Chapter I

INTRODUCTION

The word "mathematics has been derived from the ancient Greek word "mathencian ", which means "to learn" (Schaff Willian. L.,1972, Retrieved from Pokharel. T. 2012) which shows that mathematics is taken as a process of learning. In other words, it has been explained as; it is the numerical and calculation part of man's life and knowledge. Etymologically mathematics is derived from the Greek word "mathematic " that means learning and "Tech" means art (mathematics encyclopedia). So, mathematics is the art of learning. This etymological meaning of mathematics of even signifies that mathematics is the key of all sciences. The word mathematics is defined in various ways

Highlighting the importance of mathematics (Cockcroft. 1982 Retrieved from Nov. 2018) observes the usefulness of mathematics arises fore the face powerful, concise and unambiguous. He further added that it is the fact that communication provides the principal reason for the teaching of mathematics to all children. About the importance of mathematics report of (UNESCO. 1989) describes; mathematics is one of the principal that disciplines to have determined the evolution and accelerated development of the technology. For this reason, science places primary emphasis of the development of mathematical theory and on improving its effectiveness when applied practical ends. Dealing with Problem requires that due emphasis on mathematics studied are placed on an exhibition of mathematical ideas, concept and methods with their application to real-life situation (UNESCO; 1998 Retrieved from Pokharel. T. 2012).

Mathematics has been given as key position in the School education in Nepal. The introduction of mathematics as a compulsory subject at all school levels throughout the country supports the above statement. The National Education System Plan (NESP) curriculum 1973, CDC, quoted in Amatya (1978) elaborates the importance of mathematics in the following words;

A well-grounded understanding of mathematics is essential for everyday life as for higher study in the field of science and technology students apply mathematical conception skills and logical reasoning to many different kinds of problems not only as students but also as adults.

Mathematics however has been generally regarded as a difficult and tricky subject share (1990) explained the situation of teaching mathematics in the school of Nepal in the following ways:

Teaching methods really heavily on rote memorization of the facts and figures. Modern teaching methods or approaches are seldom practiced because either the teachers are ignorant of them or they think they are not worth practicing.

After realizing the importance and role of mathematics in all around the world, still the human being is not ready to learn mathematics. Only a small mass of students appreciate and ready to learn but a large mass of students advocate opposite it.

The History of Mathematics Education in Nepal:

Education as a system can be called the brain of any society and it is the backbone of any system. Mathematics is a vast adventure in ideas an exact science and truly saying the mirror of cyclization. According to Perry, mathematical education began because it was useful, It continuous because of the usefulness of its results. Nowadays, even the social sciences are becoming more and more mathematical most mathematical creations are the result of intuition. The direction of modern mathematic without a doubt has been greatly influenced by the developments in other disciplines. The mathematical science has changed significantly during the past few decades. The most obvious change is the enormous growth of mathematics. Even the latest scientific achievements.

In 1918 A.D. A formal and systematic way of teaching mathematics has firstly started in a western manner in an intermediate level in Trichandra College. But in 1853 A.D Durbar school was established and mathematics had been taught in English medium. In this school, only the higher–level students were allowed to study. So, mathematics Subjects was not familiar to common people in those days in Nepal. In the period of Rana Prime Minister Dev Shamsher, many other schools were opened

throughout the country and its terms of earlier Astrology, mathematics has been taught. Darbar School was affiliated to Calcutta University. Students had to go Calcutta to appear matriculation examination and then they had to pass to get the certificates. In 1890 A.D, Rana Prime Minister Chandra Shamsher was the first Nepal who had appeared that matriculation examination of Calcutta University and passed the mathematic subject in the age of 20 years. During this period, the major subject in mathematics curriculum was algebra, Arithmetic and geometry. The textbooks were from the famous British mathematician of that period. Algebra from knight and Hall (1887A.D) had not been introduced at that time. In 1877A.D, Sanskrit school was first established. In this school, there were separate teachers for teaching mathematics and astrology. Teachers teaching Scottish were teaching popular mathematics book written in Sanskrit.

About 125 years ago, there were no mathematics books written in Nepal. Students in those days used to go to Kashi (Banaras) to learn Sanskrit and there, they were taught famous books on mathematic like Siddhant Siromani of Bhaskar Acharya. Among four units of Sidhant Siromani, Lilavati and Bijganta (Algebra) were quite famous. So, it is found that there was a great influence of India mathematics culture in Nepalese system.

Since 1957 A.D. Mathematics course was divided into 8 papers, among 2 were elective. In 1st yeas, there were four papers and the same for the second year. Students had to pass all the papers. In the earlier syllabus of mathematics courses, there ware many subjects like Algebra, Analysis, static and Dynamics, Differential equations, spherical trigonometry, Astronomy, complex variable, statistics, Qualitative mechanics, Relativity, etc. Nowadays, these courses are not taught and some modern courses have been introduced like Topology, function Analysis, Numerical method, etc. (Jha, k. 2006, A HISTORY OF MATHEMATICAL SCIENCES IN NEPAL Retrieved from Dec 2018)

History of ICT in Nepal.

Computers came into use in the country sporadically since the mid-1980s, mainly in private companies such as large hotels and behemoth travel agencies to replace the ageing typewriters. Private computer institutes started operating in the late

1990s, computers were widely used, again, mostly in the private business. Private sector or rather private individuals, in the beginning were the harbingers of computer popularity in Nepal (Manandhar, N. 2015.A Very Short History of Technology in Nepal Retrieved from Jan 2019).

Stages of development of ICT in Nepal:

1971 introduction of computer in the country for the census (1BN1401)

1974 Establishment of the Electronic Data Processing Centre.

1982 First pirate overs as Investment in software development by establishing company for export, Data systems International (p) LTD.

1985 distribution of personal computer in Nepal

1990 Liberalization on imports of equipment

1992 Establishment of computer Association of Nepal

1996 Establishment of the ministry of science 7 technology.

1998 Telecommunications ACT 1997 and Regulation

1998 Establishment of Nepal Telecoms Authority /NTA

2000 Announcement of the first It Policy "It policy 2000"

2001 Announcement of the National Information Technology center (NITC) as ICT Implementation Body

2003 Establishment of the High-level Commission for Information Technology.

2004 Telecommunication policy 2004

2004 Electronic Transaction ordinance 2004

2006 Electronic transition Act Oct, 2006

2010 Announcement of IT policy 2067

(Neupane, P. 2010. Analyzing the ICT Development of Nepal. Retrieved from Jan, 2019)

Background of the Study

When I was in primary level, our mathematics teacher was very nice and funny. He taught mathematics in an entertaining way and told different jokes and give various examples. For example, 4-2=2, he would be taught like this; *If you have four oranges and you eat two oranges then how many oranges do you have now?* He was used to teach us mathematics by playing various games. That's why, I loved to study mathematics more than other subjects. My friends had also like to study mathematics.

