Chapter- I

INTRODUCTION

Background of the Study

Mastery of mathematics is a key literacy component that influences children's success in education and in future society (Engle, GranthamMcGregor, Black, Walker, &Wachs, 2007). Mathematics is a compulsory subject for all students at the secondary level in Nepal. This view is held by curriculum developers, teachers, parents and students alike. Mathematics need not be learned by students in secondary for the sake of career choice or advancement but students should be able to learn mathematics with understanding and therefore be able to apply mathematical ideas later in life (Cockcroft, 1982 and Stanic, 1995).

The government has prepared a five years Master Plan (2013-17) to integrate ICT in school education. The basic problem in installation of the infrastructure to fully equip the 34000 schools with ICT facilities require a huge amount of money. Which is very challenging the Ministry ofEducation (MoE)by its own funding. The major reason behind this is the financial crunch. Although the government spends 16 percent of the national budget in Education Sector most of them is consumed by teacher salaries. The other side of this is even crucial; it is the curriculum and pedagogy. Updated curriculum and teacher training are essential part of ICT implementation. In this regards some works have just begun in Nepalese educational system. In pre-service teacher education programs ICT has been an elective subject but the products will be knowledgeable in all aspects of integrating ICT in education in general and classroom in particular.(Country Report; Nepal.2012 and 2013)

A research report produced by Becta (2003) highlighted that ICT provide fast and accurate feedback to students, and speed up computations and graphing, freeing students to focus on strategies and interpretation. The use of interactive multimedia software also motivates students and leads to improved performance. Further, research studies showed that more students finish high schools and many more consider attending college when they routinely learn and study with technology (Becta, 2003). In another study it is found that teachers with routine access to computers tend to employ teaching practices that put students at the center of learning& Teachers' perceptions of the use of ICT as an instructional tool in Mathematics and Science. (Rockman, 1993)

The success of ICT integration is hindered by many factors. The main problem faced by many teachers is lack of training. Mellon (1999) points out that forcing technology down the throats of teachers without adequate training or support, and without allowing a reasonable time frame, is unlikely to improve students' performance in every classroom.

Hope (1998, as cited in Iipinge, 2010) identifies five barriers to teachers' use of computers and related technologies in teaching: (1) school leaders neglect to identify the problem(s) to be addressed when introducing new technology in schools, or problems that will emerge when introducing new technology in the school; (2) school management fails to create a vision of how technology transforms teaching; (3) teachers have a vested interest in other pedagogies to accomplish teaching and learning objectives; (4) teacher's lack access to the technology which they are expected to integrate into practice; and (5) change agents fail to articulate the advantages technology has over what teachers currently do to accomplish their work (p. 137-138).

Passey&Samways (1997) contend that ICT poses an enormous, possibly unique, challenge as a resource for the teacher because its use demands considerable shifts on all fronts. Computer use in schools also requires a change in educational ideology (Wild, 1993). Faced with the scale and complexity of such changes, it becomes clear that teachers must be assured of assistance so that they can respond positively to the profound changes required from them, to consider such changes critically, to accept them where appropriate and to manage the transition process effectively.

The result of the research by Cox et al. (1999) shows that after teachers attended professional development in ICT, they still did not know how to use ICT in their classrooms; instead they knew how to run a computer and set up a printer. Cox et al. explain that these courses focused only on teachers acquiring basic ICT skills and did not often teach teachers how to develop the pedagogical aspects of ICT. This result is consistent with what the findings of this study revealed, namely, that teachers who were trained still struggled with integrating ICT in their lessons as they felt the training they underwent had not made much difference. The findings of this study are consistent with what Cox found out in that teachers indicated that they still did not know how to integrate ICT in their reading and writing lessons after they had been trained. In line with Cox et al. (1999), Balanskat, Blamire&Kefala (2006) indicate that inappropriate teacher training is not helping teachers to use ICT in their classrooms and in preparing lessons. They suggest that this is because training programmes do not focus on teacher's pedagogical practice in relation to ICT, but only on the development of ICT skills. Donnel (1996) mentions that the average classroom teacher is not computer literate and cannot utilise computers fully in the basic academic curriculum, and that as a result, the many computers that have been placed in schools are not being utilised to full capacity.

The literature describes the kind of skills teachers may need when integrating ICT into their subjects.The broad curriculum for the Ministry of Education (2008) suggested the following basic competencies in ICT: learners should be able to choose appropriate communication solutions, utilise hardware and software, evaluate information, transform information to knowledge, follow ethical practice, interact considerately, communicate clearly, etc. For learners to attain these skills, teachers should have gone through the right initial teacher' training. Similar skills are also suggested by Stakenas, Tishkin&Resnick (1992, as cited in Roblyer, Edwards &Havriluk, 1997). They suggest the following skills as basis for computer technology skills:

1. Basic knowledge about computer technology: teachers must have a general grasp of how computers work and be able to use basic terminology.

