MOTIVATIONAL FACTORS FOR CHOOSING MATHEMATICS AS A MAJOR SUBJECT AT HIGHER SECONDARY LEVEL

A

THESIS

BY

SHIV RAJ JOSHI

A THESIS PARTIAL FULFILLMENT OF THE REQUIREMENT

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LETTER OF CERTIFICATE

This is to certify Mr. **Shiv Raj Joshi**, a student of the academic year **2018/2019** AD with thesis number **1764**, Exam Roll No. **7328460**, Campus Roll No. **582,** and T. U Regd. No. **9-2-552-218-2012** has completed his thesis under my supervision on the basis of prescribed rules and regulations of Faculty of Education, T. U. Nepal. The thesis entitled **Motivational Factors for Choosing Mathematics as a Major Subject at Higher Secondary Level** embodies the result of his investigation conducted from **2021 to 2022** at the Department of Mathematics Education, University Campus, Tribhuvan University, Kirtipur, Kathmandu. I recommend him and forward his thesis for final evaluation to award the Degree of Master in Education.

.....…….....…….....

Prof. Dr. Bed Raj Acharya

(Head)

Date: 21 June, 2022

RECOMMENDATION FOR ACCEPTANCE

This is to certify that Mr. **Shiv Raj Joshi** has completed his M. Ed. thesis entitled **Motivational Factors for Choosing Mathematics as a Major Subject at Higher Secondary Level** under my supervision under the prescribed rules and regulations of Faculty of Education, Tribhuvan University, Kirtipur, Kathmandu, Nepal. I recommend his thesis to forward to the Department of Mathematics Education for the final viva-voce.

....……..…….....

Assoc. Dr. Rajendra Kunwar

(Supervisor)

Date: ……

LETTER OF APPROVAL

Thesis Submitted

By

Shiv Raj Joshi

Entitled

Motivational Factors for Choosing Mathematics as a Major Subject at Higher Secondary Level

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

Viva-Voce Committee	**Signature**
Prof. Dr. Bed Raj Acharya (Chairman)	……
Prof. Dr. Binod Prasad Dhakal (External)	……
Assoc. Dr. Rajendra Kunwar (Supervisor)	……

Date: 30 July, 2022

DEDICATION

This thesis is dedicated to my father ***Mr. Purilal Joshi****, my mother* ***Mrs. Sarupa Joshi,*** *and my wife* ***Mrs. Rupa Panadi*** *whose love, support, and encouragement have enriched my soul and inspired me to complete this research.*

DECLARATION

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

Defense Date:

_____ _____

Date Shiv Raj Joshi

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Shiv Raj Joshi

ABSTRACT

This study focuses on the **Motivational Factors for Choosing Mathematics as a Major Subject at Higher Secondary Level.** This is a qualitative research with case study research design. The objectives of this study were to explore the motivational factors of girls and boys choosing mathematics as a major subject and to dig out the strategies for making mathematics learning meaningful. This study was conducted on the sample from the Laboratory Secondary School, Kirtipur selected through purposive sampling. One mathematics teacher and two boys and two girl's students were chosen purposively as the sample for the study. Direct interview with students and math's teacher were taken. Classroom observation was done for two times in different days during teaching learning activities. The collected information from teachers and students were analyzed with the help of theoretical and conceptual framework developed by the researcher. This study concluded that, there exist different motivational factors for choosing mathematics as a major subject and there are different ways of constructing mathematical knowledge. Opportunity for good job, motivation to learn mathematics, special priority for mathematics learner and priority for mathematics students in society are the major factors to chose mathematics as a major subjects. There is a lack of knowledge which motivating students to study mathematics as a major. It is recommended that priority should be given to the mathematics students in our society and positive attitudes should be created towards learning mathematics to increase the students with majoring mathematics.

TABLE OF CONTENT

Chapter- I

Introduction

This chapter begins with its introductory part highlighting the background of study, statement of the problem, objectives of the study, justification of the study, delimitations of the study and definition of the related terms.

Background of the Study

Mathematics has a crucial role to build up our human civilization and thus, it has become a fundamental part of our life to exist and develop the modern world today. Mathematics has not only been useful in our life but it has also been enriching the development of other fields of knowledge (Gulnaz & Fatima, 2019). The term mathematics has been derived from the ancient Greek word Manthanein which means "to learn". This shows that mathematics is considered as a process of learning and interpreting the natural phenomena of each individual. According to the new English Dictionary, "mathematics in a strict sense considered as the abstract science which investigates deductively the conclusions implicit in the elementary conception of the spatial and the numerical relation". Further mathematics is said 'a man made science and it is a branch of knowledge including, thinking, computing, reasoning and applying orderly.

Mathematics provides a great preparation for a variety of jobs, and in the current job market many employers are desperate for applicants that have mathematics background and problem solving skills. Math majors are increasingly in demand and mathematics major from university can provide us with critical thinking skills and technical training that will give us higher-paid jobs.

Mathematics is so important for a student's life and it helps us to better problem solving skills and think analytically with better reasoning skills (Aydogdu & Ayaz, 2008). But in the

present situation in Nepal, there are a low number of mathematics students in higher secondary level and higher level too. Most of the students are not interested in studying mathematics because mathematics is often considered to be one of the most challenging subjects in school (Kunwar, 2019). It is an important subject having broad application to everyday life, yet it is often considered as a difficult subject in schools (Kaur, 2017). Students do not like to take mathematics because it is difficult in nature and always depends upon its own sequence. Each topic is interrelated to the previous one. The concepts of the each content of mathematics are difficult to learn and understood and require more practice and patience. Many students have trouble with math and they find it more difficult than other subjects (Kunwar, 2021). It is a universal belief that many students think that math is a boring subject. There are many reasons why students are not interested in studying mathematics compared to other subjects. Some reasons are it can't be committed to memory, some students find it is a boring boring and disengaging subject (Colgan, 2014) and they hate mathematics, and try to avoid due to fear and humiliation (Kunwar, 2020).

Motivational factors for mathematics are those factors which develop the student's interest towards mathematics, which helps to increase the number of mathematics students in the field of study. Choosing mathematics as a major subject is challenging for those students, who are weak in mathematics and those students who are not interested in mathematics. But choosing mathematics as a major subject is the best way to study because there are so many advantages in mathematics compared to choosing other subjects. Some of the students choose mathematics as a major subject at a higher level because they love mathematics. Some of students choose mathematics for the field of study to be a mathematics teacher in the future and some of the students choose mathematics as a major to be smart and prestigious. Some of the students are

interested in mathematics so they choose mathematics as a major and some other students choose mathematics influenced by their peers and relatives. There are many factors which motivate the students to choose mathematics as a major instead of the other subject such as they like mathematics, favorite subject, economic factor, mathematics teacher, value in mathematics, creative subject, and interesting subject, foundation of other sectors, prestige, social value, and large income.

There are several reports indicating that few tertiary students around the world are enrolled in science, technology, engineering and mathematics (STEM) related careers (European Commission, 2004). In particular, the recruitment rate of women in these areas is particularly low (European Commission, 2009). Meeting the demand for scientists and engineers is a widespread concern because of the important role that these careers play in the development of modern society; however, there is also a global interest in producing a diverse and gender balanced scientific workforce. This situation has generated a number of studies that try to identify what factors attract and retain students to STEM careers (Brickhouse, Lowerly & Schultz, 2000; Herzig, 2004; Hill & Rogers, 2012; Medick, 2005). In the context of Nepal women are found comparatively behind the men in all most all spheres of life due to patriotic social structure, cultural traditions, religious practices, attitudes and deep rooted gender discrimination. Except the role of religion, the role of culture, patriarchy system, social perception, sources of income, level of education, political awareness & involvement and gender based division of labor had significant effect to increase the gender disparity in society (Shrestha, & Gartoulla, 2015). The recruitment rate of girls' students in STEM careers, particularly in mathematics, is very low. The latest figures on the study of mathematics at the tertiary level in Mexico show that :(1) women represent 38% of the people studying in a bachelor degree in

mathematics;(2) women represent 24% of the people studying a master degree in mathematics; and (3) women also represent 24% of the people studying a PhD degree in mathematics (Barrera, 2012).

In spite of these problems to attract women to the study of mathematics, there are very few studies in Mexico (and in general in Latin America) focused on identifying the factors that may attract and retain girl students to study math-related careers in this region. In this paper, researcher has reported an ongoing research project focused on identifying some of the factors that may motivate students to choose mathematics as a major. Specifically, researcher trying to answer the following research questions: What factors motivate students to choose mathematics as a major subject? The main contribution of our work is to help to understand what motivates students to choose mathematics as a field of study. This research could help to identify the motivating factors to study mathematics among the students studying at different institutions in Nepal. Researcher also believes that this research can produce pedagogical recommendations to promote the study of mathematics among young students in our country.