When I was in the lower secondary and secondary level, the perception towards mathematics had been changed as the methods of teaching had been changed too. Usually, in mathematics class, our teachers used to enter the classroom and just solve the problem. My friends considered mathematics as the most difficult subject but I enjoyed studying mathematics. I used to spend more time studying mathematics than other subjects. But the teaching approach focused only problem-solving. I didn't like this method that the teacher used to teach mathematics. There was no visualization, fun, entertaining in the class, rather there was only problems and solutions. Due to this, the negative perception of mine towards mathematics increased gradually. The reason for my negative perception was the problem-solving method used by the teacher. The method of teaching never changed during the school life. When I was in class 10, their environment was different. However, the study focused only on how to get good marks and good result in SLC. At that time, there was no use of technology, but the only emphasis on how students would get a better result. At school, we didn't have any chance of using technology. The saddest thing was that the teachers didn't have any intention of using technology.

I chose education faculty for my further study after I passed SLC. I didn't find any difference in teaching method in +2 level. In +2 level I also saw the same teaching method being used on high school and I was not satisfied the ways of teachers taught mathematics. At that time, I felt if I became a teacher then I will use different teaching approach.

In the early days, it was very difficult to exchange the views and ideas with other people but now it is very easy because of the development in ICT. The prevalence and rapid development of information and communication technology

(ICT) has transformed human society from the information technology age to the knowledge age (Galbreath 2000 Retrieved form Nov, 2018). The development of ICT has given an open platform for the students and teacher for better education. Information and communication technologies offer several opportunities for education. First, they can be used as a means of preparing the current generation of students for the future workplace that is providing tools for tomorrows' preparing. As the time is rapidly changing day by day, so our teaching methodology also needs to be changed. Our teaching methodology must help to show the new horizon so that they will feel comfortable to fly with the new paradigm.

Statement of the Problem

In the context of Nepal, many students have a major problem in mathematics. The students have a great fear and anxiety of mathematics. The students spent more time in mathematics compared to other Subjects. But still we can see the high failure rate in mathematics. In School, teachers also gave important to the mathematics rather than others subject. But still, we can never feel the satisfactory performance of the students in mathematics. As a student, I found that in school level students feel mathematics as a boring subject and the hardest one. Most of the students were not able to understand mathematics due to their perception towards math. Basically, in most of the mathematics class, the way of teaching is the mathematical problem-solving method and there were not sufficient teaching materials used in mathematics and it is oriented towards marks only.

In this today's changing world, there is a great role of ICT. Further, in the education sector, its importance is more remarkable. In this field of mathematics, by the use of ICT, we can establish new teaching approaches. In the developing country like Nepal, there is a great necessity of use of ICT. In some school, the use of the ICT is in practice. Through, this study I wanted to find the difference between students of those schools which apply ICT in teaching mathematics and those schools who do not. This study also focused on the following question:

- What are the perceptions of the students regarding teaching and learning mathematics with ICT?

Objective of the Study

By considering the above statement of the problem "to explore the perception of students towards mathematics teaching with the use of ICT" is the objective of this study.

Justification of the Study

In the context of Nepal, many types of researches have been done in the field of mathematics whereas we can't see the researches that have been conducted on the use of ICT in mathematics. So, this research study tried to find out the perception of students, who have studied using ICT in the classroom. The importance of this study is to use ICT in mathematics to improve the student's perception towards mathematics.

Thus, the significances of this study are presented in the following manner:

- It is important to find how the use of ICT changed the educational sector.
- It helps to mathematics teacher to change their teaching strategies.
- It also helps to provide a guideline to the teacher, researchers, and curriculum designers.

Delimitation of the Study

The study has the following limitations:

- This study is limited on three different secondary schools in Kaski District
- This study made in Pokhara metropolitan city, Kaski District
- This study is based on both the ICT used school and the non- school.
- This study is based on qualitative research design.

Definition of the Terms

Community School. The school which is conducted by the government of Nepal. They should provide a free evaluation as well as 100% of the salary of the teacher.

Institutional School. The school which is established and sponsored by the private sector.

Chapter II

REVIEW OF LITERATURE

Everything has its own history. History leads us to go on the right path. The Positive or negative aspect of the subject can be learnt by studying its history. After knowing the history, we can avoid the wrong way or method and apply the right are. It helps to conduct the research program and give a better idea to the server the research questions. It helps to conduct the new research in a systematically by providing the general outlines of the study.

A literature review is a written summary of journals articles books and other documents that describes the past and current state of information on the topic of your research study of (Creswell, 2012 Retrieved from Poudel.S 2015). So literature review is the search, study and analysis of the existing knowledge in they are of the research problem.

About ICT

The term "information and communication technologies" (ICT) refers to terms of technology that are used to transmit process, store, create a display, share or exchange information by electronic means. This broad definition of ICT includes such technologies as radio, television videos, DUD, telephone, satellite system, and computer and network hardware and software as well as the equipment and services associated with those technologies, such as video conferencing, e-mail and blogs (UNESCO, 2007, P.4 Retrieved from Maharjan. B 2015). The terms ICT used to refer to the convergence of audiovisual and telephone networks with computer networks through a single cabling or link system. ICT is an umbrella term that includes any communication device. encompassing radio, television, cell phones, computer and network hardware, satellite systems and so on as well as the various services and appliance with them such as video conferencing and distance learning.