2. Equipment operations skills: teachers must be able to perform standard computer operation procedures e.g. formatting disks, loading and running programmes, saving files and printing documents) as well as trouble shooting for minor problems.

3. Productivity tools skills: Teachers should use and teach word processing, database, spread sheet, graphics and desktop publishing software.

4. Instructional application skills: Teachers must evaluate and use various types of specialized computer software (e.g. drill and practice, tutorial, simulation, and problem solving packages) to accomplish specific educational objectives.

5. Management application skills: Teachers should use computers to manage and complete tasks such as record-keeping, progress reports, report cards, attendance, worksheets, tests, letters to parents and grade books.

The above skills were also supported by Newhouse (2002) who argues that while for many teachers computer implementation may require changes in attitudes and classrooms practices for most teachers there are a number of practical skills such as computer operation skills and classroom management skills which present an obstacle. Becta (2004, p.7) concludes that "many teachers who do not consider themselves to be well skilled in using ICT feel anxious about using it in front of a class of children who perhaps know more than they do." This study revealed that ICT was used rarely and only to some degree, mainly by individual teachers with ICT confidence and competence. Teachers who lacked the necessary skills and strategies tend to turn a blind eye to the integration of ICT to avoid frustration and confusion on the part of learners. This shows already that it is not only operation skills which are needed for the effective integration of ICT, but teachers also need to manage their classes by ensuring that all learners engage fully in the activities at hand and that assistance is rendered at all times. Additionally, teachers can only gain the necessary skills and competencies if they are exposed to or have access to resources. However, the findings of this study indicated that teachers did not have access to ICT resources.

Statements of the Problem

The problem of the study was mainly concerned with the infrastructure for ICT and intention to use by teacher in Mathematics class at secondary level. It is also included for what and how to use it as integrated with Mathematics. So in light of the foregoing discussion the following research questions were posed for this study:

）What is the status of the use of ICT in Mathematics teaching?

）What are the opportunities and challenges of practicing ICT at secondary level mathematics teacher and student?

Significance of the Study

The ICT brings more rich materials in the learner to use maximum senses to get the information. Information are in different form like text, audio, video or other media is also to be transmitted to the users. The recent trends of learning through ICT in different form like online learning, e- learning, virtual learning, virtual university, e- coaching, e- journal are practiced by different institutions and organizations etc. The taste and flavors of learning according to the modern trends everyone wants to be up-to-date which is only possible with the help of ICT. Hence the study have the following significance. It wouldprovide variety in the presentation of content which help the learners in

-) Concentration
-) Better understandingand
-) Long retention of information which is not possible otherwise the learners can get opportunity to work on any live project with learners and experts from other countries.
-) It would helpful for teacher

Objectives of the Study

The objective of this study are:

-) To find out the status of the use of ICT in Mathematics class at Dhanusha District.
-) To find out the opportunities and challengesto practice ICT at secondary level mathematics teacher and students.

Delimitations of the Study

Due to the constraints of time, expenses and other related factors the researcher won't overcome the entire field. So it has some limitation &delimitation which were as follows:

) The study was limited at Dhanusha district only.

) The population of this study was limited on grade IX, X, XI and XII students of public and private secondary school from urban and rural area of Dhanusha District.

) Only the tools like mobile as ICT Tools

Definition of the Related Terms

Computer lab(oratory): A central area or room where computing activities are carried out for teaching and learning purposes. It can also be accessible to students after lessons.

ICT Tools: some modern tools such as Mobile, Tablet, phablet, iPad, Laptop, computers, Radio, TV, calculators, Internet, DVD and different Software programs' etc. which are used in teaching and learning mathematics were considered as ICT Tools in this study.

Online: Describes an instrument or sensor that is connected to a central computer as worldwide webwere considered as online in this study.

Secondary Level: Intended for students who were completed their primary educationand participated for next level or class, in this study class 8-12 were considered as for secondary level

Students: Somebody who studies at a school, college were considered as the students in this study

Teachers: Somebody who teaches students as a professions in private institutions and organization

Rural Area: The area outside the city

Urban Area: The area inside the city

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Chapter- II

REVIEW OFRELATEDLITERATURE

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The review of theory and literature involves the systematic identification and analysis of documents related to the study under taken. Scientific research much base on past knowledge. The previous studies cannot be ignored because they provide the foundation to the present study. Within this assumption some works on relating this topic are presented here.