Research in the past indicates that there is low participation in mathematics at a higher level. Some of the research indicates that there are most of the students participating to study mathematics at a higher level. But in the present situation, some research indicates that there is low participation in mathematics at a higher level. So, this research can help to find the issues and factors that motivate the students to choose mathematics as a major subject for increasing mathematics students at a higher secondary level of Nepal.

Statement of the Problem

Mathematics has started from the beginning of human civilization to the advanced level at the twenty-first century. The need of mathematics is apparent for everyday life as well as for

higher study in the different field of studies such as science, technology, social science, etc. Thus mathematics is considered and placed as the central part of the school curriculum not only in Nepal but also in the entire world. Most of the students in schools are poor in mathematics so that low achievement in mathematics is common problems at school levels in developed and under developed countries as well. More than half of the total failed students in SEE have seen to be getting poor grades in mathematics (ERO, 2019). In the present situation, there are few students who choose mathematics as a major. So it is one of the issues why students are not interested in mathematics? So it is very crucial to find out the motivational factors which help students to choose mathematics as a major subject. The study is mainly concerned to answer the following questions.

- What are the motivational factors to the students for choosing mathematics as a major subject?
- What are the strategies for making mathematics learning meaningful?

Objectives of the Study

The objectives of the study are follows:

1. To explore the motivational factors of girls and boys choosing mathematics as a major subject.
2. To find out the strategies for making mathematics learning meaningful.

Research Questions

The research is based on the following research questions.

i) What are the motivational factors to the students for choosing mathematics as a major subject?

ii) What are the strategies for making mathematics learning meaningful?

Rationale of the Study

Mathematics plays an important role in our everyday life for this reason the national educational system plan has emphasized to make teaching mathematics as life oriented as well as practical. The goal of teaching mathematics is to provide students with essential skills and knowledge related to life and their further study. Mathematics is used as a tool in all the field of studies such as physical and biological sciences, social sciences, management, science, and information and communication, etc. The use of mathematics in everyday life is increasing day by day. Therefore, mathematics is extremely important and useful for the people throughout the world to enhance their lifestyle and occupation. Thus the study can enhance the learner to acquire mathematical knowledge and skills through detecting the motivational factors and proper mathematics learning strategies in school education. The study can help to understand what motivates students to choose mathematics as a field of study. Likewise it could help to identify the different motivating factors that can assist and inspire the learner to learn mathematics. It also provides the useful pedagogical recommendations to promote the study of mathematics among young students in our country. The study is also important in itself because it dig out various untold and unseen facts in this area of study.

As stated in the problems statement, the story achieved and observed during the study would motivate the students to choose mathematics as a major subject. In the other hand the study would provide the information about how the factors affect the student's participation in mathematics learning. Equally, it helps to provide the information concerning to the gender issues about the teaching learning process that can support the improvement of the whole education system. Thus, it can be helpful for the school administration to create the proper learning school environment for the students.

Delimitations of the Study

Each study cannot be free of limitations and delimitations, so this study has the following delimitations which are pointed as follows.

- This study was limited to Laboratory Higher Secondary School, Kirtipur, Kathmandu district.
- It was based on +2 level (grade XI) mathematics students of Laboratory Higher Secondary.
- The main tool to collect the data was in-depth interview which was conducted to the sampled student and the mathematics subject teacher of sampled school.
- The in-depth interview was conducted concerning to the factors affecting the students choosing mathematics as a major subject.

Operational Definitions of the Key Terms

Student Enrollment

The students who were enrolled at Grade XI are the sampled school.

Factors

The terms factor is defined as one of the several things that causes or influence some things other e.g. educational, social, economic etc.

Home Environment

The environment where all the requirement of students for study is needed are available such as study room, study time, interest, and attitude are found.

Physical Facilities

The physical facilities of the concern school such as well managed rooms with spacious well ventilated, appropriate furniture and other necessary facilities.

Assessment System

The activities that are conducted by the teacher to their students to access the students knowledge, skills, attitude and behaviors concerning to the proper subject at school to measure the learning outcomes.

Students

It is belongs to the learner of Grade XI of the sampled school for the study.

Contextual Factor

The factors, that occurs in the context of performing something. In this study it is associated with family background, self- confidence, influence of society, parents' attitudes, interest, occupational goal etc.

Teacher Efficiency

In this study, teacher efficiency means who completes masters in mathematics education and can perform his/her task effectively.

Motivation Skill

In this study, motivation skill means the teacher who can inspire to learn or do something intrinsically and extrinsically to their students in teaching learning activities.

Technical Skills

In this study, technical skill comprise of the skills which is needed to perform a learning task technically that may be use of ICT or other teaching learning activities in the classroom.

Chapter- II

Review of Literature

The review related literature deals with the theory or research studies. Review of related literature provides the knowledge of what has been already established, known or studied and what has been attempted to be obtained. It is more important to draw a meaningful conclusion particularly in comparative research where the result in the similar content can be compared with earlier research. It helps to conduct an essential aspect of a research project and it is basically undertaken for the purpose of documenting the research finding drawn by the different research. In this chapter different literature related to motivational factors and strategies to mathematics learning among the boys and girls students have been reviewed.

It is focus mainly on mathematics education research journals, books and masters' degree thesis relevant to this study to find out the methods, tools way of analysis and gaps in the literature. Similarly, few other relevant research articles have been also reviewed focusing on what factors attract and retain female students to STEM careers.

Empirical Literature

The literature review had a dual role in our research. On the one hand, it allowed us to locate some of the methods used in the literature to identify the factors that may motivate women to study STEM careers. Such information was used to design the research method. On the other hand, the literatures were used to identify hypotheses or possible explanations about why some women are attracted to this type of careers.

Joshi (2014), on the topic “Students’ Enrollment Trend in Major Mathematics at Higher Level”, the main objective of this study was to identify causes of low enrollment of students in major mathematics at higher secondary level. He used interview schedule, observation note and

document review as the research tools. He found that loss of self- efficacy students; environment, parents and teacher are the main causes of the low enrollment of students in major mathematics at higher level.

Chataut (2014), on the topic “Causes of Low Enrollment of Students in Mathematics Education”, the main objectives of this study were to identify the causes of low enrollment in mathematics at higher secondary level and factors affecting student's interest toward mathematics. In this study, observation, interview and field note were used as the research tools. The results of the study were the lack of social economic, education, gender gap, traditional society, teacher’s role, student’s role and thinking of mathematics were the main causes of low enrollment of students in mathematics education. Various researches have been made regarding the students enrollment in primary, secondary, higher secondary level and factors affecting students' achievement of mathematics. The rate of student enrollment in mathematics has been found decreasing each year. Similarly, the problems related to gender difference, economic status, available materials, caste, and culture and so on are found to be creating problem and thus it has been also affecting the students’ enrollment in mathematics at higher level.

Ghimire (2012), study on “A Study on Factor Affecting Teaching Learning Mathematics at Secondary Level” with the objective to study the factors affecting learning of school in term of the following; school environment, family background, physical facilities, internet of learners and t-test was applied to conclude the study. It was found that, the girls students from the rural area were found more affected due to home environment than boys. Similarly, the urban students were found more interested to study of mathematics.

Tiwari (2002), has reported that both farmer and non-farmer parents had positive attitudes towards the school mathematics. Farmer and non-farmer parents had positive attitudes

towards their male child and female child about the school mathematics however educated parents had positive towards daughters' education rather than non-educated parents.

Pandey (2007), conducted the research on topics “Factor influencing mathematics achievement in case studies of ineffective secondary school of Kailali district." This case study was done in one of the secondary school of Kailali district only 20 students each from effective and ineffective schools were chosen as sample, personal and environmental factors such as gender, age prior knowledge, affordance, motivation, study, at home parental support quality of teacher, class, size, student, teacher, interaction, physical and environmental condition and school leadership were in consideration. The major finding of this study was that students' achievement was mostly affected by both their personal and environmental factors that cause the girls to achieve low marks and boys high. The causes of students' high achievement in mathematics were found the home environment, school environment, teacher quality, student self-motivation. Low level of knowledge on instructional strategy, less teaching experience and lack of teaching materials were found to led students' mathematics achievement forward to a low percentage. Another physical factor like the school surrounding environment was seen as an influencing factor. Teachers' laziness and school leadership have also close links to student performance and achievement.