While discussing things about ICT, we must understand the effect of it in the educational sector. In many countries all around the world, ICT is in use in a very fast way. These countries are more developed due to the wide use of ICT in the education sector. In the context of our country, the use of ICT in the education sector isn't

satisfactory. Also, in those school where there is the use of ICT can't apply it is an effective manner. So, we are unable to get a satisfactory result. To solve these problems, one of the most effective ways is to include the use of ICT in teaching mathematics. ICT has turned the world into an information-intensive society and it is considered as the nerve of growth that can tremendously transform the economic, political, cultural, and social conditions in many developing countries. (Detiktas & Kok, 2003 and Hick & Streeten, 1979 Retrieved from Sharma. A. 2016). The use of Information and Communication Technology (ICT) in education is an important tool to achieve the broader goals of education and has been identified as an innovative and effective means of teaching learning. (ICT in Education/ United Nations Education, Scientific, and Cultural. Retrieved Dec 2018).

Empirical Review

For my research Proposal, I went through different books, journals and researches which were carried out concerning the use of ICT in Mathematics classroom. Some research findings have shown that ICT has a significant impact on mathematics and its teaching and learning.

Maharjan, B. R, (2015) has conducted research on" Integration of ICT in teaching mathematics in secondary Level For motivation And Innovation: An Auto ethnographic Inquiry". The Purpose of the study was to see motivate in learning mathematics with conceptual understanding by the integration of ICT in the mathematics classroom. He has adopted the interpretive paradigm of the qualitative method for his study. He has used Interview and observation as tools to generate primary qualitative data. He had selected some schools in Bhaktapur district where two teachers and two students were selected and studied. The major findings of the research are ICT are the advanced tools for making mathematics more easier and more practical. The use of ICT in teaching mathematics makes the students motivated in learning mathematics ICT base classes are helping to build conceptual understanding about mathematics and the use of ICT in mathematics classroom helps them to visualize the mathematical concepts in a better way.

Pangani, K. S, (2013) has conducted research on "use of ICT in school: Exploring opportunities and challenges". The purpose of the study was to see how the

schools are using ICT by the administrators, teachers and students. In his research, he has also expressed the challenges and opportunities of using ICT in schools. He has adopted the interpretive paradigm of semi-structured interview schedule with open-ended questions, observation, check list, guideline and filed diary as tools to generate primary qualitative data. The major findings of the research show that ICT is used for three major purposes in schools. The first purpose to facilitate administration to ensure efficiency and effectiveness in service delivery. The second purpose is to enhance classroom instruction. Schools are aimed at providing better quality education by assuring improved students innovation, personalized students learning, enhanced students learning, feedback and reinforcement enhanced quality of teaching and improved teacher education. And the third purpose of using ICT in schools is to strengthen communication, networking and school exposure. For this, the schools have been using the tele-phone, SMS, e-mail and other web-based communication and professional networks.

Poudel, S. (2015), has conducted a study entitled "Teacher and student's perceptions on the use of ICT in mathematics teaching". The main purpose of the study is to explore the perception of student and teachers towards mathematics teaching with the use of ICT. He has adopted the interpretive paradigm of the qualitative method for his study. He has used interview and observation as tools to generate primary qualitative data. He had selected some schools in Bhaktapur district where four students from lower secondary level as well as from secondary level too. For his research not only students he also selected four teachers from lower secondary to secondary level to participate. The major funding of the research are using ICT in mathematics class makes students enjoy the audio and visual activities and the interaction among themselves and it also draws the student attention towards learning in general students consider mathematics a boring and difficult subjects and if we use ICT instrument in mathematics class it will be helpful to reduce such misconception among such student. Lack of use of ICT in mathematics classroom student has created a negative perception about mathematics.

Rana, K. (2015), has conducted research on "ICT in Rural Primary school in Nepal: context and teachers Experiences." The purpose of the study was to examine the extent to which Nepal's policy aspiration concerning ICT in education are realized

in rural Primary schools. He has adopted the interpretive paradigm of the qualitative method for his study. In his study, he had selected 16 primary teachers from the five rural primary schools and observed the classed of 12 of them he has used interview, observation audio record, observation notes as tools to generate primary qualitative data. The major findings of the research are follows:

- Most of the teachers had a positive perception of the ICT training they had received and that this developed their confidence in using new technology in instructional activities. However, the teachers were not satisfied with the training provided by the government.
- Nepal's approach by eliciting partnership to integrate ICT in education may seem to be beneficial for a short term in the situation when the government cannot invest in ICT infrastructure and teacher development activates.
- Teaching perceived digital technology as a positive teaching tool as one which changed their traditional teaching strategies' to include collaborative activities and student-centered teaching.

Theoretical Review

To make research on any topic theories are the backbone. Without proper theories, we cannot make our research successful so theories are an inseparable part of our research (Maharjan, B. 2015). "A theory provides a conceptual formwork for research. Research, in turn, contributes to the development of theory" (pant, 2012 Retrieved from Poudel.S 2015). A theory plans and directs the research studies. any philosophies must be supported by any theory for its pedagogical implementation. Likewise, the use of ICT supporter by many theories. Here I will discuss in brief about these theories.

Constructivism Theory

Constructivism as a paradigm or worldview posits that learning is an active constructive process. The learning is an information constructor. People actively construct or create their own subjective representations of objective reality. Constructivism says that people construct their own understanding and knowledge of

the world through experiencing things and reflecting on those experiences. When we encounter something new, we have to reconcile it with our previous ideas and experience, maybe changing what we believe or maybe discarding the new information as irrelevant.

In this approach, students try to find the answer to the given problems and learning of one would be the learning of the group. In the class, students cooperate rather than compete. In this way, we can say that constructivism is the way of learning theory where the students are motivated to do their work themselves and teacher work is just to facilitate the students. In this type of teaching approach, the students may not be fruitful for them another type of teaching approach may be better. One of the key assumptions of constructivism is that "knowledge is symbolically constructed by the learners who are making their own representations of action" (Gagnon et al. Retrieved from Poudel S. 2015). The guideline principle of constructivist learning theories is the learner's own active initiative and control in learning and personal knowledge construction that is the self-regulation of learning (Chan, 2002, p.3 Retrieved from Poudel S. 2015).

Knowledge and reality cannot be discovered but it is constructed by interaction with each other. In constructivism, classroom should be good environment than means there should be open and wide classroom. In constructivist the classroom students, they try to find the solution of the problems by learning to a group when students are motivated to do their work themselves and find the solution and teacher work is just to facilitate the student. By using ICT in mathematics classroom student will develop their knowledge by visualizing and have teacher role is just as a facilitator.