Theoretical Review

This study was informed by the constructivist learning theory which has its origins in the field of psychology and was made popular by Dewey (1966), Bruner (1996), Piaget (1970) and Vygosky (1978). Constructivism, according to Burning et al. (2004, as cited in Schunk, 2009), is a psychological and philosophical perspective contending that individuals form or construct much of what they learn and understand.Schunk (2009) emphasizes that one of the constructivism assumptions is that teachers should not teach in the traditional sense of delivering instruction to a group of students. Rather, they should structure situations such that learners become actively involved with content through manipulation of materials and social interaction.

Research has shown evidence of how ICT integration helps learners to construct their own knowledge. Lourdusamy, Koon &Khine (2001) emphasizes that development of ICT has provided new opportunities for delivering instruction and at the same time, the constructivism movement in instructional design emphasizes the importance of providing meaningful, authentic activities that can help the learner to construct understanding and develop skills relevant to solving problems rather than feeding them with more and more information. In addition, Olsen (2000, as cited in

Lourdusamy et al., 2001) is of the opinion that through the use of technology, teachers can provide opportunities for students to learn how to think critically and conduct discussions with their peers, supported by ICT. According to Roblyer, Edwards &Havriluk (1997), ICT addresses the following needs as identified by constructivism:

1. Making skills more relevant to students' backgrounds and experiences by anchoring learning tasks in meaningful, authentic (e.g. real life), highly visual situations;

2. Addressing motivation problems through interactive activities in which students must play active rather than passive roles;

3. Teaching students how to work together to solve problems through group based, cooperative learning activities;

4. Emphasizing engaging, motivational activities that require higher level skills and pre-requisite lower level skills at the same time.

The Role of Technology in Education

Technology is often equated with equipment (e.g. computers, CDs, DVDs, VRCs) but the meaning is much broader (Schunk, 2009). Jonassen et al. (1999, as cited in Schunk, 2009) describes technology as the designs and environments that engage learners. Technology in the context of this study refers to machines, equipment, and the soft part is software and ways of doing things that are based on modern knowledge about science and the computer.

Jonassen et al. (1999, as cited in Schunk, 2009) presents the following functions of technology that are relevant to learning:

⟩ Tool to support knowledge construction.

⟩ Informative vehicle for exploring knowledge to support learning by constructing.

)　Context to support learning by doing.

)　Social medium to support learning by conversing.

)　Intellectual partner to support learning by reflecting.

Use of Computer in School

Han (2008) argues that one big difference between computers and teachers is that computers will never get tired, and will repeat the same thing again and again without complaining. Whatever a computer is programmed to do, it can do over and over as often as necessary, which is an advantage, particularly for slower students. Furthermore, computers can retain teaching resources for a longer time, which is almost impossible in traditional classes.

Another advantage of ICT is that whereas in most cases, printed books limit teachers to using the same information repeatedly over the years, computers and ICT have vast resources of information which can be accessed at any time and which is upgraded from time to time. Karchmer (2001) argues that when readers engage in print-based text, they are confined to what is written on the paper in front of them. Reinking et al. (1997, as cited in Karchmer, 2001) suggests that electronic texts eliminate such boundaries and provide readers and writers with the opportunity to easily connect to relevant material.

The impact of computers upon teachers has, with some notable expectations, been less marked, as many teachers still feel very uncertain about the new technology, and this uncertainty has been exacerbated by the feeling that their pupils often know more about it than they do (Warry&Medwell, 1991). With the integration of ICT, teachers are expected to perform certain tasks on the computer such as tying worksheets, tests, activities and summaries, and searching for information on the www.In their research, Hill & Slater (1998) mention that the Internet enables learners

to engage in a communicative dialogue. This can be done through communicating across the globe with other learners.

The uses of ICT Tool which be in any form weather it help the modern teaching and learning or not, for that surety this study be conducted in the form of survey and the opinion, perception be collected from different teacher and students. The availability of the tools are the basic which help to recognize that they were used or not.

The Role of Teachers in the Success of Technology-Based Learning

The role of teachers is to ensure that the use of ICT is integrated effectively in their Mathematics Lessons to improve reading and writing. However, for the teachers to do this successfully, they need the necessary knowledge. They should know the right equipment to be used for a specific task, as well as where and how to access information, etc. Watson, an Australian researcher (1999), argues that integrating the new technologies into educational settings requires change, and different teachers will handle this change differently. According to him, considering different teachers' change of attitude is important because teacher's beliefs influence what they do in the classroom. Becta (2004) claims that one key area of teachers' attitudes towards the use of technologies is the understanding of how these technologies will benefit their teaching and their students' learning.

Hennessy, Harrison &Wamakote (2010) argue that many teachers are intimidated by technology, and are very comfortable with their established teaching styles. They further argue that initially, many feel threatened by the perceived loss of control in the classroom as students, who are usually more adept at using technology, can quickly access information and challenge the teacher's role as a Secondary source of knowledge. Olakulehin (2007, as cited in Hennessy, et al., 2010) emphasizes,

however, that teachers who engage in appropriate professional development learn how to manage their classrooms more effectively and how to use the technology to create a more stimulating learning environment.