Ryan and Deci (2000) state “motivation comprises energy, direction, persistence, and equifinality and these all aspects make activate the intention”. According to Dörnyei (2001) motivation as “why people decide to do something, how hard they are going to pursue it, and how long they are willing to sustain the activity”. Motivation is an internal and external agent that inspires the learner to do something. On the other hand, engagement is the amount of effort spent doing a task over time. How hard someone pursues an activity and how long they are

willing to sustain the activity are physically measurable quantities; however, motivation is not directly measurable. It is an attribute of cognition (Elizabeth & Christine 1986). For example, a cat can be motivated to eat, but the cat food is not motivated to be eaten. Instead, cat food is motivational factor for cats.

The term motivation is used at least two different ways in research. Pintrich (2003) used the term motivational science as science dedicated to the understanding of motivation, with science being "reasoned argument from evidence" (p. 668). Although there is a place for philosophical and theological theories of motivation, Pintrich defines motivational science as inquiry into motivation supported by empirical research. I am strongly aligned with Pintrich's motivation science; however, the term "motivational" in this review will generally refer to a relationship between a structure and an agent. Notice, a structure could be lots of things. Students may become more engaged when they work together, they may become more engaged because of affection towards a teacher, they may become more engaged when the teacher facilitates discussion, and they may become more engaged when they are able to search for materials on a Smartphone. Students, teachers, teaching methods, and types of technology could all be correlated to student engagement, and therefore, these relationships can be motivational. A relationship, which is motivational for a student when interacting with a task, tends to increase the student's engagement.

Motivational relationships are observable and measurable. There is a great deal of research on motivation, with a fair amount focused on mathematics. As psychology shifted towards an acceptance of cognitive research, the science of motivation also moved to investigate the cognitive not directly measurable construct of motivation. Bandura (1997) focused on self-efficacy as a cognitive model with affective and selection components associated with

motivation. Ryan and Deci (2000) focused on a social-cognitive model of motivation concerned with autonomy, competence, and self-regulation. Elliot and Harackiewicz (1996) focused on a social cognitive model of motivation related to achievement goals. These three avenues towards understanding motivation may not be exclusive and probably interact; so following suggestions\ made by Pintrich (2003), this review approaches motivation as a composite having affective, cognitive, and social components. According to McLeod (1992) factors such as attitudes and beliefs play an important role in mathematics achievement. The general relationship between attitude and achievement is based on the concept that the better the attitude a learner has towards a subject or task, the higher the achievement or performance level in mathematics (Naungayan, 2022). Stuart (2000) argues that teacher; peer and family attitudes toward mathematics may either positively or negatively influence learners' confidence in mathematics. The findings are that learners who have positive attitudes towards their teachers have high achievement levels. Newman and Schwager (1993) found that at all grades a sense of personal relatedness with the teacher is important in determining a learner's frequency. According to McLeod (1992), factors such as attitudes and beliefs play an important role in mathematics achievement. They further state that this aspect of the classroom climate has been shown to be related to good academic outcome. In the same vein, Dungan and Thurlow (1989) state that the attitudes toward mathematics may either positively or negatively influences learners' confidence in mathematics. The findings are that to which learners like their teacher, influence their liking of the subject.

Research on attitudes towards career choice and towards mathematics teachers is extensive. Eccles and Jacobs (1986) found that self-perceptions of mathematics ability influence mathematics achievement. Norman (1988) concluded from a wide review of literature that there is a positive correlation between career choice and mathematics achievement. Subsequently

Trusty (2002) reported that learner attitudes impact on later career choices in mathematics. Mathematics attitudes during high school had a positive effect on choosing science careers. Trusty and Ng (2000) studied learners' self-perceptions of mathematics ability and found that positive self-perception mathematics ability has relatively strong effects on later career choices.

Regarding the methods used, it is found that in some studies questionnaires are employed in conjunction with other instruments (for example in Holmegaard, Ulriksen & Madsen, 2012; Sjaastad, 2012), but most studies use open interviews to allow women to produce narratives about their experiences with mathematics (Mendick, 2005; Piatek-Jimenez, 2008; Solomon, 2012). Through these personal narratives researchers try to locate activities and experiences that have led women to study mathematics.

With regard to the hypotheses or possible explanations for why some women choose to study (or not so study) mathematics-related careers, they are very different in nature. To explain why some women choose not to study mathematics, some authors claim that mathematics can be perceived as an unfeminine profession, resulting in a discrepancy between female identity and a mathematical identity (Piatek-Jimenez, 2008; Solomon, 2012). Another explanation for the low number of women in mathematics as a field of study is that there is discrimination against women in math intensive fields and in the mathematics classroom sometimes unconsciously (Ceci, Williams & Barnett, 2009). There are authors who claim that the level of creativity required in some hard sciences, which is not socially favored among women, can be a reason why there is a low presence of women in these sciences (Hill & Rogers, 2012). There are at least two factors that have been identified as motivating and inspiring for women to study mathematics-related careers: (1) the confidence that individuals have in their own intellectual

abilities (Eccles, 2007) and (2) the positive influence of significant persons, such as parents, teachers and friends (Sjaastad, 2012).

During my review of the literature, I also noted that some studies associate the process of choosing a career with the construction of an identity in young people. For example, Sjaastad (2012) uses as a theoretical tool the concept of self; he bases his discussion of the concept of self in the works of Higgins (1987) and Swann & Bosson (2010). The self refers to the attributes that a person believes to possess and the attributes the person would like to possess. One important thing here is that, the self is influenced and shaped by interpersonal relationships; as stated by Swann & Bosson (2010) "We know ourselves … by observing how we fit into the fabric of social relationships and how others react to us" (p. 589).

Similarly, Holmegaard, Ulriksen & Madsen (2012) relate the choice of a career with the process of defining oneself. The decision about which course of study to choose after finishing upper-secondary school is not limited to figuring out what could be interesting or promising; it is also about defining oneself, and making a decision about whom one wishes to become" (p. 4). Similar to the theoretical position of Sjaastad (2012), Holmegaard, Ulriksen & Madsen (2012) conceptualize the constitution of an identity as shaped by interactions with others and the cultural context where the person is immersed.

The concept of mathematical identity or identity as mathematics learner can also be found in the literature on mathematics education (Anderson, 2007; O'Hara, 2010). The construct of identity refers to "the way we define ourselves and how others define us" (Anderson, 2007), and serves to explain what makes a person to feel like an able mathematics student and as a consequence get involved and engaged in mathematical activities. As I can see, this construct could be helpful to explain some of the results of my study.

Research Gap

From the above review, there has been much research on motivational factors for choosing mathematics as a major subject. From which the researcher has found that there are many factors such as attitudes towards mathematics, confidence level of learners towards mathematics, influence of the mathematics teacher, economic conditions, and influenced by their relatives are motivational factors in learning mathematics. From the above research study, it is clear that mathematics there is many factors that can affect the achievement of the students in mathematics. However, in the context of Nepal, there is huge gap of such research conducted in higher secondary level regarding motivational factors and strategies used for learning mathematics meaningful. Thus, to fulfill the gap, I select the topic and area of study to find out the genuine causes that why the students studying at Grade XI with majoring mathematics are decreasing.

Theoretical Framework

In this study, different theory can be used as the theoretical framework such as Bandura Social Cognitive Theory, Vygotsky's Socio-cultural Theory, Maslow's Theory of Hierarchical Needs, Hertzberg's two-factor Theory, etc. However, I have conducted my study based on the Vygotsky's Socio-cultural Theory.

The Socio-cultural Theory of Vygotsky is a form of social constructivism. It is based on the thought that cognitive functions are the byproducts of social interactions. He emphasized the collaborative learning by the construction of knowledge in social phenomena. He believed that children are active seekers of knowledge, but the donor views them as solitary agents. In this theory, rich social and cultural content profoundly affects the children's cognition; knowledge is being constructed in the social situation of negotiations rather-than being the reflection of the

objective reality, which is termed as social constructivism. Social constructivism believes in the multiple realities. In social constructivist theory each human being makes sense of the world in a unique way. Vygotsky argues that the child development cannot be understood by studying the individual that it needs to examine the external world. The children as they go about their daily activities we will see that they continuously talk loud to themselves as they play and explore the environment. He termed it as "private speech" Vygotsky believed that all higher cognitive processes develop out of social; interaction.

According to Vygotsky, knowledge is constructed in two ways in social content. Firstly social interaction influences the nature of knowledge that is constructed and the process of individual use to construct that knowledge. The knowledge constructed by a child is not only through his own capacity but also from the content and interaction with more knowledgeable others. Vygotsky proposed that child knowledge could be predicted if we could understand the social context. Vygotsky pointed out instantly that children act against their impulses because they must subject themselves to the rules of the play scene.