Engagement Theory

The engagement theory is a framework for technology-based teaching and learning (Kearsley & Shneiderman, 1999 Retrieved from Dec 2018). It's the fundamental underlying idea is that students must be meaningfully engaged in learning activities through interaction with other and worthwhile tasks. While in principle, such engagement could occur without the use of technology, Kearsley and Scheneiderman believe that technology can facilitate engagement in ways which are difficult to achieve. Engagement theory especially promotes students activities that

involve cognitive processes such as creating problem-solving, reasoning, decision making and evaluation in which students are motivated to meaningful nature of learning environment and activities (Kearsley & Shneidenrman, 1999). Also, engagement is aquality of user experiences with technology that is characterized by challenge aesthetic and sensory appeal, feedback, novelty, interactivity, perceived control and time, awareness, motivation, interest and attest(O' Brien, H.L. & Toms, E.G. 2008 Retrieved from Jan 2019 Engagement Theory-Edu Tech Wiki).

In my research, this engagement theory helps to understand the student involvement in ICT based classroom and perception of students towards the use of ICT in the classroom.

Research Gap

In my research proposal, I went through different research papers, national and international journals and books. I found some common views and ideas on this matter. The positive impacts are mention in this paper and research. There is no doubt that it has been mention about the positive effect in learning mathematics when there is the use of ICT in mathematics classroom. In some research paper, it talks about the integration of ICT in the mathematics classroom. In some research paper, it talks about the integration of ICT in teaching mathematics in the secondary level for motivation and innovation. Yet, I found the research gap prevailing in these various researches carried out. But I know that my research can't be totally different than the others. It is very much similar to them because my research and the research conducted are related to ICT in mathematics classroom to inspire in learning mathematics by positive perception in mathematics classroom. The methodologies are also in some cases are similar but still there are big gaps. Despite being this research is similar to others. I conducted the study particularly in my home town Pokhara.

Chapter III

RESEARCH METHODOLOGY

The methodology is the systematic, theoretical analysis of the methods applied to s field of study. It comprises the theoretical analysis of the body of methods and principles associated with a branch of knowledge. Typical it encompasses and quantitative or qualitative techniques (Irny, S.T and Rose A.A 2005 Retrieved form Dec 2018). In this chapter covers methodological issued of this research. Any research or study is based on some core research ideas. I had mainly focused on the research paradigm my ontological, epistemological and axiology for the proposed research. There are certain paradigms that can be followed which give a clear direction as to how the research proceeds. In addition to that, this chapter also contained methods that would be employed while collecting data.

Qualitative Research

Normally, there are two research approaches, Qualitative and qualitative research approach. In my research, I used the interpretative paradigm which is qualitative a research approach. Qualitative research is a scientific method of observation to gather non-numerical data through direct observation, open-ended survey, focus group, interview, oral history, participant observation, content analysis. This type of research refers to the meaning, concepts, definitions, characteristics, metaphors, symbols, and description of things and not to their counts or measures. This research answers why and how a certain phenomenon may occur rather than how often (Lune, Howard 2012. Retrieved from Dec, 2018). According to Denzin and Lincon (2005) qualities research is a situated activity that locates the observer in the world. It consists of a set of interpretative material practices that make the world visible that is they turn the world into series of representations including interviews, conversations, photographs recording and memos to the self (Denzin and Lincon 2005, Retrieved from Jan, 2019 Poudel. S. 2015).

Interpretative Research Paradigm

It is a qualitative research paradigm. Appropriating qualitative approach to inquiry for my research study. I had used the interpretative research paradigm. Interpretive research Paradigm focuses on action and its beings individual and set out to understand that interpretation of the world around them. The theories emerge and the most arise from particular situations. It should be grounded in data generated by the research act (Glaser and Strauss, 1967. Retrieved from Maharjan. B. R. 2015). Yanow & Schwartz- she a (2011) claim that interpretative researchers discover reality through participant's views, their own background and experiences.

So, I have chosen interpretive research paradigm because I also want to interpret the student's perception towards the use of ICT in mathematics. The Interview and class observation of students was the primary source of data collection to strengthen my research.

Ontology

Ontology is the philosophical study of being more broadly it studies concepts that directly relate to being, in particular, becoming, existence, reality as well as the basic categories of being and their relations. The world 'ontology is derived from the Greek words 'ontos' which means 'exists'. From this meaning of the word, we can say that ontology is the study that describes the nature of the word and its reality. According to Luitel (2011), ontology is the theory of reality, ways of being in the social reality (Luitel 2011 Retrieved from Jan 2019 Maharjan. B. R 2015). To my research project, there is no single reality and it always changes according to context and situation that reality will differ according to assumption or philosophy of different school that is the perception of students toward use of ICT in mathematics differs as well. As far as my research is concerned, I consulted with students of the different school where there was a use of ICT while teaching mathematics about the effect of using ICT towards students to change their perception towards mathematics during observation and interview.

Axiology

Axiology is the study of values and how those values come about in a society. Axiology is the philosophical study of value. Axiology seeks to understand the nature of values and value judgment. Axiology refers to truth, worth, values and ethics. It studies how people think and determines the value of different things. In my research, no value is right or wrong rather the value is context based so that it differs from individual to individual. I had followed subjective values that depend on the needs and interests of the participant that gets changed according to time & situation.

Epistemology

Epistemology is a branch of philosophy which is a study of the nature, origin and limits of human knowledge. And also, epistemology relates with knowledge of how we come to know or how we construct the knowledge about a certain subject. Richards (2003) defines "Epistemology as the science or study of knowledge refers to the views we have about the nature of knowledge and the relationship between knower and known" (P.35) (Richard 2003 Retrieved from Jan 2019 Poudel. S 2015). In my research, I had tried to develop my epistemological through observation, interview and experience involving in the field. In other words, I also tried to generate the knowledge through interactions between me as a researcher and the student form the different schools where there is a use of ICT while teaching and learning mathematics. I interviewed with them to get detailed information about student's perception of the use of ICT in teaching mathematics.

Data Collection Tools and Procedure

In my research is qualitative research. The study was based on primary & secondary data sources. The data can be collected from both primary sources refers to the data collected directly from the field by the researcher himself. The secondary source of data collection refers to the data collected not directly from the field. for the class observation and interview the tools like tape recorder, mobile and note pad were used.