 In addition, according to UNESCO (2005), knowledge learned by learners should not be coming from the teacher, but rather, learners should create or construct their own knowledge. However, even though teachers make every effort to play their role as Secondary sources in the implementation of ICT integration, they are confronted with numerous challenges.

Empirical Literature

Chong cheekeong, Sharafhorani& Denial (2005) did a research on "A Study on the Use of ICT in Mathematics and Teaching," in Malaysia. This research developed a survey method to investigate the use of ICT and barriers of integrating ICT into the teaching the mathematics. The survey was carried out during mathematics in-service course conducted by State Education Department. The finding concluded that the use of ICT in teaching mathematics can make the teaching process more effective as well as enhance the student's capabilities in understanding basic concepts. Nevertheless, implementing its use in teaching is not without problems as numerous barriers may arise.

Likewise, Moila(2006) did research on "The Use of Educational Technology in Mathematics Teaching and Learning: An Investigation of South African Rural Secondary School." The investigation followed a mixed method approach that was more evaluative and was a case study. The study consists 25 students and 5 mathematics teachers from Phusela secondary School. The findings concluded that the computer technology was not used in mathematics teaching and learning, there are no plans on the use of educational technology tools in mathematics teaching and

learning, adequate educators training on the use of educational technologies in teaching and learning and lack of relevant educational technology tools for rural schools.

By emphasizing the status of ICT using shreshtha(2015) did an action research on the Topic of"Status of ICT Use in Teaching/Learning Mathematics"by observing Students and Teachers activities through computer assisted teaching in Heartland Children's Academy school of Kathmandu.There were 4 mathematics teacher among 26 teachers; three teacher out of four were participated(i.e almost 60%) and similarly 5.7% out of 114 student participated. The aim of her study was to investigate the use of ICTs in Mathematics teaching and learning at Heartland Children's' Academy. Therefore, this research study renders the ICT used situations and the problems to use ICT tools in Mathematics teaching and learning. She concluded that if students and teacher has no such rich environment of technology to teach or learn that cause to them. If not then they surely learn through it. The limited access to ICT tools will results in anxieties and fears of usage of the technology to teachers which is also a contributing factor to resistant's in using computers in teaching and learning.

Likewise to find the belief of teacher, Gautam (2005) did a study on "Teachers' Belief on Learning Geometry and its Manifestation in Teaching at Secondary Level". This is a survey type research and interpretive in nature. The prime concern of this study was to study the secondary teachers' beliefs on learning Geometry and its manifestation in teaching. This study attempts to examine the urban and rural teachers' beliefs as well as the comparison beliefs of teachers' with respect to year of experience and to assess the manifestation of internalized beliefs in teaching.

The population of the study consisted of all secondary mathematics teachers' of Parbat district. Twenty eight teachers of Parbat district were taken as the sample for the study with purposeful sampling from seventeen schools of Parbat district, and three geometry classes of two different teachers' in two different schools were observed for the study of manifestation of internalized beliefs in their teaching. One belief scale was developed as the tools for collecting data for the study. This scale consists of 40 statements related to geometry learning, teaching and evaluation. The Likert scale (5 points) was used to quantify the beliefs attributes data. The next method was observation to assess the manifestation of beliefs in teaching. Observation was done with the help of prepared observation protocol.

The weighted mean, percentage mean, standard deviation and two tailed t-test were used as statistical tool for the analysis of the data at 0.05 level of significance. Qualitative analysis of the data was done with the help of Ernest's, Venhien and Bruner's theory. Based on the interpretation and analysis of the data the following results were found:

) Secondary level teachers have positive beliefs about learning geometry

) There is no significance difference between the mean beliefs score of urban and rural teachers.

) The mean beliefs score of the teacher who has been teaching for 0-5 year is significantly greater than the mean beliefs score of teacher who has been teaching for more than 5 years.

) Teachers internalized beliefs towards learning geometry is not manifesting at teaching

Another research which related to use of lesion plan in secondary level by mathematics teacher, Ghimire (2011) did a study on "Mathematics Teachers' Belief

and Attitudes towards the Use of Lesson Plan in Secondary School." The main aim of this study was to investigate the beliefs and attitudes of mathematics teachers' towards the use of lesson plan in private and public school and to compare the beliefs and attitudes of mathematics teachers towards lesson plan in public and private school. The study was also aimed to find the causes of not using lesson plan in classroom teaching.

