don't favor females in their right to education. Most of the females have to face such barriers while continuing their careers.

Miss Alia had also gone through such barriers in her life. She said, *"I am the elder daughter in my family so, I always had to be more responsible in my family. My mom used to be frequently sick so I had to take care of all the household works. I had to work alone because I was helped by none, not even my brother"*. This is most happening scenario in most of the families. Parents don't expect males to be involved in household work considering females responsible for doing household work. Pathetic condition of females indeed... Miss Alia continued, *"First priority was work to be done at home so education became secondary for me. In my village, people have a belief that daughters shouldn't be more educated because they may elope with a boy as they come to teen-age. It developed as a part of culture so even my own uncle's daughters didn't get education beyond grade IV"*. Moreover, when female grows up, everyone thinks that her duty is limited to marriage, bearing some children and taking care of her own family.

Miss Alia further continued, *“I have two elder sisters who are 23 and 24 years of age. Whenever my relatives or neighbors come, firstly they say that they are old enough to get married and then only begin the greetings or rest of their conversation”*. It makes female feel dominance which really makes them frustrated. Females aren't born not only to bear babies or handle household matters, they can contribute equally in economic, political and other sectors by breaking existing narrow walls.

Being female in this patriarchal society is a challenging job. A female is bounded by certain rules and regulation in name of existing culture. Though females are given opportunity to learn, they are tied by the household works to be done at home. In most of the families, females are expected to be involved completely in household work despite her engagement in another field. The situation varies from family to family. In context of Miss Arika's family, her parents provided her complete freedom to study at home. They don't expect her to work but she has one brother whose opinion about Miss Arika is, *“Since you are daughter of this home you need to do at least some household work. As a sister, it is your responsibility”*. Miss Arika further said, *“Though my brother says so in mocking way, it hurts. Since, my mom's health doesn't remain good most of the time, I often help her in household work”*. When a female student needs to be involved in household work, she has to compromise with the time for her study thus, she wouldn't be able achieve success as per her caliber.

Miss Arika further shared, *“I am supposed to return home before 8 pm. I am not considered to be safe outside during nights. I can't shout or show my anger at all. On the contrary, sobbing and remaining emotional is further sympathized and encouraged”*. Females rarely express and behave as they are. Rather, they need to be

humble, submissive, kind, soft-spoken, charming, enchanting as defined by so called patriarchal society.

In a clear scenario, Miss Arika shared the saying of her mother, *“Female should be well mannered, shouldn’t come home late, should be good in household works to get a better husband and so on. My family makes sure that I don’t perform any task that needs physical force”*. According to her mother, female’s work is not given any priority over the so-called male works. She expressed bitter experience regarding her mother, *“I have seen my mother’s hard-work throughout the day which is never counted in terms of economy and isn’t given any value. My father rules the family with his spoken words as law of house, while mother works as an unpaid labor”*.

Patriarchal society is deeply rooted in such a way that females are compelled to be engaged in household works. It doesn’t matter whether they have a job or not. That is the major reason why females are treated in different manner since very rearing practice of child. Though scenario may be different in urban areas, there still exist some differences regarding the environment and opportunities for son and daughter. *“It is believed that if the cultures of child-rearing practices are gender-stereotyped, then boys and girls will be brought up very differently from each other”* (Leuvan, 2004 as cited in Ipinge, 2014, p. 17). Such culture which is in practice in most of the society makes parents spend more money on boys than on girls’ education considering the son to be the caretaker of the entire family’s future. The existing culture of considering boys more important than girls in a family has conditioned girls from an early age to feel that they are inferior to boys; therefore, resulting in less participation of females in education.

Chapter Summary

In this chapter I have depicted multiple realities regarding disempowering forces that come on the way of female to hinder accumulating day to day lived experiences based on different dimensions like academic, professional, financial, socio-cultural, and psychological. As per my participants' reflections as well as my observation, the major disempowering force I felt is role played by parents and teachers under the influence of patriarchal society. Parents and teachers create narrow walls for females in many ways consciously or unconsciously. Such unfair treatment disempowers female and distant them from academic growth. Students themselves are also responsible for their academic performance. After students are guided by negative beliefs of mathematics, they don't try to learn so they give up before they even try. It happens because of lack of motivational beliefs provided by teachers. When teachers become unable to provide meaningful environment for teaching/learning process, students do suffer. Difficulty of students gets its continuation in the form of exam phobia. They lose their self-confidence due to which they become unable to outperform.