Interview

An interview is essentially a structured conversation where one participant asks questions, and the other provides answers. Conducting intensive individual interview with a small number of respondents to explore their perspectives on a particular idea, program or situation (Byce, C. & Neale, P. 2006 Retrieved from Dec, 2018). The qualitative research interview seeks to describe and the meaning of central themes in the life world of the subjects. The interviews enable me to discuss their interpretation of the word in which they live and to express the situation from their point of view. For the interview, I used mobile phone, tape recorder note pad.

Observation

Observation is the active acquisition of information from a primary source observation is one of the powerful tools of primary data collection in which researcher directly visits the field & collects the data from his own careful watching of the events happened or happening in the field. For my research, I observed the teaching learning process in classroom situation in schools where there was the use of ICT in teaching mathematics.

Selection of Research Participants

For my research first I choose different three schools from Kaski district and I have chosen four students from lower secondary level as well as from secondary level too. For my research not only institutional schools I also have chosen community school too.

Profile of Research Participants

Student 1 (Amar Adhikari): He is a student of Global Collegiate Secondary School, Kaski, Pokhara-11

Student 2 (Mohan Sharma): He is a student of Global Collegiate Secondary School, Kaski, Pokhara-11

Student 3 (Nikita Bista): She is a student of Bethany Secondary School, Kaski, Pokhara-14

Student 4 (Sandip Nepali): He is a student of Ratna Shova Secondary School, Kaski, Pokhara-28

Quality Standards

It is very important to maintain quality standards while conducting education research, thus means a researcher tries to formulate quality standards of my research project letting others to judge the quality of my work based on it. This section of my research project attempts to address the quality standards that I use to generate and represent my data. Depending upon the dissertation, research questions and problems, my research question and problems, identified some quality standers regarding my research project which is discussed below:

Trustworthiness

Trustworthiness is a moral value considered to be a virtue. The term trustworthiness refers to someone who can rely on or to be good, honest and sincere. It is more related to ethics in the context of research. If we become trustworthy them only, we can maintain a good relationship with our research participants. I tried to maintain trustworthiness with my research participants, developing good and honest behavior. I tried the best to establish a good and friendly relationship between me and my participants in the research field, and try to get collect in-depth information to make my researcher is more valid, reliable and trustworthy.

Authenticity

The word authenticity is the state of something being authentic or legitimate and true. The term 'Authenticity' means the quality of being real, true or which is not copied from others. In the context of the research study, authenticity refers to what extent our research is believable. It is also concerned with how for our research methodology and data or information, gathered, are reliable or true. Research has to maintain authenticity to be judged as quality work by others, the work needs to be authentic. For that, the work need have relation to its research problem, questions and it finding out of data collection and its analysis and interpretation done towards the ending of the research work. I had proper respect to the participants, more than an interview and tried to explore their perception towards the use of ICT in mathematics.

Credibility

Credibility is the criteria which talk about the idea of isomorphism between constructed realities of participants and those realities as represented by the researcher. For maintaining the Credibility, I made a sequence of interviews of the participant's prolonged tenements in observations. My engagement continued until the real data are obtained. Mostly I used open-ended question in the interview.

Ethical Consideration

Ethical considerations in research are critical. Ethics are the norms of standards for conduct that distinguish between right and wrong. They help to determine the difference between acceptable and unacceptable behaviors. Ethical behavior is also critical for collaboration work because it encourages an environment of trust, accountability and mutual respect among researchers.

Regardless of the approach to qualitative inquiry, qualitative researchers face many ethical issues that surface during the data collection in the field and in analysis and dissemination of qualitative reports (Creswell 2007 Retrieved from Jan, 2019). Being a researcher, I became aware of their professional and educational legal responsibility not only to their research participants but also to the community and society where the research was conducted. Any researcher needs to anticipate the ethical issues during their research study in addition to conceptualizing the writing process of a proposal (Hess-Bieber & Leavey, 2006. Retrieved from Jan 2019, Poudel. S. 2015).

I tried my best to promote accuracy, honesty and truthfulness in my research. I have tried to respect individual, societal and cultural and all other possible differences based on race, gender, identity, language, religion, sex etc. while working with all these groups of people as research participants. To ensure privacy, the codes ware used instead of the participants' name. I have tried to ensure that my research project would be more a fruitful document for all the people like research participants, teachers, the students and other people who are directly and indirectly involved in this field.

Chapter IV

STUDENT PERCEPTION TOWARDS THE USE OF ICT IN MATHEMATICS

Chapter Overview

In this chapter, I am writing stories which will be linked with major issues to my research question "*what are the perception of the students regarding teaching and learning mathematics with ICT*"? Where I deal with how ICT in mathematics classroom change the perception of students towards mathematics which is supposed to be one of the harder and boring subjects. To investigate the student perception towards mathematics I interview with four students from the different school where the students are learning mathematics through the use of ICT. I represent their views in a narrative way and the form of stories and question answer.

Technology for Change

It was the month of December 30, 2018, I was sitting in my uncle's hardware shop at that time, I met a teacher who was our customer. I introduced him and I asked him about his school. He has been teaching since the past fifteen years but they started using ICT in teaching mathematics two years ago. I told him, one day I will come to your school for my research. He said, "you are always welcome to my school".

It was a day of February 11, 2019, I got up early in the morning and I made formulated the research question. It was cold weather. I was feeling cold too. I took a bath and put a formal dress on. I was quite excited because I was going to take an interview. I wanted to discuss with some students about the use of ICT in mathematics class. I interacted with the class ten Students. But their regular classes in the school had completed already and staying at a hostel for the preparation of SEE Exam. Then the teacher called one of the students and I started him interview. He was talking as, if he was very keen about using technology. As a researcher, I thought that he was the person I was searching for, so I approached him. I started asking questions and he answered them.

Me: Do you like the technology?

Student: Yes! I like technology.

Me: How many years have you learned using technology?

Student: only two years, when I was in class eight technology was not used after going to class nine it was used.

Me: How would you feel if you were taught using ICT?

Student: I would love it.

Me: Reason?

Student: Not only because it would be more interactive and gives us a clear perspective of the lesson but also because it would make us a smart student could compete on a global level.

Me: Did you get the difference between class eight and nine?

Student: of course, I got the difference between class eight and nine. It was hard to understand what was taught by the teacher in class eight. The teacher used to teach us by just solving the problem and he didn't clear the problem. The teacher could even explain. saw all the difference when I reached nine class. It was easy to understand by using technology. The Teacher takes us to the projective room and teaches us the topics like transformation, trigonometry. It becomes more useful to as.