To investigate the beliefs of mathematics teachers towards the use of lesson plan in secondary level. The researcher used the opinionnaire form. An opinionnairesheet contained twenty five statements (positive and negative). The opinionnaire administrated among twenty five teachers included in the sample and questionnaire used for ten teachers from the sample teacher. The chi-square test was used to investigate the belief and attitudes of the teachers towards use of lesson plan and t-test used to compare the belief and attitudes of public and private school teachers. Entire test used at 0.05 level of significance.

The information from questionnaire set obtained in qualitative form and the data from questionnaire analyzed by descriptive method. The population of the present study contained the secondary mathematics teachers of Arghakhanchi district. The researcher found that the positive belief and attitude towards the use of lesson plan in mathematics in public secondary school and negative belief and attitude towards the use of lesson plan in private school. Also concluded that there is significant difference between mean score of public and private school teachers' belief and attitudes towards use of lesson plan.

Conceptual Framework

In this topic, the researcher introduced the conceptual understanding for the use of ICT in Mathematics Teaching. A conceptual framework is a representation,

either graphically or in narrative form of the main concepts or variables, and their presumed relationship with each other. A conceptual framework covers the main features (aspects, dimensions, factors, variables) of a related study and their presumed relationship. On the basis of literature review the conceptual framework is:
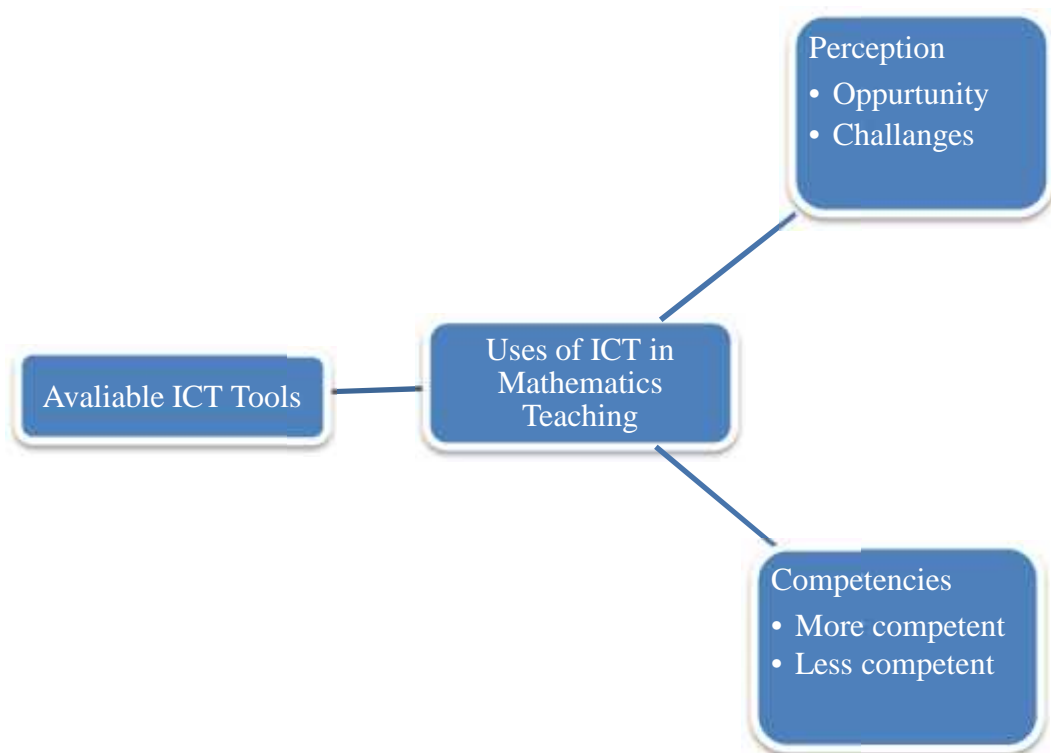
Figure: Conceptual Framework

The conceptual model of this study with respect to the previous done national and international master's thesis and related literature review to this topic, then the researcher arrived at the above conclusion. In this research the researcher conform the available ICT Tools by visiting secondary school then searching what are the uses of it in the class for teaching and learning. After that it was categorized into perception and competencies of the teacher whereas the positive perception for the benefit and give the opportunities to students, teacher and the teaching learning

technique similarly its negative perception means there was some challenge which were faced by them that's why they were not interested. Another aspect of it was competency of the teacher with educational technology in the form of more competent and less competent. Which also give two aspect for opportunities and challenges respectively.

Chapter- III

METHODS AND PROCEDURES

This section highlights or discusses how the study was conducted. It outlines the procedure and strategies which were used to collect and analyze data. It consists of the description of the research design, target population, sampling techniques and sample size, research instruments and their validity and reliability, data collection procedures and data analysis.