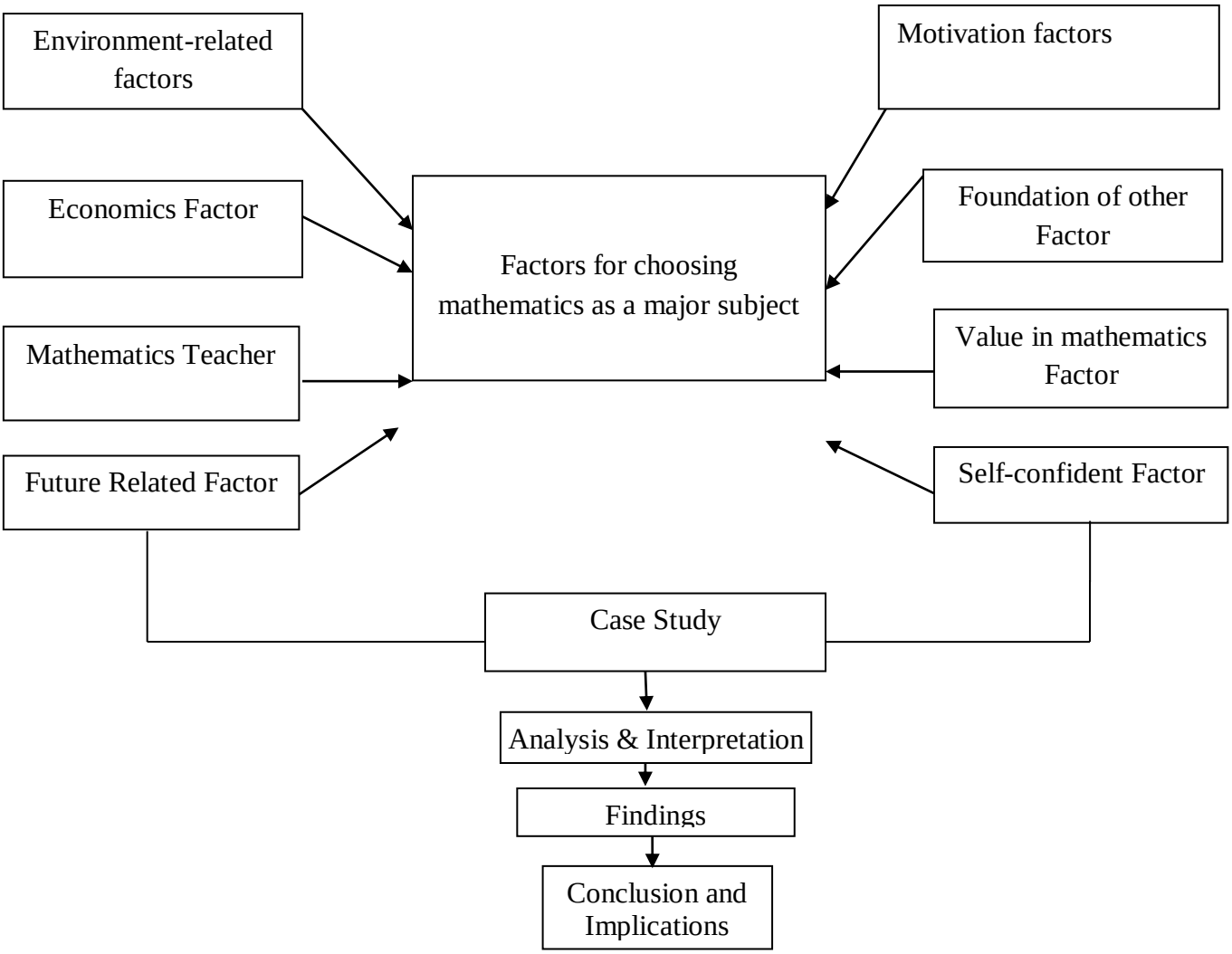
Since school is miniature society where the learner play, interact, learn and grows up in the school surrounding with his/her peers and teacher. During his/her school he/she make his own understanding, thinking and create self knowledge. Creation of knowledge depends on the participation, interaction and sharing the ideas of inter and intra cultural experiences of the learner. So the motivational factors and learning strategy for learning mathematics can relate closely to the Socio-cultural theory. Therefore this study is linked to the Vygotsky theory Social constructivist.

Conceptual Framework of the Study

The study is on "Motivational Factors for Choosing Mathematics as a Major Subject at Higher Secondary Level" is based on following conceptual framework.

Figure 1

Conceptual Framework on Motivational Factors for Choosing Mathematics



Chapter - III

Method and Procedures

This chapter begins with the design of the study, population of the study, sample and sampling strategy, study area/field, data collection tools and techniques, data collection procedure and data analysis procedure. Qualitative research takes an interpretative, naturalist approach to its subject matter, qualitative researchers study things in their natural setting, attempting to make, phenomena, in terms of meaning that people bring to them, so, I chose this methodology. The chapter explains the plan and method of study which helped to achieve the objectives of the study.

Design of the Study

The qualitative research design/method helps to discover the individual views for data collection such as group discussions, individual interviews, and participation of others (Carol, 2016). It is difficult for measuring and calculates the numerical value of students' difficulties in learning mathematics from the quantitative method; therefore, I have used the qualitative research method. Qualitative research can be regarded as 'naturalistic inquiry' in the sense that it is conducted in the natural setting by trying to avoid any intentional manipulation and distortion of the environment of the informants by the researcher (Creswell, 2007).

Case Study Approach

According to Jack and Hersh (2008), case study research approach is a research methodology that helps in exploration of a phenomenon within some particular context through various data sources, and it undertakes the exploration through variety of lenses in order to reveal multiple facets of the phenomenon. In case study, a real-time phenomenon is explored within its naturally occurring context, with the consideration that context creates a difference (Peter &

Kaarbo, 1999). The major concern of this study was to find out the perception of students about which factors are affected in their learning mathematics. So, for achieving this major concern the case study approach was adopted under the qualitative research method because according to Creswell (2007), in the case study approach, the data is collected through direct observation in a natural setting and the actual incident on the spot. Here, the case is the process of selecting a limited number of students & doing research on those students and then collecting data from them. And also, the objectives of this study were to explore the causes of difficulties faced by the students in learning mathematics and to explore the ways to improve the interest of students in learning mathematics. I thought that only the case study approach could fulfill these objectives, so the case study approach was applied in this study.

Sample of the Study

The sample of this study was chosen by using purposive sampling technique. For this study Laboratory Higher Secondary School at Kirtipur was chosen because there are enough girls students of mathematics which was needed for the study purpose. All together six students studying Grade XI (3 boys, 3 girls) were chosen for this study. Thus, the in-depth interviews were conducted with 3 girls and 3 boys. Also the interview was held with two mathematics teacher of the same school and head teacher for the data collection. In this research, the respondents were selected according to their marks obtained in the first terminal examination of grade XI mathematics. Based on the obtained score, one boy and one girl getting higher marks, other one by and one girl getting medium marks and the remaining boy and girl getting lower marks were selected respectively.

Study Area/Field

The selection of research area is also a very important task for the study in order to obtain easy access, establishing immediate rapport with informants and gathering data directly related to the research objectives. In this sense, by easy access, cost benefit, and easy for rapport building, Laboratory Higher Secondary School of Kathmandu district Kirtipur Municipality was chosen.

Data Collection Tools

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

Observation

Observation in a natural setting is a special skill and requirement to address the issues regarding the motivational condition of the students and the proper strategies used in teaching learning mathematics. It helps to maintain the potential deception of the people being interviewed, impression management, and the potential marginality of the researcher in a strange setting (Hamersley & Atkinson, 1995; as cited in Creswell, 2007). Observation is a kind of tools that helps to seek knowledge through the use with sense i.e. eyes, nose, tongue, and skin. It has great importance not only in research work but also in our daily lives. Direct observation has the advantages of putting researchers into first hand contact with reality (K.C, 2000; as cited in Adhikari, 2007). In this study, observation was used to capture the physical setting that is the physical environment of school and classroom, the human setting that is the organizations of

students in the classroom and interaction setting that is the participation as well as interaction of teachers with students and vice versa.