Me: What is your perception towards mathematics by teaching it traditionally?

Student: When I was up to class eight still that old way of teaching was in practices. Untill that time, I wasn't able to do good in mathematics, also concept on mathematics satisfactory. That's why I was worried that in the near future I couldn't get a better subject to study. Sometimes, I thought I have to pass this subject anyhow. Also, my friends were really worried about these teaching approaches. At that time, I feel that if mathematics was taught by

applying new techniques and teaching learning process is done by visualizing then obviously I could do better in this subject.

Me: I have figured out that, still the perception of many of the students towards mathematics isn't satisfactory. What things have to be changed to satisfy the perception of those students?

Students: I think, for those students who don't have good knowledge of mathematics has to be taught by applying new technology with the help of ICT. Earlier, I also used to have a negative perception towards mathematics. But now by using ICT on the study, my view towards mathematics has changed positively. To change the negative view of the students towards mathematics different software, visualization in teaching and use of ICT has to be used.

Me: So, in your view what are the benefits of using ICT in teaching mathematics?

Student: To tell the truth, there are remarkable benefits of using ICT in teaching mathematics. The major advantage of using ICT is that it can contribute to change the negative perception of students towards mathematics. By using ICT on teaching learning process, difficult problems can be understood easily, the understood topic can be remembered for a long time and lastly, the topic can be studied in a fun way.

Me: What do you think about the possibilities of using ICT in teaching mathematics in those rural areas school?

Students: I strongly feel that to use the concept of ICT in rural areas schools, the government has to do something to make it happen. By including those school new policy has to be brought in use. In the school of rural area, the use of technology is below the average. In many places, electricity and network haven't reached yet. In this condition, rather then, expecting from the school premises, the government has to do something as soon as possible.

me: Ok, thank you very much for your valuable thoughts and time. I am really impressed by listening to your ideas. Best of luck for your upcoming SEE exam.

Student: Thank you, sir

After reading the view of this student, I have found that the perception of students towards mathematics has changed due to the use of new tools and technology. As he said he didn't use to have a good view regarding mathematics when there is no use of ICT, but when the practice of ICT is included in this subject, he is loving it more and more. From this statement, we can easily say that technology can bring a vast change in the perception of students regarding mathematics. According to him what can be said there is a lack of dedication and commitment from school management to manage the ICT tools in teaching learning activities. He says he was more enjoying reading using ICT. His perception wouldn't have been negative about mathematics. Due to the lack of use of ICT in mathematics the perception of the student has been negative. There is the only way to bring positive perception about mathematics in the student's mind that is to bring fresh air into the classroom using ICT. We can say that the use of technology only changes the mathematical development of students.

ICT for Excitement

It was the month of February 26 in 2019, I went to the school again. I was quite excited because I was going to take an interview. I reached school during the break time. I met a teacher in the school and discussed my research topic. Then the teacher called a student who had chosen for my research. He was playing with his friends and already was told by his teacher that I am going to ask some question to him so he came towards me and I started asking question about his experiences and use of ICT in the mathematics classroom.

Me: Hello Mohan, how are you?

Student: Hello sir, I am fine and you?

Me: I am also fine, how long has it been you studying in this school?

Student: It's been two years, sir.

Me: which subject do you like to study more?

Student: (Excitingly) Mathematics.

Me: you really seem to happy. Do you use to like mathematics from earlier?

Student: It's not like that. Actually, I used to like mathematics since I joined this school.

Me: Really? What do you find in this school so that you like mathematics all of sudden?

Student: First of all, in this school, each individual is focused in class. In my previous school, most of the teachers teach using old methods, also there was no use of technology at all so that I found problems, hints and tricks very hard. To be honest, I didn't use to understand the topic properly and also, I used to forget the understood things so quickly. That's why I used to hate this subject previously. When I came to this school, I find the environment of the school much better. In this school, a new technique is applied in teaching. By the use of ICT, the hard topic like algebra and geometrics has been much easier. Also, here by the visualization of each topic, we can remember it for a long time. Due to this reason, I used to like mathematics more and more.

Me: Now, please explain to me your experience of using ICT in study purpose in this school?

Student: I am really happy about using ICT in our study purpose. By the use of this, those unlikable subject has been much easier. I feel curious to see the new thing and also, I enjoy a lot. I learn by seeing and enjoy without any pressure so I understand it very easily. I am more interested to study mathematics than other subjects. I became more excited in mathematics period.

Me: Thank you for your valuable time

Student: it's my pleasure, sir.

After reading the given story we can say that the students will start loving and enjoying mathematics subject if they are taught using technology. In school, where there is a condition of teaching by only one method, if they are taught by applying different methods surely, they can learn this subject easily. According to his saying, he didn't use to like mathematics in the absence of the use of ICT and he was weak in this subject too, but where he joints the school that includes ICT in teaching mathematics, he started liking mathematics and also, he did far better in this subject. From his saying, we can find that, the importance of the use of ICT in teaching mathematics for the students. So, in conclusion, we can say that the perception of students towards math as a hard and boring subject can be changed if the teaching strategies are changed or the traditional teaching methods are replaced by using ICT in the classes, we can help the students to visualize the topic and they understand the core concept of the topic and they learn actively, easily and effectively.

ICT at Home

It can be the day of May 13 in 2019, I made a plan to meet one of the students of the school called Bethany Secondary School.

On that day, I reached school during the break time. I interviewed a girl from the school. She was playing with her friends and already she was told by her teacher that I am going to ask some question to her, so she came towards me and I started asking question about her experiences and use of ICT in mathematics class. After interviewing her I expressed her feeling in the narrative form below.

I am a student of grade 8 from Kaski district, my favorite subject is computer science. I always get the highest marks in computer science. I am quite poor in mathematics I have the computer and internet assess at home. So, I can to all things on computer what the teachers teach us at school. That's why I feel easy to read computer science.

In comparison with the usual methodology, I feel comfortable with ICT in education. Once our mathematics teacher gave a computer presentation on co-ordinate geometry that, the time I could understand more than other time. To be honest, I like to play or do work on a computer. I used to feel sleepy when our teacher used the usual method. May be, it is easy to use this method in teaching

learning but for those students like me who have a proper basic idea of computing, ICT based classes is more effective than, usual methodology. So, I feel very comfortable, since we are habitual to the usual methodology. I think everyone feels the same if they practice at home. If we don't have a general knowledge of computer, it will be difficult to read using ICT. So, what I say, if you want to read using the technology, you need to know the common use of computers, mobile and devices. I think it is very hard to study using technology in Nepal.