Research Design

The aim of this research was to explore the status of the use of ICT into the mathematics teaching in Secondary schools. The researcher conducted a descriptivesurvey and qualitativeresearch.For the current research, a mixed method technique was the most appropriate approach. Since the researchwas to explore status of ICT use in school with Opportunities' and challenges faced by Mathematics Teachers in ICT integration, which is part of the Learner-Centered Approach, this research was anchored in the constructivism theory.

Population

All the mathematics teachers and students of Dhanusha district were targeted as population. The secondary mathematics teacher, were engaged to teach on grade IX to XII. The Teachers from class IX to XII from each selected schools were particularly targeted.

Sample

The researcher was selected 30Secondary schools in the rural and urban area of Dhanusha District.All secondary Mathematics Teachers who was participatedin the study,had been teaching Math from grades IX-XII, at different schools and Plus Two. Survey start from questionnaire and observation checklist was conducted among 28

teachers' and 32 students and finally an interviewwith 5 teachers' and19 students'was

conducted.

Research Instruments

Questionnaire

Two forms of questionnaire waredeveloped in which one was given to students -

(Appendix A)and the other one was given to teachers' (Appendix C). They ware self-

administered questionnaires. They are structured questionnaires that both was

composed of close format, open-ended format and rating scale type of questions. The

questionnaires was based on Christensen and Knezek (Molia, p.40, 2006) instruments

for assessing the impact of technology in education, but it was contextualized

forNepals' secondary school of especially onDhanusha district.

Observation checklists

Observation was done during the teachers' normal working hours. The

schools' daily timetable was followed for conduction the observations and thus there

was no class disruptions. The main focus of the observation was on the students,

teachers' and technology interaction in the teaching-learning situation.

Semi-structured interviews

Finally the researcher was selected semi-structured interviews because of their

flexibility which allowed the researcher to probe participants to gain understanding.

De Vos et al. (2005) indicate that the researcher can use semi-structured interviews in

order to gain a detailed picture of the participants' beliefs, perceptions or accounts of

a particular topic. A set of open-ended and closed-ended questions was prepared

before the interviews. These questions were used during the interviews to gain clarity

from all the participants depending on their responses (see appendix D) which

wasconducted after analysis of collected data from questionnaire and observation checklist.

Reliability and Validity of Tools

The following three tools has been selected on the basis of Christensen and Knezek (Molia, p.40, 2006).

The questionnaire is good tool to collect data in short time as mentioned detailed in question through our required choices and each choices will be coded by numeric value.

The observation checklist also the very popular and reliable tool to check the correctness of questionnaire's choices and availabilities according to the listed by researcher.

The interview, which is most powerful and interactive real objective revealer by their expression, activities, and reactions during the questioning.

Data Collection Procedure

At first the researcher visited the sample schools to collect the data. The data was collected by administering the questionnaire among the sampled teacher and students. The respondents were requested to provide their valuable responses. The researcher was made the statement clear when they found any difficulty. Their views were collected by asking to put a tick mark ( ) in any column of the options strongly agree (SA), agree (A), undecided (U), disagree (DA) and strongly disagree (SD) for related statement as instructed and similarly another also coded in the questionnaire which be marked according to their willing.

Data wasalso collected through Observation checklist and interview which are mentioned above and very detailed questions are in appendices.Mathematics Lessons was observed first, then interview(see Appendix B) was conducted and notesbe taken

on how ICT be integrated. This be followed by semi structured interviews to seek

clarity, as some interview questions was formulated during observations. Most of the

interviews were tape-recorded and others were not. Data wascollected during

interviews be transcribed immediately after the interview of each participant.

Scoring Procedures

Each statements received the score based on the basis of 1 points for strongly

agree, 2 point for agree, 3 point for undecided, 4 point for disagree, 5 point for

strongly disagree and 0 for no response. And similarly the option 'daily', 'weekly',

'monthly', 'less than four times a year' and 'never' was received the score 1, 2, 3, 4

and 5 points respectively.

Ethical Considerations

Ethics refers to well based standards of right and wrong that prescribe what

humans ought to do, usually in terms of rights, obligations, benefits to society,

fairness, or specific virtues (Velasquez, Andre, Shanks, & Meyer, 2008). All

participants was assured that all the information they provided were remain

confidential.

Data Analysis

Descriptive and interpretive analysis was used to analyze the data. Basic

features of the data was described and interpreted. Questionnaires and observation

checklist was analyzed by SPSS V20 program and the statistical device Chi- square

($\Re^2$) test was applied to all statement of questionnaire at $\Im=0.05$ level of significance.

This indicated that if $\Re^2$valuefor every statement more than obtained value (tabulated

value) then the teachers has positive perception and more competencies towards these

statements otherwise negative perception and less competencies towards these

statement.