CHAPTER VI

MY FINAL INSIGHTS, CONCLUSIONS AND IMPLICATIONS

This is the last section of my research. In this section, I have drawn the findings of my research based on participants' experiences. Furthermore, I have derived the conclusions based on my findings. The constructs that were developed in previous chapter IV is organized form of experiences of those four females as well as mine (somewhere) that reflect the perception towards mathematics highlighting the disempowering factors that arise in the context. This chapter includes findings, conclusions and recommendation that I have obtained throughout my research process. This chapter highlights research question wise findings as meaning making of interview. Then, I have drawn some syllogism as well as recommendation on the basis of those findings. I have also included my journey of research along with my future plans.

My Insights

Addressing my first research question about perception of females towards mathematics, participants felt the concept of mathematics as abstract due to which they consider mathematics as difficult subject. Two of my participants fall under less gifted students through perspective of mathematics. They opined mathematics as boring subject since they don't have any interest towards abstract concept of mathematics. They couldn't see any use of those abstract concepts in their further life. They consider mathematics as the collection of those abstract formulas. Lazarova et

al. (2015), states that serious issue among teachers is regarding lack of student motivation and engagement in academic work.

My research participants believe that mathematics is all about solving problems of book. One who gives proper time for formulas can solve mathematics problems. Otherwise, it just remains a problem. So, they see mathematics through the eye of rote learning of formulas and apply in solving problems given in the book. Two of my research participants totally depend upon the methods taught by teachers in classroom and follow same procedures while solving problems of exercise. According to Bishop (2014), mathematics education makes students memorize and then practice endless lists of equations by most of the teachers.

It was my schooling, where I also used to consider mathematics as fixed form of knowledge which is always true and unchangeable. Perhaps due to this reason, objective of learning mathematics for me was to solve problems with right answers and submit to the teacher before others due to guidance of conventional approach of teaching. To achieve highest marks was all I aimed for, regardless of the context. Schoenfeld (1992), states that there is common acceptance regarding the idea that the primary goal of mathematics instruction should be in such a way as to make students competent problem solvers.

In spite of having belief about absolute nature of mathematics, two of my research participants believe that there are some concepts of mathematics which is used in our daily life. They love those topics of mathematics whose application they could feel in real life like percentage, profit and loss, simple and compound interest, home arithmetic and so on. They feel easy and interesting to address those topics of mathematics so they find themselves academically strong in these topics

According to two of my research participants, mathematics is all about giving sufficient amount of time in solving problems. They stated that one needs to bring evidences, logic and all the possibilities to solve any problem beyond linear way of thinking. One of my participants tries to see single question through different angles and find alternative ways of solving them correctly. So, she approaches mathematics through problem solving. My research participants are of the opinion that, it is important to have positive attitude towards mathematics to be academically strong through perspective of mathematics. They opined that when one can achieve well in mathematics, their confidence level is boosted up. According to Monteiro et al. (2012), more recent studies point out a positive correlation between attitudes of students towards mathematics and their academic achievement. They stated that mathematics is very important in real world as knowledge of mathematics helps to make an individual think critically.

Trying to address my second research question about various disempowering forces that arise in context, I encountered with the existing scenarios that takes place in the context of mathematics teaching/learning process. Two of my participants have expressed their negative belief about the nature of mathematics. They are explicitly influenced by the absolute and abstract form of mathematics along with rigor, memorization and testing of their standards. They find rigid content of curriculum of mathematics difficult. They don't find themselves confident to solve mathematics problems and hence suffer from exam-phobia. They have a sort of fear about their suffering due to low grades in exam. Students of grade VIII, IX and X need to prepare a bulky course for exam that has been taught from the very beginning of the session which pressurize them a lot due to which leads the students feel negative about exam. Francis and Jacobsen (2013), states that mathematics is generally taught poorly by

emphasizing rote and procedural methods rather than creativity and problem solving approach.