In ICT based classes, many electronic devices like projectors, laptop are used That's why we get the opportunity to know the different electronic devices. This system creates the three dimensions relation between students, teacher and electronic deceive. Finally, I think the technological approach may be a good reform in the education system.

"You gave us so valuable opinions thank you very much."

After reading the views of students, I find that the student using ICT in the classroom was very excited when reading mathematics. Here we examined the use of ICT in teaching learning is effective to provide opportunities for the student of different mathematical skills and levels for better understanding concepts and fostering them to doing mathematics in a new attractive way. She said mathematics teacher gave a computer presentation on co-ordinate geometry that time could understand more than other time. It can be said that if a student who is weak in mathematics and is taught by the technology, she/he can easily understand it. If the technology tools are also available at home this can be said that the student can learn quickly & easily. So, in conclusion, we can say that not only in the classroom but it is also necessary to use ICT at home

ICT in a Community School

One day, I got up early in the morning, I was drinking tea and writing a proposal. Suddenly, I thought that I should visit a government school and understand the student's perception of the use of ICT in mathematics class. So, I selected a community school within Kaski district.

I also studied in community school. So, I decided to visit the school where I studied. This school is located at Pokhara -28 Kaski. At that time in the school, the tools of technology were very less. At that time, we were unknown about ICT and did not even know how to use it. Some materials like laptops, computers and projectors weren't available and didn't know how to use them. But now the school has a projector, sound system, about 18 computers and two printers and also the school have a computer lab. But still technology is not being used while teaching mathematics. While visiting the school what I noticed that there was no difference in teaching methods between the time period of 13 years.

It can be the day of April 17, 2019, I got up early in the morning and made a plan to go to school. I took my bike and reached the school after one hour. The first period had completed when I reached there. I already informed that I am visiting the school. I selected a student from class nine for my research whose name was Sandip. I took the permission from the principal and the mathematics teacher to interview the student. The teacher called that student and I started interviewing.

Me: Hello Sandip

Sandip: hello sir Namaste.

Me: Namaste how are you Sandip?

Sandip: I am fine sir. How about you?

Me: I am fine, I heard that your final exam is coming, is it true?

Sandip: Yes sir, it is

Me: what happen Sandip? You look sad, is there any problem?

Sandip: In this exam, I cannot do well in mathematics too, so I am worried about this.

Me: You know you are a strong boy we have to struggle with the problem that arises in our life. Everything will be fine. Your hard work and devotions definitely lead you toward success. Don't worry.

Sandip: I hope so, I am trying my best to do better in mathematics.

Me: why do you think mathematics is so difficult for you?

Sandip: I was weak from the lower classes in mathematics. I could not have a strong base in our junior classes and still studying by the traditional method. I can't afford extra classes because our parents are from a very poor economic background. For the students like us who can't spend much time on practice, it is a very different subject. My teacher tried to explain the different topics of mathematics on the whiteboard but I can't understand what the teacher has shared. Sometime I feel as if it is a really boring and dead subject too. I feel difficult to understand the problem and also, I forget soon. When a teacher comes up with a new problem, it is difficult to solve and it is hard to understand that problem because of all this, so my mathematical do not have a strong base. Sometimes I feel as to why people discover mathematics subject.

Me: You think that your mathematical perception is poor. But how do you think it can be improved?

Sandip: I don't have any specific idea but I have seen some of my boarding friends have learned mathematics in a different way.

Me: Different way what kind of different way can you tell me?

Sandip: In that boarding school while teaching mathematics in entertaining way so they also learn to be an entertaining way. They are not only learning content but they are learning mathematics using different materials in the classroom. They have different projects in mathematics. They search for different ideas about different topics of mathematics on the internet. It seems as if learning mathematics is fun. But we don't' have any project work as they have and we never use computers and the internet for learning mathematics. We only learn how to solve some important question that is frequently asked in the exam. If we using the new idea and some other aspect to learn mathematics it would be more interesting.

Me: If mathematics is taught using computer internet, projector etc, how can your mathematical perception improve?

Sandip: first of all, if mathematics is taught using a computer, internet projector etc, that class is interesting. The traditional practice that we can see in our classroom is just learning how to solve the problem. This problem also resolves. When I see some of my friends, I feel that we are very far behind because the method that they follow in learning the same level mathematical is very different. They are not only learning how to solve the problem but they have used different materials, different technology and using computer and interments. But in our case, these things are a little bit out of reach. Nether the school can provide these facilities nor we can afford by our side. If the government do something in this matter then only a lot of change is possible. This is a changing world, so we also need to be changed. This change brings technology so, if there is some change in education, technologies should be used. I think the use of ICT improves the mathematical perception of the student.

Me: Have you seen teaching mathematics about using ICT at any school?

Sundip: Yeas I have seen so many schools in Nepal one of my friends is studying in one of the reputed school of Nepal and he always talks about the use of ICT in his school. He loves doing mathematics because he is good at it. He tells me that the use of ICT makes him more clearly about the chapter that he is studying at school.

Me: Are you sure that the use of ICT is more effective by learning mathematics?

Sandip: Yes! I am sure that the use of ICT is more effective in learning mathematics. The use of ICT us making the students smart and advanced. This is the era of technology. If we follow the same old traditional approach only in teaching and learning then our level learning can't be improved. If we observe the result of SLC many students are failed in mathematics & science. The students are bound to recite the mathematical problems. We all know that this is not the way of learning mathematics. To improve this problem we all must encourage ICT base classes in government school to students having good mathematics in the coming examination.

Me: what are the main problems to manage the ICT classes in your school and what to do to solve these problems?

Sundip: The first thing is the financial situation of the school. The government's policy is also one of the main reasons. Government's policy is to provide quality education to everyone bat I think it has not yet been done. The one who can play and spend more money they are studying in the private boarding school and the education that then gets is absolutely different from the education that we get government school. But if our government can apply new policies and big investments in education, this problem will be resolved. For this, the teacher also needs to be experienced in technology. The main problem that we have in our school is we do not have all ICT based infrastructures for ICT based classes. We have a computer lab but have not been able to use it properly. The skillful and train manpower are lack on our school that have good knowledge about ICT based curriculum. There are many such problems in our school. This is all because of the weakness of our government. Every government school needs a teacher to know about and using it to teach students. If this is possible, the government school will also get a good result.