In qualitative research, data analysis involves reducing and organizing the data, synthesizing, searching for significant patterns and discovering what is important (Ary et al.). so the researcher used the cross match method to analyze qualitative data given from in-depth interview of teachers and students.

Chapter- IV

ANALYSIS AND INTERPRETATION OF DATA

Since the introduction of ICT integration in school teachers have continued to be confronted with many challenges and increasing pressure as to how these types of new technologies can be successfully integrated to enhance teaching and learning. Teachers must consider how best this integration can be made a reality, be meaningful, and serve the needs of learners. The main reason for conducting this study was to investigate available ICT tools and the challenges faced by teachers in integrating ICT to enhance reading and writing in Mathematics at secondary schools. In this chapter, the researcher presents the data analysis and interpretation in different headings.

The analysis was carried out looking at the teachers' perceptions towards ICT usage and teachers' Educational Technology Competency (ETC)frequent use of ICT in Mathematics teaching and learning. Tables, figures and descriptions of data were used to present the findings. For this the chapter is divided into two section. Section first was discussed about the status of the ICT in Mathematics Teaching and section second was discussed about the opportunities/challenges faced by teacher/students during teaching/learning.

1.   Status of the ICT in Mathematics Teaching

For answering the first research question "*What is the status of the use of ICT in Mathematics Teaching?*" The researcher collect different relative data, information that concern very closely to the following heading that clarify to answer it

Infrastructure to support the integration of ICT in educational institutions

In every school must had the infrastructure that support to operate the ICT Tools, it mean it helps to install and integrate ICT devices or tools for teaching and learning. The basic infrastructuresare as:

Electricity and Telecommunications

Without electricity no any electric devices would be operate so the researcher investigate about it and to establish the national or international communication among colleague or friends, the need for another infrastructure was telecommunication.

1. Status of ICT Tools in urban and rural schools

For answering the second research question "what are the opportunities and challenges of practicing ICT at secondary level mathematics teacher/students?" I took the interview with mathematics teacher, students, educationist and mathematics experts. I researched the respective sample school and necessary information were taken during my observation period. Various information from different classroom were observed and taken interview with participants. Responses from interviews and findings from observations are presented in subsections under the following headings:

- Availability of ICT Tools in School
- Teachers' training in ICT integration;
- ICT skills of teachers;
- Experiences in ICT integration in the teaching of mathematics;
- Supports of ICT on Mathematical contents;
- ICT tools used by teachers,

Status of the use of ICT in Mathematics Teaching

The status of the ICT and ICT tools which was observed after visitingfor three weeks around the concerned schools and collected information about the availability of the basic infrastructure that be necessary to stand this research and the researcher foundwhich reported below.

Infrastructure to support the integration of ICT in educational institutionsElectricity

To support teaching and learning, as well as improve overall education management, a variety of ICT-assisted instructional approaches may be implemented, ranging from the use of radio or television to computers, Internet and newly-emerging mobile devices.

Fig. 1. Availability ofPower sources
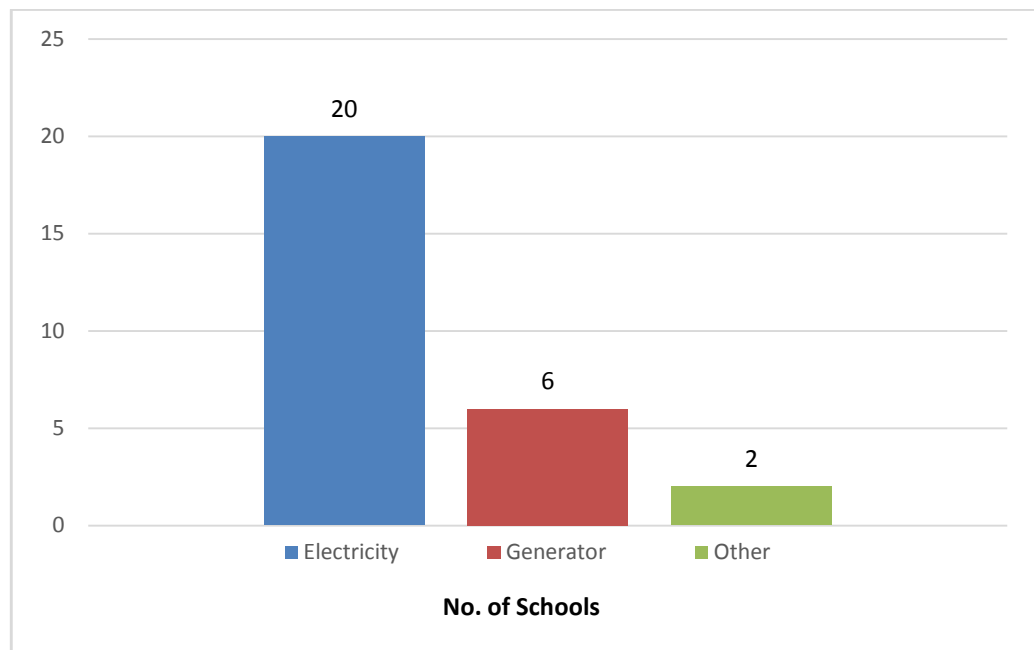
While newer battery-operated ICTs are emerging, in addition to mobile devices that may be recharged off-site, the majority of ICTs including television, computers and the Internet continue to require a more stable energy source. To summarize, the integration of ICT into schools requires electricity (e.g. grid/mains