Out of 4 research participants, one was married female teacher. She opined that nature of discrimination differs according to different roles of females (daughter, daughter in law, wife). She spent her childhood in rural area so she had suffered a lot of discrimination in various forms. Her parents expected her to be engaged in household work thinking that she should be able to handle her household in future. Due to this reason, she didn't get proper opportunity to learn. She needed to engage in household activities whereas her brother needn't. According to Nicolaidis (2015), women are oppressed mostly in patriarchal societies based on their sexuality so they are viewed as lesser beings and inferior to males thus promoting to the core of social inequality.

Alia's parents even created sort of discrimination in matter of investing money for education of son and daughter as well. Her brother had facility of studying without doing side job whereas she was compelled to earn herself for her study. After marriage, she had to continue her education and job, and house hold work simultaneously. Existing culture and tradition compelled her to take participation equally in all areas whereas duty of husband was just to be involved in so called job. It isn't that husband doesn't help in household work but he literally expects wife to accomplish household work.

Another disempowering factor that I found through research participants is parents. Children have great attachment with parents. My research participants felt that parents don't try to understand their feeling. Students spend almost 7 hours at school being engaged in academic activities. When they reach home from school, they expect some space from their parents. If they are forced to study every time at home

and school both, they find their life monotonous. They expressed their interest that they want to invest some of their time in fun and entertainment. They never expect objection from parents in providing some free time for their children because according to them, refreshment is also one of the important parts of life of an individual. At the same time, when parents understand the feelings of children, children are more motivated to walk in right path to resume the trust of parents on them.

Another disempowering factor I got to feel through research is teacher. Teachers are considered to be second parents of children since they spend more time in school with teachers. My research participants opined that their performance in mathematics depends upon the nature of teaching the teacher adopts. The demand of students has been changed along with time. They love class filled with humor, love and attention rather than one way boring lecture. They expect teachers to be ready anytime to help them. Some students believe that mathematics teachers retain Hitler personality; they don't try to understand feelings of students so they are very rude to students, they scold students most of the time and show their superiority over students. Whereas some students adore the way of teaching of teachers due to the way teachers present themselves. They love to learn with the teachers who are friendlier with them.

My research participants opined that every individual love being counseled rather than being punished. Counseling students can bring positive vibes in them. Whenever students get motivation and encouragement from teachers, their confidence level go high due to which they are more inspired to work hard in their study. Students don't enjoy when teachers make them directly study formula and solve problems of book. Without letting students know how the formula exists, students are

not all able to make learning meaningful. They expect teachers to teach them less but more in detail so that they could have meaningful learning. Another role teacher can play to empower learners is contextualization of mathematics. When mathematics is taught to students by making proper connection between content and context, it results in fruitful and insightful learning process. When mathematics is taught contextually through real examples of life, students can see application of mathematics in real life due to which their interest towards the subject is enhanced. Students love to learn with friends rather than teacher. It doesn't mean that they don't need teachers but they feel more comfortable to share with friends rather than teachers.

Along with change in time, model of teaching/learning process has also been changed. Next dis/encouraging factor that arises in context is ego. Generally, egoism isn't considered to be good but sometimes egoism helps to do hard work and encourage an individual to be academically more strong. A single humiliation from a teacher to my participant brought a radical change in her study. Since her ego was hurt, she worked hard to prove herself as a capable student. Finally, she proved herself as a successful learner. Even in my case, when I came to know about success achieved by my college mate, automatic subconscious process took place in me about which I was completely unaware of. Perhaps, it was also a sort of ego which motivated me to join college for the completion of my master degree with better performance. When an individual determines to do something passionately, success is certain. So, sometimes pushing factors are also required to make an individual know about his/her capabilities.

Conclusion

According to the data explored by research participants, it can be analyzed that the nature of difficulty of any particular subject depends upon interest and attitude towards the subject. Participants having negative attitudes towards mathematics regarded it as a difficult subject. Pant (2015), states that the portion regarding how mathematics knowledge came into existence has been neglected so students are compelled to construct disempowering view of mathematical knowledge as the god-made-fact. Therefore, mathematical knowledge and truth have become entirely exact and indisputable for students. Generally, students have tendency to follow straightforward methods and rely totally on the methods discussed in the classroom. At the present context, it looks as if most of the teachers are completely guided by the traditional approach of teaching which focuses on the achievement of right answers rather than meaning making.