The observation guideline was developed with reference to the research objectives. The teachers were pre-informed about the purpose of observation and the permission was taken before entering into the classroom. All together, 4 classes were observed by the researcher as a non participant observation. During the observation the researcher only noted down the things occurred in the classroom. Observation helped me in collecting detail information about respondents, their everyday practices and captures the actual experiences of the participants. Since, the classroom was constituted varied socio-cultural forces having the students from different socio-economic and cultural background they found to be varied live responses and activities in the classroom. To get the required information regarding mathematical concepts, the researcher observed school overall as well as key respondents individually and collectively during their work at school, classroom, playing with peers, interacting with teachers and friends, school behavior, culture, and participation. It was also observed the teachers collaboration and discussion in subject matter, participation of students in classroom activities as well as extracurricular activities in terms of gender, caste, religion etc. Likewise the teacher's behavior towards students in teaching learning process, and teaching learning strategies used in the classroom were also observed.

In-depth Interview

Interview is a two-way communication between researcher and the respondents in which interviewer creates situations that can attract the attention of respondents for a enough period of time in asking questions and answering the questions which interviewee puts his/her understanding and meaning (Ok J, & Kwan, 2015). Interview is a face to face interpersonal role

situation in which one person, the interviewer, asks a person being interview, the respondent and questions designed to obtain answers pertinent to the purpose of the research problem (Kerlinger, 1986). In-depth interview is also known as unstructured interview that could be regarded as informal interview. It is used to discover the in-depth understanding of people in the context under the study (Bailey, 1982). It can be done in a day to day conversational way in which interviewer does not know whether s/he had been interviewing or not. This interview helped to create a friendly situation that opens up a free feeling environment for both researcher and respondent.

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

Documents Analysis

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

Quality Standard

After completing the construction of the research tools, it is necessary to maintain quality standard. For quality standard, it was used cross match, triangulation, member checking, prolong stayed in the field. For quality standard, it was followed the following steps:

Credibility

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

Transferability

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

Dependability

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

Conformability

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

Data Collection Procedures

Data collection refers to gathering information from vivid sources through the application of multiple data gathering methods to attain the objectives of the research under consideration (Niure, 2014). For this study, the data and information were collected by using tools as observation, in-depth interview and documents analysis in order to collect information from the respondents. To collect the primary and secondary data, class observation were done regularly during teaching learning activities. During the class observation, the students' activities like behavior, interest and interactions were recorded on the basis of the classroom observation from. With the help of semi-structured interview schedule and questionnaire, the in-depth interview was held with the selected four students, two mathematics teacher and head teacher. The story during the interaction with the respondents were carefully listened and recorded properly.

Related documents were also reviewed and analyzed on the basis of need. The data obtained from interviews consists of direct questions to the respondent about their experiences, opinions, feelings and knowledge. The data from observations consists of detailed description of people's activities, behavior, actions and the full range of interpersonal interactions and

organizational processes. And data from document analysis consists of expert's quotations, program records, memorandum and correspondence, and reports, personal diaries and open-ended written responses to questionnaires and surveys (Creswell, 2007).

Method of Data Analysis

Data analysis in qualitative research consists of preparing and organizing the data for analysis, then reducing the data into themes through a process of coding and condensing the codes and finally representing the data in figures, tables or a discussion (Creswell, 2007). In this study, the data collected through above mentioned tools from different respondents and sources were processed in different steps. First, the data gathered from interview in the tape recorder were translated in English. The writing and reading of transcripts allowed me to generate common codes and themes as well as the issue that have anticipated. Further, this coded sentences that expressed similar meaning were segmented into common categories. Finally, after revising those categories, smaller specific themes related to the research questions were generated. For the purpose of analysis, the themes were analyzed for answering the research questions. The important paraphrases with same meaning were bring together and summarized to support the argument whereas less relevant passages with same meaning were skipped for the ease of analysis. Cross match or triangulation were adopted to maintain the validity and reliability of the results of the study. Mainly the three sources of the information was triangulated in classroom observation, teaching learning styles of mathematics, and interview with head-teacher, mathematics teacher and key students in addition with field notes. Then after, with the help of theories the analyzed texts interpreted and summarize. Thus, analysis of the statements from the specific themes were done and theories was used to interpret the meaning, values, experiences, opinions and behavior of respondents from the analyzed themes and answer the

research questions. The data analysis and interpretation part divided in three sections on the basis of research questions. The first section discusses about the cultural diversity in Nepal and causes of difficulties in learning mathematics of culturally diverse students at school. The second section explains the relation between culture and learning mathematics. The third section discusses about effective pedagogy for culturally diverse classroom.

Ethical Considerations

If any kind of research involves the person, special attention should be paid to the person's rights, dignity, freedom, and privacy (Khanal, 2019). To maintain the ethical considerations in this study, oral permission from the math teacher as well as head teacher was taken before observing the classroom. Likewise, permission was also taken to the concern authority of the school and the key students before conducting interviews. It was also informed about the study purpose to the participants and getting their approval about the data. Similarly the use of gender biased language, ethnicity, culture related matter and personal and comfortable language were avoided.

Chapter- IV

Analysis and Interpretation of Data

This chapter is mainly concerned with the analysis and interpretation of the data. The data collected from the informants were analyzed and interpreted to find out the motivational factors of choosing mathematics as a major subject and way of constructing the mathematical content. The case students, behavior, activities and interaction with teachers were observed by the researcher in the study. The motivational factors were evaluated by the researcher with the help of the in-depth interview. The required data was collected by using interview and observation tools. The case students and math's teachers were interviewed. Regular 3 mathematics classes were observed for the collection of required data on the basis of pre-observation form. The interpretation and analysis of the data are presented in the following heading.

Introduction of Case School

The establishment of Laboratory School was in 2013 B.S. ushered as a modern and methodological teaching institution in Nepal. Coming as 'Demonstration School' to complement the teacher training program, the country has embarked upon, the school has kept pace with, and contributed significantly to the educational innovation that have been crucial in bringing Nepalese education to its present standing known as Lab School in popular tongue. The institution has over the years recorded many feats and everlasting impression on the minds of the multitude of students who have passed its gates to a world where each of them has been successful in leaving a mark of distinction in whatever they do. Among the many pioneering works, the school is credited to have done is the successful integration of visually disabled students in general schooling an experiment considered to be a word first. Spread in a sprawling

109 Ropanies of land of the picturesque eastern flank of Kritipur hills the school offers a serine environment that is unparalleled, and very conducive to serious academic pursuits.

Laboratory School has been the prime choice of cream students from all over Nepal. The total students of Laboratory School are around 1400 in +2 and secondary level. Besides academic achievements, Laboratory School also carries numerous co-curricular and extracurricular activities for the overall development of the students. Students were found to be encouraged to develop their personal leadership styles and provided with ample opportunity to interact with faculty and practitioners alike.

Introduction of Case Students

Respondent -I

Respondent -I is male student in grade XII Laboratory School of Kathmandu district. He came from kailali district to continue his studies. When I asked him informally about his family background he said that he was a son of a farmer, so his economic condition was not good.So, he felt it was difficult to manage the college fee. He did not give proper time to practice mathematics at his room. Although record of his college found very well. According to the first terminal examination of grade XII, he obtained 33 marks in mathematics under the full marks 50. From his result I concluded that he is excellent in mathematics. When I observed the class, I found that he was so interested in mathematics and he actively participated in the class. His class performance was good. He said that mathematics is an easy and interesting subject. So, he chose optional mathematics as a major subject at school level. He said that mathematics is his favorite subject from childhood. He likes mathematics but he is good in other subjects then mathematics. He says that mathematics is a practical subject. So, practice is most important to develop mathematical content.

Respondent -II

Respondent -II is a female student of grade XII of the sample school. Her college record shows that she is excellent in all subjects. She came from Ramechhap district to study at a higher level. Her main aim in life is to be a good mathematics' teacher. According to the result of the first terminal examination of grade XII, she obtained 32 marks in mathematics under the full marks 50. She is talented in mathematics. She regularly participated in mathematics class but sometimes she missed the mathematics classes due to some reason. When I observed the mathematics classes, I found that she was actively participated in classes and her activities inside the class were very good. She respects all her teachers and friends. She helps her friends inside the classroom when her friends were in trouble while solving the mathematics problem. As a result, she is very good in mathematics and she said that mathematics is a very easy and interesting subject than other subjects. Her father is a farmer and she lives in Kathmandu with her brother.