Me: Think you very much for your valuable thoughts and precious time. Best of luck for your upcoming days.

Sundip: Think you, sir.

After interviewing this student, I realized that the students are worried about the teaching method of learning. It is still not learned that the students centered at community school. Due to this, the number of students is also decreasing today by in community school. The main problem is if we are taking care of only a few those good charming students or those who really need our support. If we really want those students who need our support doing better than it's very high time to rethink on our methods that we are following. According to the student, it seems that there is a lot of problem in government schools. He said, "The government policy is to provide quality education to everyone but thinks it has not yet been done." Of course, he is right still not able to provide quality education in all the places, it is all the government's weakness. Students from community school are very excited to read

using ICT but it has not been done. Nepal governments need a special interest in this matter.

I felt having an interview that student, a weak student in mathematics if to teach by the use of ICT that he can understand mathematics well. Most of the government school students have been seen the negative perception of mathematics.

1. The government should make the teaching of ICT a free and compulsory part of the curriculum to massively increase the number of ICT experts in the nation.
2. Government & non- government organization should help to facilitate skilled manpower, stabilized electricity supply, hardware resources and softer resources to enhance the use of ICT in a government school.

Chapter Summary

In this chapter, I discussed the student perception towards mathematics. I interact with the student about the use of ICT in teaching mathematics and I have presented their responses properly. For this chapter, I also visited the different schools of Kaski District. I visited not only private schools as well as government schools. Among them, I selected the three schools within Kaski District, where I interviewed the students and investigate the perception of students towards mathematics. The overall view of students is that in the previous day mathematics class was quite difficult and students were only provided with vocational training and they could hardly understand the words of teachers. Students feel that listening to the lectures were really boring and they could not concentrate well in the class. The students remember the courses and lesson only by mugging them up with knowing their exact meanings. After the advancement of time as well as the upgrading of the level of students the school started to realize the need of education for student through the help of perfect information, proper communication and modern technologies, slowly students were taught by the use of ICT. After using ICT in mathematics classes, the student felt more comfortable, easy and the classes started to become interesting. All in all, after the use of ICT student have a positive perception towards mathematics. But in government school Students, it's not yet. Students still have a negative perception about mathematics. Many students in the community school still have this problem. I believe that gradually this problem will be reduced to a community school.

Chapter V

REFLECTIONS, DISCUSSIONS AND CONCLUSIONS

My Reflection

I am one of the students of mathematics, but I didn't use to like the teaching approach that used in the classroom. I have found that in many schools still, those traditional teaching techniques are widely used. If we ask them which their least favorite subject is in today's generation most of the students probably answer mathematics. In this changing world, ICT has played a remarkable role in the educational sector. I chose this topic to analyze student's perception towards the use of ICT in teaching mathematics. Then, I discussed this topic among my friends and some of the teachers and extracted some suggestions from them. The main purpose of this study was;

> *To explore the perception of students towards mathematics teaching with the use of ICT.*

To fulfill this purpose, I observed a few classes and took interviews with some of the students.

In order to conduct the research on something, research questions are must. So, I formulated a research question which is as follows.

> *What are the perceptions of the students regarding teaching and learning mathematics?*

And my whole study was based on finding the answers of these research questions.

What are the perceptions of the students regarding teaching and learning mathematics?

During the study, I found that students take mathematics as the hardest and equally most challenging subject. Also, their experience in this subject wasn't satisfactory. But there were some of the students, who had different perspective on

mathematics and their perception on this subject was positive. These students were learning mathematics with the use of ICT pin more exciting way. The same student who didn't like math in class eight, due to the traditional way of teaching, but analyzing the data math is more interesting and easier due to the use of ICT in class nine. From this, we can easily say that using ICT on teaching learning process changes student's perception of mathematics.

The point of view of students from community school towards mathematics was a bit different. Those students really worried about getting fewer marks as expected. They didn't get a chance to study using technology tools even these tools were available in the school premises. Also, there were very few teachers, who use these technology tools in their teaching materials. But, if the school premises provide them with the basic facilities and technology tools, they were sure to achieve good marks in the examination.

Discussions and Conclusions

As per my research purpose, I went to the schools that I chose and met some of the students. And, I found out that students' perception on the use of ICT in teaching mathematics. By selecting three schools in total, I took the interviews with four students. After taking interviews with those students, I came to know that by involving technology tools in teaching mathematics students are more likely to learn mathematics by both physically and mentally. I went to both the schools which use ICT and which don't in teaching mathematics and I took the responses from the students. The concept of students towards mathematics where ICT used in teaching mathematics was different from the students where ICT was not use in teaching mathematics. Students were learning mathematics excitingly, where this subject was taught by visualizing. On the contrary, students were really worried and sad where this subject is taught without visualizing, it means traditionally.

During a conversation with one of the students, he said that he knew the significance of using ICT in teaching mathematics but, he was deprived of this. The reason behind this has negative attitude of students towards mathematics was the way of teaching and not involving new technology tools in teaching learning process. If there is an improvement in teaching approach, teaching materials and technology

tools, then obviously there will be an improvement in the result of community schools too.

From the study I draws the following conclusions:

- By the use of ICT in learning mathematics, the negative perception of students regarding this subject is changed.
- Those students who are studying mathematics by including ICT are more excited to learn this subject.
- In those schools where ICT isn't included in teaching mathematics, the students from these schools are worried and sad regarding this subject.

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Appendix

Guiding Question for Participant

1. How many years have you learned using technology?

2. What is your perception towards mathematics by teaching it in traditional way?

3. What do you think on the possibilities of using ICT in teaching mathematics in those rural area's school?

4. Explain me your experience of using ICT in teaching mathematics in this school?

5. Why do you think mathematics is so difficult for you?

6. What are the major problems to manage the ICT classes in your school and what to do to solve these problems?

7. Still the perception of many of the students towards mathematics isn't satisfactory. What things has to be changed to satisfy the perception of those students?

8. What do you think using ICT in teaching mathematics is good or not?

9. When learning mathematics by using ICT, have you been benefited?

10. Have you seen teaching mathematics by using ICT at any school?