Along with the demand of time, if teachers slightly modify the way of teaching to address the interest of students, it can bring positive change in mathematics teaching/learning process. Boekaerts (2002), states that students want to be treated impartially and they love to learn more about their favorite topics. When they see application of mathematics in real world, they find nature of mathematics as fallible where they can construct their own knowledge according to the context. It helps in creating space for learners in constructing new knowledge and ideas. As Mathematical knowledge is not something that is acquired by listening to teachers or reading textbooks, it is something that learners' themselves construct through active participation and mental connections. One knows nothing which he/she hasn't made so one can only know something when he/she has worked it out themselves. This

vision is possible only through active participation of students. And, undoubtedly students participate actively when they have interest in the topics taught by teachers.

Learning in group is more effective than an individual. Collaboration in classroom enhances students' level of confidence. The role of teacher in collaborative classroom is to create rich environment and activities to link the information and knowledge so that students could be motivated for collaborative work. According to Kyriakides, Creemers and Antoniou (2009), the collaboration technique is included as a factor of contribution of teacher for the establishment of classroom learning environment. Teachers help students to maximize the student's ability by helping them when they are in problem and teach them how to learn. Providing directions and useful hints as instruction supports students' learning process and nurture inner endorsement of the classroom activity.

A single individual can have different perspectives towards mathematics at different phases of time. It isn't that mathematics is inborn talent rather it is about hard work and effort of an individual which makes them mathematically strong. Howe, Davidson and Sloboda (1998), states that it is very important to keep in mind that early ability is not evidence of talent since it emerges in the absence of distinct opportunities to learn. So, we can't determine the talent of an individual through the evidences of his/her early ability because there are various factors that are responsible to make the talent emerge out of an individual. Boekaerts (2002), stated that students are often inclined to hide their thoughts and feelings leading them to misconception about their values, beliefs and outcome expectations. Therefore, talent of an individual can be identified by parents, teachers or individual himself/herself through motivational belief or may be discovered fortuitously.

Due to patriarchal nature of our society, females need to face certain sort of discriminations in different situations. In name of existing culture and traditions, female needs to change her identity from daughter to daughter in law, wife and so on. Scenario is quite different in urban and rural areas. In case of urban areas, though equal opportunities are given in term of education, the environment provided at home varies for son and daughter. After marriage, daughter's role is transferred into daughter in law's and wife's roles. As a husband, male isn't supposed to be involved in household work but no matter even if wife is also engaged in job, she is expected to complete all household works by herself. Scenarios may vary depending upon the nature of family but in most of the families, wife needs to look after household work along with continuation of job. It becomes for females to manage time for their learning process. So, such disempowering factors arise in the context due to deep rooted tradition and culture of the so called patriarchal society. Although, the empowerment mechanism in Nepal has been developed, improvement is still needed in different sectors along with real actions at grassroots level (Mahat, 2003, p. 67).

Parents play vital role in creating favorable environment of learning at home. Bempechat (1992), states that parental cognitive and academic socialization practices can play a vital role to foster academic achievement of children in an unexpected manner. It seems to be true that parents expect their children to study hard and bring fruitful result so they try to make their children engage in study all the time. But, children feel like parents don't address interest of their children. So, children feel like they aren't getting space from parents and feel pressure. Giving space for children doesn't mean providing full freedom but certain fraction of time for refreshment. It works a lot for mental growth of children.

Presentation matters more than content so learners get to learn well when teachers present themselves in such a way that they could win the heart of students so that they feel comfortable to ask and share anything whenever they need. Boekaerts (2002), states that motivational belief acts as very crucial role to guide thinking, feelings and actions of students in a subject area. Students have been familiar with various recent technologies which can be used in teaching/learning process so they love visual class rather than lecture based classroom. Every individual can learn more when they get to see concrete face of their learning. Through visual class, those abstract concepts which they have learnt through book are converted into concrete forms due to which learners make learning meaningful. Students love to learn mathematics by playing through software rather than just solving problems of books.