Respondent -III

Respondent -III is a male student of grade XII of the same school. He also came from Ramechhap district to continue his study. At school level, he chose optional mathematics as a major subject. According to school records, he is a medium in mathematics. He obtained 20 marks in mathematics out of 50 marks in the first terminal examination. He also takes part in class regularly. He said that mathematics is an easy subject. From the lower level, his performance in mathematics was so good rather than other subjects. He is helpful and kind to all friends. When I asked informally about his personal life he said that his father's economic condition is poor. He could not manage the proper time for studying mathematics at home. However his performance in mathematics at school was found good. He was actively

participating in the class while the teacher was teaching mathematics. He said that mathematics is a practicable subject. More practice is most important to study math. Otherwise it will forget.

Respondent -IV

Respondent -IV is a female student of grade XII of Laboratory School of Kathmandu district. She came from Kavre district to continue her higher study. She is too good in mathematics. She is a more talented student. Her lecture impressed me.On the first terminal examination of grade XII, she got 23 marks in mathematics out of 50 marks. She said that there is lack of good female mathematics teachers. So she intends to become a mathematics teacher in her village in the future. She said that there is no perfect mathematics teacher in her village. She also said that mathematics is an easy and interesting subject. She is free for her academic decision. In her house, she has no restrictions. Her parents do not compel her to study. She can decide herself that at what and which time is to study and at which time is to do other things and go outside with her friends. Generally, she is free from household works. According to the school, she is excellent in all subjects as well as in extracurricular activities. She said that practice is most important to develop the mathematical content and taking tuition is also another way of constructing the mathematical content.

Class Observation of the Respondents

Learning environment of the case school is the totality of the education atmosphere in the school. In the school environment students need to feel secure and positive about the school, teachers need to feel value and be professionally enriched by their teaching skills. The school climate refers to the sum of the values, safety, practices and organized structure within a school. Teaching practices, diversity, and the relationship among administration, teachers, and students

can contribute to the school climate. I observed 5 classes in the school in which two episodes are presented below

Episode - 1

It was the first class observation. The teacher entered the classroom and I entered the class. All the students stood up and said good morning sir. Teachers said 'Good morning' and 'sit down'. Then the teacher wrote the title permutation and combination all students were silent in the classroom. Then the teacher said you do not have the pre concept about permutation. The students were listening to the teacher by noting. Then the teacher started to teach the concept of permutation. Eye contact of the teacher and students was good. All students were actively participated in the classroom. They asked questions which they did not understand. At last, the teacher gave a task about the concept of permutation. I don't know how the time has gone. From the above activities, I concluded that all students were interested in mathematics. They were also active in mathematics class.

From their activities, I concluded that mathematics can be regarded as an interesting subject if the classroom delivery is effective. Therefore mathematics can be considered as is an interesting subject when the classroom delivery is effective. Thus, effective classroom delivery is one of the motivational factors of choosing mathematics as a major.

Episode- 2

It was the second class observation. There were 28 students in that class. The class was well managed. All of the students participated in the classroom and they were quiet. The teacher was lecturing on permutation and combination. Then he asked the students what they know about the combination. The students responded without any hesitation after that he defined the combination. Then he wrote a problem from the exercise book and solved it explaining. The

teacher gave a simple classwork. Most of the students performed the class work correctly. At the end he gave homework from the exercise book.

In this episode, I found that the class was well managed. Students were not fully participating. However, the teacher seemed to be aware of the importance of student participation in the classroom. Some of the students seemed very enthusiastic in mathematics class. There was no differentiation between the back benches and other students. Teacher behaved equally but he did not give special attention with good manners when students were asked questions but he did not focus on the particular students, he behaved equally to all students.

Teacher's and Student's views

The views of the students and the teachers were collected by conducting interview schedule formed in semistructured form (Appendix I, II, III) to find out the motivational factors for choosing mathematics as a major subject, way of construction of the mathematical content. Both the views of the teachers and students were most importance to fulfill the objectives of the study. The views of the teachers and students are presents as:

Teacher's views

The teacher's opinion was collected regarding the motivational factors of choosing mathematics as a major subject and way of constructing the mathematical content. The following responses were obtained. The teacher's responses were about the lack of mathematics students in the education stream as:

> *He said that mathematics is a hard subject for students; mathematics is hard for remote area students. Mathematics is difficult for mathematics students who come from remote areas due to poor in English language. There is no option other than to choose a career*

as a teacher rather than other sectors in future. So, at present time there is a lack of mathematics student's in mathematics stream than other.

Mathematics is a hard subject and there is no option other than to choose teaching as a career that affects the mathematics students and they feel bored and irritated to choose math as a major subject. The response for the question asked about the motivational factors for choosing mathematics as a major are as follows.

He said that mathematics is everywhere such as mathematics in population, mathematics in management, mathematics in science, mathematics in rural development .So that mathematics is important and the foundation of other sectors. Mathematics is important for us for the job in the future. There is a lack of mathematics teachers so it will secure the job in the future. He said that mathematics It is important for the study of GRE, IELTS. It helps to get a good scholarship for further study.

From the above responses of the teacher, I concluded that *mathematics is the foundation of other subjects* such as population, rural development, management and science. So, it is one of the motivational factors of choosing maths. Mathematics helps to secure a job in the future so it influences the mathematics student's to chose mathematics. The responses for the questions about how students learn the mathematical content are as given below.

Teacher said that he teaches three level students' (School level, +2 level and bachelor's level). He said that he understands the psychology of student's. He said that mathematics is a critical subject so that the previous knowledge about the lesson is most important for learning mathematics. He said that in a free environment student's construct mathematical content. So, a free environment is one of the ways of constructing mathematical content. He also said that mathematics is learned through the guardian,

talented students. It is a practical subject so it is better that mathematics learns from practice.

From the above responses I concluded that mathematics is a critical subject. Free environment and talented students, guardian are ways of constructing mathematical content. Free environment is most important for learning mathematics. Likewise, previous knowledge is also a crucial factor.

Student's Views

Following responses were obtained for the questions through the students.

"Do you like mathematics, why?"

"I like to read mathematics because it is an easy subject."

"I like mathematics because it will be possible to get the job in the future."

"I like mathematics because I obtained good marks in mathematics more than other subjects."

"I like mathematics because I feel it is easy from my childhood."

From the above response, it can be said that most of the students have understood the importance of mathematics but because of household obstacles, they don't have enough time to practice etc.

The responses to the question asked about the reason for stay in Kathmandu are as *follows:*

"I live in Kathmandu to complete my higher studies."

"I live in Kathmandu and study here because there is no perfect mathematics teacher in my village."

From the above responses I conclude that most of the rural area's students come to Kathmandu to complete their higher study and fulfill their aims in future. The responses for the questions asked about their position in school level are as follows:

"I have a third / fourth position in a school."

"I take the first position in girl's students."

"I am a medium student, not talented but mathematics is an easy subject."

From the above responses, I conclude that most of the students are excellent those students who choose mathematics as a major. The responses for the question asked about the reason to choose mathematics as a major are as follows:

"I choose mathematics as a major because I take optional math as a major subject in up to grade X."

"I chose mathematics as a major because it is difficult to find the mathematics teachers."

"I choose mathematics as a major because there are many sectors in the mathematics field."

From the above responses, I concluded that mathematics is an interesting, critical subject. Most of the student's feel mathematics is an easy subject. Mathematics is that subject which helps to get a job in the future. There are many sectors in the mathematics field. The responses for the questions about the motivational factors of choosing mathematics as a major are as follows:

The students said that it will be possible to get the job in the future: Mathematics is an interesting subject itself. It is an easy subject. It helps to obtain better marks than other subjects. Students It is the foundation of other subjects such as population, management,

engineering, science etc. It helps to be a businessman. It helps to prepare the governmental job.

From the above responses, I concluded that mathematics is an interesting subject, foundation of other subject; critical subject, good job subject etc. are motivational factors of choosing maths as a major. The responses for the questions asked about the way of mathematics learn are as follows:

The students said that practicing more at home is most important for learning mathematics on the basis of teacher hints and instruction given in school. Similarly another student said that more practice and trying to understand at home. Similarly another student said to do practice and asked with friends in case of confusion is the best way to construct mathematical content. Similarly another student said that tuition, discussion with friends, regularly after the mathematics class, and assignments which are given by the teacher are the ways of learning mathematics content.

In another class, students said about the way of mathematics learn are as follows:

Practice is the most important way to construct mathematical content. Similarly they said that self-study, peer group discussion, discussion with friends, tuition, and assignments after the mathematics classes regularly are the best way to learn mathematics.

From the above responses, I concluded that there are several ways to construct mathematical content: practices, peer group discussion, discuss with friends, do assignment, and tuition is the best way to construct the mathematical content. In the above different views of teachers and students I conclude that mathematics is an interesting and creative subject. It will help to get a good job in the future; it is the foundation of other sectors such as population, management, science, engineering etc. It makes student's smart, it increases the social value are

the motivational factors of choosing math's as a major and tuition, assignment, practice, peer group discussion, discussion with friends, regular mathematics class are the best way to learn and construct mathematics.