Whenever students do some praiseworthy work, being praised by teachers in front of mass becomes strong empowering factors for students. Praise works as positive informational feedback to affirm progress, improvement and task mastery of students. Children who are well loved and clearly wanted will be able to make positive decisions on which to base the rest of their lives (Solomon, 2003, p. 20).

Providing formulas and making students solve problem becomes just a burden for them so before learning different formulas of mathematics, students expect to learn the way they have been derived to make their learning process long-lasting. While working with mathematics, motivational beliefs help students to determine which strategies are appropriate for specific task.

Just teaching formulas and solving problems of book has become old practice of teaching/learning process of mathematics. Teaching/learning process has been updated in such a way that learners take active participation with the intention of learning and gaining new ideas and experiences as well. Mosvold (2005), stated that

teachers generally know what the curriculum says but their deep beliefs about mathematics and how to teach mathematics remain the same every time. Teachers usually may not know how to apply new ideas in practice.

Classroom environment matters a lot for fruitful teaching/learning process. Learning is possible through various ways so students deserve to be motivated to create learning through different perspectives that makes them construct knowledge and interact in environment in their own way. Giving time to students to work on a problem in their own way is an autonomy- supportive behavior because teacher allows students' interest and preference to guide the classroom activity (Reeve and Jang, 2006, p. 210). Everyone learns from anyone so each student love to get opportunity for making contribution and appreciate the contribution of others. It is possible only through collaborative classroom where every student take part actively in classroom discussion and work.

Recent technologies have promoted the way of teaching mathematics. There are various software of mathematics which can be taught to students through visual class to enhance mathematics teaching/learning process. According to Campoy (1992, as cited in Myer, 1992), it does not matter whether the student is a high achiever or a low achiever. Teaching and learning through the use of technology increases graph of students by raising the low and high level students to unknown heights. Mathematics learning in students can be empowered through visual class by addressing the interest of the learners. It helps in updating both teachers and learners with recent software and technologies along with attaining higher levels of mathematical achievement.

Implications

This research has been a key learning journey for me, both academically and personally. From the overall research journey and reflections along with the

culminations drawn thereafter, I have formed the following significant implications of my research:

Myself

For me, this research journey has been fruitful at every aspect. Spending more than one year has been academically and personally very challenging task but ultimately outcome has been very meaningful to me. First, it became valuable for my academic success as I fulfilled the research requirement of M.Ed. level. But most importantly, I got to update myself with prospect of better future at academic as well as professional life. Personally, through this research journey, I have created a memorable journey blended with several ups and downs. I have got chance to be close towards perspectives of females on mathematic which would not have been possible without this research journey. Hence, it has provided me new vigor academically. On the top of that, I have developed myself to think through critical point of view.

Parents/Teachers

I have explored various factors responsible for disempowering females in mathematics, one of the important factor is parents. Parents are highly responsible and expected to provide favorable environment for both son and daughter to maintain state of equity not equality. Parents are the role model of their children so they could try to fulfill the expectations and interests of children as per the need. Teachers are second parents of children. At present context, the role of teacher isn't just to transfer knowledge to the students rather teach them by accumulating their needs and prepare them to acclimatize in real world activities.

Textbook Writers

Textbook writers are also responsible in creating environment of learning for students and stimulating a learning person's interest. We can see elaborated content in

mathematics textbooks due to which students feel pressurized. Textbook writers should focus in comprising ideas of using the subject matter in practice by stating the examples from the real life so that students can see application of mathematics in real world. Textbook writers transmit heavily stereotyped images of males and the roles of females are presented with low profiles lacking in leadership. So, textbooks writers should present books consciously to remove such stereotypes. It doesn't give fruitful result by compelling students to learn regardless of their interest through passive delivery of information. So, it has been important to rethink on curriculum, instruction and assessment system. Policy makers should make rectifications on these areas to bring radical change in educational system regarding teaching/learning process.

School Administration

School administration is another factor which can play important role in supporting to ensure high quality teaching. School administration should be liberal to maintain educational culture along with demand of changing time. Being rigid about single philosophy doesn't work in providing quality education to students so school administration should be familiar with latest pedagogies to be applied in teaching/learning process for fruitful consequence. School administration should train teachers in regular interval of time to update teachers with recent pedagogies, skills and technologies to be used in teaching/learning process.

Looking Back to My Research Journey

It was the moment of first semester after I joined Mathematics University, when I made myself so close towards the philosophy of feminism. There was a course "Foundation of Education" through which we got to know about various philosophies of education. Our facilitator provided a list of topics to be prepared for presentation. We were given freedom to select the topics which had been provided in a loose sheet

of paper, my eyes stopped over the title Feminism. I didn't know why I selected that topic but I realize now that whenever discussion takes place around me regarding gender issues, unconsciously my mind gets diverted towards the discussion and compels me to pour down my feelings regarding the issue of discussion. Anyway, that particular course "foundation of education" was initial phase of my journey towards issues of females towards mathematics.

Later, it was my second semester at Mathematics University when we came to know about second national conference of mathematics to be held at Pokhara. Our facilitators motivated us to take part in the conference. We prepared ourselves for the parallel session of presentation for national conference. I chose the topic regarding gender issues in mathematics. I went through various literatures to support my issues. Searching literatures enriched me with various ideas and knowledge which helped me to trace a path towards my research. My presentation went good. I was so happy to present at the national level for the first time. I noticed very less number of females in that conference. Among the eight presenters of the parallel session where I presented, I was the only female presenter.

That particular phase of national conference built up my confidence regarding my research issue. Whenever I got the opportunity for presentation, I used to select the topics regarding gender issues. Gradually my inclination started increasing towards issues of females which have been prevailing in our society.

Perhaps due to my inclination towards gender issues, I can't digest the fact that females are considered to be incapable in any particular field. Capabilities become visible when opportunities are provided without any bound and without any terms and conditions. I came across many journals and research papers during my third semester course at Mathematics University. I used to get hurt when I happen to

go through some papers in which females were supposed to be weak in mathematics. Such biased write ups played major role in motivating me to conduct research regarding females and mathematics.

It was Research Methodology course of third semester at Mathematics University when we were informed to select appropriate title for our dissertation. Without any delay, I selected the title, “Perceptions of Female Students and Teachers on Mathematics Classroom Practices”. I was keenly waiting for conducting research on the topic for a long period of time. I was so happy due to the support and proper guidance of our facilitators. It was all due to the supervision of our course facilitator that I started working on the research field on “Perceptions of Female Students and Teachers on Mathematics Classroom Practices”. I didn’t find it difficult till the completion of first three chapters of my research. But after proposal defense, I needed to go to the field to spend time with my research participants. Among participants, I needed to reach to one female math teacher having educational background of mathematics. I had to suffer a lot in searching such female teacher since teachers are appointed in most of private schools regardless of their educational background.

Finally, I got to know one female math teacher in one of the seminar at Mathematics University. I spent considerable amount of time with her due to which I came closer to many realities regarding my topic. I conducted focused group discussion among my female colleagues of school where I have been working. It also helped me in generalizing my research issue. I collected opinions of less gifted and high gifted female students (through mathematics perspectives) separately from different classes. At last, I selected three students from three different classes and conducted interview addressing my research topic. I was able to gather insightful ideas through interview. Besides these efforts, literatures have also helped me a lot in

gaining ideas regarding my research topic. Not only through an angle of philosophy, but also practically I have been observing and experiencing various sorts of discrimination in the name of female so my effort has always been in generalizing issues of females so that I could continue my research in days to come.

My Future Plans

For academic upliftment and the completion of my master degree in Mathematics Education, I have conducted this research on “Perceptions of Female Students and Teachers on Mathematics Classroom Practices”. The journey of my research doesn’t end here. I want to further extend my research issue in a more elaborated form including perspectives of both male and female. I will continue my study in same field i.e. Mathematics Education. If I get any opportunity to participate in any seminar or conference, I will certainly make my presence feel over there. I will utilize every opportunity to enrich me and be academically more capable. My plan isn’t just regarding research rather I will try to address the expectations of the students as their dream math teacher which I have come to know through this research.

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