Motivational Factors of Choosing Mathematics as a Major Subject

Motivational Factors

Motivational factors are drivers of human behavior related to the intrinsic nature of the work, but not necessary to the surrounding circumstances or environment. The term motivational is defined in the content of the two-factor (motivation hygiene) theory as a so-called "satisfier" e.g., achievement, advancement responsibility that motivates a person to work harder and more efficiently (Alrawahi et al., 2020). Motivating factors include achievement, advancement, autonomy, personal growth, recognition, responsibility, and the work itself. Researchers show that different types of motivational factors which are said by the case students while conducting the interview. Now creative subjects, interesting subjects, they like mathematics; they realized they are good in mathematics are merged in the theme of value in mathematics because of their nature and thus the researcher has mentioned the four main themes of motivational factors are as follows:

Value of Mathematics. Mathematics has many educational values which determine the need of teaching the subject in school. The practical value of mathematics that has a greater contribution to everyone to use mathematics in everyday life and it is needed to all of us whether rich or poor, high or low. Cultural value of mathematics has got a great cultural value which is steadily increasing day by day and has a major contribution to our cultural advancement. Disciplinary value of mathematics also trains or disciplines the mind. It develops thinking and reasoning power. According to Locke, "Mathematics is a way to settle in the mind a habit of

reasoning." Thus, we see that mathematics has many educational values which show the increasing importance of the subject in schools and in social life.

Thus, these all sub themes such as the creative subject, interesting subject, they like mathematics, they realized, they are good in mathematics have been merged in the theme values of mathematics due to their nature.

In the classroom, when I conducted an interview of case students and subject teacher of case school about the factors which motivates the students to choose mathematics as a major subject, the following responses were obtained. When I asked the students that, what is the reason of choosing mathematics as a major? The responses of the students about the value of mathematics are as follows:

> *They chose optional mathematics as a major in school level and they got higher marks in mathematics than other subjects. Some students said that mathematics is easier than other subjects. Some students said that they like mathematics from their childhood. They took mathematics as a major from their lower level. They feel that mathematics is easier than other subject's .They also said that mathematics is a creative subject. (Student's view)*

The student's responses obtained that they like mathematics, mathematics is an interesting subject, and mathematics is a creative subject which is included in the value of mathematics.

When I observed the classroom while the teacher was teaching mathematics, I found that students were fully participated in learning mathematics and they were interested too. They were active and noted the problem in their copy taught by their teacher. Teacher was also actively presenting in the classroom.

From the above responses, I concluded that most of the student's choose mathematics as a major who feel mathematics is easy and those students who realized that they are good in mathematics. The reason for choosing mathematics was interesting and creative also that represents the value of mathematics. So, value of mathematics is the most important motivational factor to choosing mathematics as a major.

When I observed the classroom, I found that at first the teacher solved the problems, and then he gave the related problems to students for solving. So, teaching learning activities were also done according to the process of Vygotsky's constructivism.

Economic Factors. Economic factor is also the most important factor to motivate the students to choose mathematics as a major. It is one of the subjects which secure a good job in the future which helps to keep good economic conditions for their life.

When the students were asked "what is the reason of choosing mathematics as a major", some student's simply responded that:

> *Mathematics helps to get a good job in the future. Some students said that there are many sectors in mathematics. Some students said that there is a lack of mathematics teachers so they choose mathematics to improve their economic condition. (Student's view)*

The responses of teacher about this question are as follows:

> *Mathematics is important for the study of IELTS, GRE for further study which helps to earn more money and foreign employment. It is only one subject which secures the job in the future. (Teacher's view)*

From the above views, I concluded that mathematics is important for students because it is one of the ways to get a good job in the future. It is the gateway to get a job and there are many sectors in mathematics which positively affect the economic condition in our life.

Mathematics Teacher. Not all students like math, but a good math teacher has the power to change them. A good math teacher can help students who have traditionally struggled with arithmetic begin to build confidence in their skills. The students who are usually bored with numbers, a good math teacher can breathe new life into the subject. A good math teacher makes her class a place where students want to enter and entertain by learning mathematics.

Mathematics teacher is one of the most important motivational factors for choosing mathematics as a major because some students choose mathematics due to influence by the mathematics teacher. There are several aspects that students highlight about their teacher. Some mentioned that they like the way they taught for example by presenting step by step and detailed explanations of the topics.

When researcher asked about the reason of choosing mathematics as a major one student simply responded that:

> *There is no perfect mathematics teacher in her village so, she comes to Kathmandu from her home town to continue her higher study and she said that she will be a good and perfect mathematics teacher in the future in her village. Another students simply responded that there is a lack of mathematics teacher than other so he choose a mathematics to became a good mathematics teacher. (Student's views)*

When I observed the classroom, I found that mathematics teacher and students actively presented in the classroom. Their eye contact was good. Teacher interacts with students related to the problems and solves the problems on white-board by describing them step by step.

From the above responses, I concluded that most of the students choose mathematics as a major subject for becoming a good and perfect mathematics subject. So it is also one of the

motivational factors to choose mathematics as a major. In the classroom, I found that teacher and students keep direct interaction in teaching learning activities.

Foundation for other Sector. Mathematics is only one subject that is necessary to study or understand other sectors/subjects such as population, management, engineer, doctor, etc. Without mathematics nobody studies these sectors. So it is also one of the motivational factors for studying mathematics. Mathematics is necessary for daily life for every person to keep a record. Mathematics helps to do IELTS, GRE which helps to get a good scholarship for further study.

When I asked about the reason of choosing mathematics as a major, some students responded that:

> *Mathematics has a key role to study other subjects or other sectors such as engineering, science, management, population, rural development etc. So, mathematics is important for us. (Student's views)*
>
> *It helps to study GRE, IELTS, which helps to get a good scholarship for further study. Mathematics also helps to success public service commission which is the gateway to entering the government service. (Teacher's views)*

From these above mentioned views, I concluded that mathematics is the base to study or understand the different sectors. Without mathematics nobody studies science, engineering, management, population, rural development, etc. So, foundation for higher study is also one of the motivational factors for choosing mathematics as a major.

Strategies for Making Mathematics Learning Meaningful

Mathematics, the science of structure, order and relation (Mickens & Ronald, 1990), that has involved basic practices of counting, measuring, and describing the shapes of the object

(Ziegler & Loos, 2017). It deals with logical reasoning and quantitative calculation and its development has involved an increasing degree of idealization and abstraction of its subject matter. Knowledge construction is the process by which new knowledge to the individual or group is created based on the generative process. Knowledge construction refers to the act or process of contributing to the development of the body of ideas, attitudes and beliefs. It is the collaborative process which aims to produce new understanding or knowledge which exceeds something that anyone alone could not achieve. It is based on each other's ideas and thoughts.

The knowledge construction process relates to the extent to which teachers help students to understand, investigate and determine how the implicit cultural assumptions, frames of references, perspectives and biases within a discipline influence the ways in which knowledge is constructed within it (Banks & Banks, 2007).

Mathematical knowledge content is subject matter-knowledge is divided into common content knowledge, specialized content knowledge and knowledge on the mathematical horizon. There is several ways to knowledge construction of mathematical content which are as follows:

Practice, Practice and More Practice

It is one of the ways of constructing mathematical content. It is impossible to study math’s property by reading and listening. To study maths and construction knowledge we have to roll up ourselves and actually solve some problems. The more practice to solving math's problems is the better way to enrich mathematics. Each problem has its own characteristics and its importance to solve it in numerous ways before tackling the exam. There is no escaping this reality, to do well in a math's exam we need to have solved a lot of mathematical problems beforehand. When I asked about it student's simply responses as such:

Mathematics is a practical subject. So, more practice is the best way to learn mathematics. They said that more practice at home which is learned at school is the best way. Whenever we do not practice more time the mathematical knowledge and content cannot be learned and constructed. (Student's views)

When I observed the classroom, I found that students also practiced the same problem while teacher solving the problem on white board. Then students try to solve related to this problem of text book.

From the above responses I concluded that without practice mathematics learning is impossible. Mathematics is a practical subject. So practice, practice and more practice is an important and best way for knowledge construction of mathematics content.

Self-Study

Self- studying mathematics is not easy, but it is significantly easier to check own mathematical mistakes. Each step of mathematical calculation or proof should be written down in such a way that we can understand it ourselves. This process makes every learner possible for self-study mathematics and change amazingly the way of solving mathematical problems. In this respect when I asked questions about the learning styles about the mathematics students the responses of the students are as:

Self-study is also important for knowledge construction regarding mathematical content. They said that mathematics learning at home and schooliis very important otherwise mathematics cannot learn. (Student's views)

From the above response, I concluded that many theorems and mathematical content are possible through self-study. Self-study helps to construct new mathematical knowledge. So, self-study is one of the best ways to knowledge construction of mathematical content which is

important for mathematical learning. In self-study, learner's need help with apprenticeships on which they do not understand.

Group Discussion

Group discussion generates different questions and solutions from the members of the group. Every individual has unique ideas, views and thinking capacity. When group discussion is executed by a group of students it helps them to learn the views and ideas of each others. It develops creative thinking in solving problems and clearing doubts. In mathematics group discussion helps to solve problems, create new ideas for solving problems, discover new mathematical content and construct mathematical knowledge. Group discussion involves exchange of ideas where important things are learned from each other which help to knowledge construction of mathematical content. When I asked questions about it, some students simply responded as:

> *Mathematics is learned by asking and discussing with friends. They said that when they were absent they asked with friends and discuss with them which knowledge they missed. (Student's views)*
>
> *Mathematics is a practical subject. So, students can learn mathematics by discussing with talented and excellent students. (Teacher's views)*

When I observed the classroom, after ending the classroom, I found that outside the classroom, some students discussed the problems which they did not understand while the teacher was teaching mathematics in the classroom. I also found that some students also discussed with talented students about the mathematical problems which they had missed.

From this observation, I concluded that by group discussion much mathematical knowledge can be developed. So, for construction knowledge of mathematical content, group

discussion plays a vital role. So, it is also one of the best ways to construct mathematical knowledge. According to Vygotsky's constructivism, knowledge is socially constructed. He focused on peer collaboration and peer collaboration focused that collective activity.

Work Along with Teacher

Mathematics is a practical subject. So, in the class students must be active while the teacher teaches mathematics. When the teacher solves problems at the front of class, then students must work along with the teacher in the notebook. Then students must work on any sample problems that their teacher posts or says to do. This work develops their intellectual capacity as well as thinking capacity which helps them to construct mathematical knowledge.

Students must participate while the teacher is working on a problem. They must be sure that their notes are clear and easy to read. Students write down anything from the teacher that increases their understanding of the concepts. In this respect, when I asked with students about the learning and construction way of mathematical content most of the students simply responded as:

> *Mathematics is a practical subject, so more practice as well as active participation in the class is necessary to learn mathematics. Working with a teacher is also important for learning mathematics and knowledge construction. (Students views)*

When I observed the classroom, I found that when teacher solve mathematical problems, students were active and noted these problems in their notebook. Also they practiced related to this problem in the classroom. But in some classes, students and teachers interaction not found good.

I concluded that one of the ways of knowledge construction in mathematical content is to work along with the teacher. When students work along with the teacher, they get the

opportunity to ask the teacher where they are confused and when they did not understand that helps to develop mathematical knowledge. So it helps to construct mathematical content. Vygotsky's constructivism is used as instructional scaffolding in teaching learning activities. According to this theory, teachers provide support to the learner and extend the range of the learners. But in the classroom, I found that teacher provide help and support to the students who are seeking to know. So, Vygotsky's constructivism has been found to use in some degree in the classroom teaching.

Chapter - V

Findings, Conclusion and Implications

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

Findings

The findings of the study based on motivational factors to choose mathematics as a major subject are as follows:

- All of the students realized that they are good in mathematics.
- Most of the students found to be feel mathematics as an easy subject from their childhood.
- Students were found more interested in learning mathematics than other subjects.
- Some of the students were found to be a good mathematics teacher in the future.
- It was realized that mathematics could be a best choice for the job seeker in the future.
- It was appreciated that mathematics could be the basis for studying different subject/sector such as population, management, engineering, RD, science.
- Major motivational factors for choosing mathematics as a major subject were found as: mathematics teacher, economic factor, interesting subject, creative subject, base for studying other subject/sectors.

Findings based on the ways of knowledge construction in mathematical content are as follows:

- Practice and more practice is the most important for studying mathematics.
- Students build up mathematical knowledge through the works along with the teacher.
- Learning mathematics through self-study by using the internet and other guidance.

- Student's interaction in a group when they did not understand the mathematical content.
- Ways of mathematical knowledge construction were found as: practice, practice and more practice, work along with teacher, peer group discussion and self-study.

Conclusions

The above findings of the study, it can be concluded that there exist different motivational factors for choosing mathematics as well as different ways of constructing mathematical knowledge. There are many motivational factors to choose mathematics as a major subject. The most important factor for choosing mathematics is to get a good job in the future. Similarly, teacher's motivational skills, teaching strategy, prerequisite knowledge knowledge, bases for studying other subject, economic status, school environment, value for the mathematics students are also the motivational factors for choosing mathematics as a major subject. However, very low numbers of student are found to be studying mathematics. This indicates that most of the students do not like mathematics either by mathematics being a difficult subject or by other factors. The perception of the teacher and student towards mathematics as a difficult subject, boring subject, more practicable subject etc may have working to be the very low number of students admitting in mathematics subject. Therefore, it is necessary to change the negative attitude and feeling of the students towards mathematics. Similarly, new trends of teaching with different effective materials to make interactive learning environment should be incorporated in teaching mathematics to develop positive attitude towards mathematics.

Implications

In this study the researcher found many types of motivational factors and ways of mathematical knowledge construction. This study was carried out within certain particular area. So, its findings cannot be generalized. Anyway this research can be the smaller knowledge

contributing part for the upcoming researchers who are interested to do the research in this field. The conclusions of this study cannot be more generalized to all levels of school due to covering a limited area of this study. On the basis of this study the following implications can be made.

- This study help to understand what motivates students to choose mathematics as a major subject.
- This research can produce pedagogical recommendations to promote positive attitude toward learning mathematics among the students.
- It can be utilized to address the students' problem regarding difficulty in learning mathematics.
- This study helps us to understand the different ways of mathematical knowledge construction.
- A similar study can be extended in other subjects and other levels as well in the different parts of the country.

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Appendix- I

Classroom Observation Note

Name of college: Date: **Name of teacher:**

Time: **Students No: Period:**

Topic:

1. Physical environment of the classroom.

2. Teaching learning activities.

i. Beginning of the class

- Creates and maintains a physical setting that promotes learning.

ii. Setting the stage for learning.

- Communicates objectives appropriately.
- Reviews and relates new learning to previous learning.
- Raises level of interest in the lesson.

iii. Acquisition of learning

- Combines auditory explanation with visual references and student involvement.
- Checks students' understanding of objectives.
- Uses motivational techniques to maintain interest and involvement of student.
- Provides guided for practice.
- Encourages relevant discussion.
- Utilizes flexible grouping for practices.
- Uses a variety of strategies such as discussion, cooperative, peer teaching, project work, and class work.
- Checks for individual understanding.

- Communicates the methods of the increasing the ability of thinking topic, formulae, etc.
- Utilizes questioning techniques.
- Provides corrective feedback.
- Provides independent practice.

iv. Integration of teaching materials

- Applies the materials truth.
- Sources of the teaching materials: hand-made, local or bought.
- Student's attractive materials.

v. Closure of lesson

- Relates lesson to objectives.
- Allows for student involvement.
- Reviews the learning of the day to set the stage for the next learning.
- Checks the understanding of students.
- Encourage students to reflect on and take responsibility for their learning
- Provides assignments/homework/project work relevant to the learning that has been practiced with guidance.

Appendix-II

Interview guidelines for Students

1. Do you live in Kathmandu to continue your studies?

2. Do you feel mathematics is easy?

3. Do you like mathematics?

4. Do you obtain high marks in mathematics at school level?

5. Do you like mathematics from your childhood?

6. Which subject do you choose as a major at school level?

7. Do you take first position in maths?

8. Do you choose mathematics by influencing your relatives?

9. Do you discuss mathematics problems in the classroom?

10. Do you give sufficient time to study mathematics at home?

Appendix- III

Interview guidelines for teachers

1. Which subject do you teach in this school?

2. Do you teach other colleges except Laboratory school?

3. What is the reason that nowadays, there is a lack of mathematics students?

4. What is the reason that some students choose mathematics as a major?

5. Does mathematics help to get a good job in the future?

6. What is the way students learn mathematics effectively?

7. Does group discussion help to construct mathematical knowledge?