26

connection, wind, water, solar or fuel-powered generator, etc.) that is regularly and readily available.

The above figure states that among 28 schools about 20 schools have pole wire and one third of the pole wire schools have generator as the alternative source of electricity as generator

Telecommunications

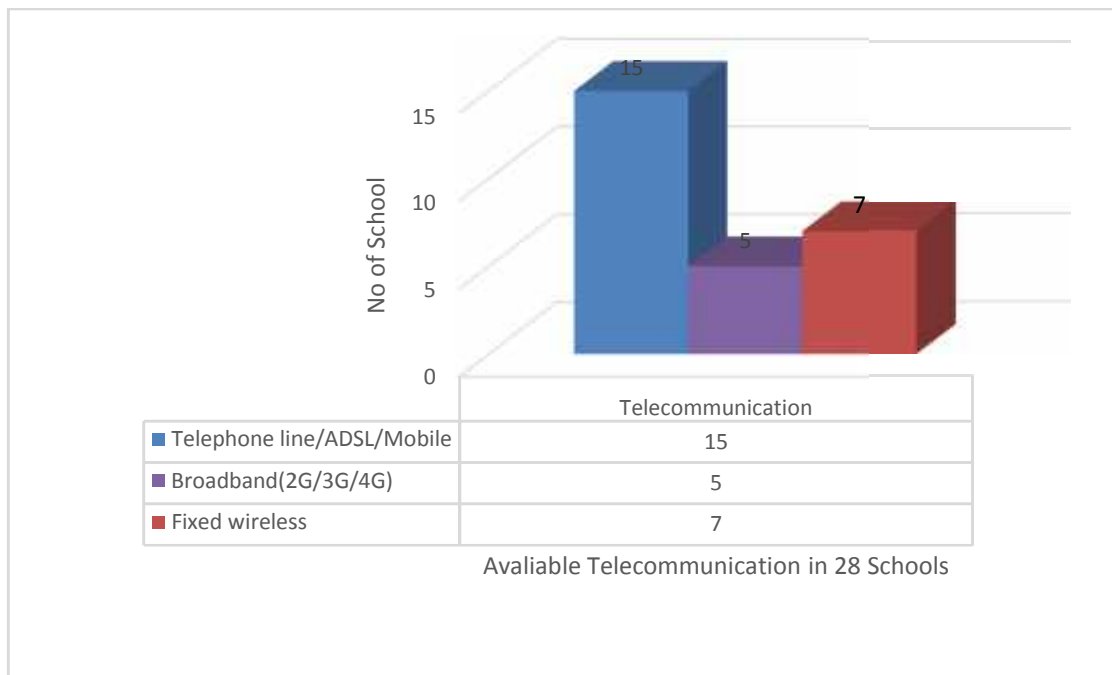Telecommunication facilities are another basic element which help to build the educational and administrative capacity of schools. Defined as a fixed telephone line, cable connection, mobile phone or other sustainable communication technology that connects a school's terminal equipment to the public switched telephone network, or other telecommunication network, and which is intended for pedagogical or administrative purposes, telecommunication facilities can be used for communication between teachers with students, parents, various service providers to the schools, local education authorities, and other administrative organizations. Telecommunication facilities may also provide the requisite infrastructure to provide various types of Internet connectivity. Fixed telephone lines can provide both narrowband and broadband Internet, while mobile telephones can provide varying levels of broadband connectivity through 3G or 4G technology. Generally, faster than mobile broadband Internet, wired connections (including ADSL, cable, fixed wireless, fiber optic cable, satellite, etc.) allow for upload and download broadband speeds that are faster.
In order to gauge national capacity to support the integration of ICT in education, measuring the share of educational institutions with electricity and a telephone communication facility provides basic information for policymakers to assess current gaps in infrastructure, as well as help inform decisions about which ICT tools would be appropriate for short- and longer-term planning.

Fig.2. Status of availability of Telephone

	Telecommunication
■ Telephone line/ADSL/Mobile	15
■ Broadband(2G/3G/4G)	5
■ Fixed wireless	7

Avaliable Telecommunication in 28 Schools

According to Figure,telephone is available in secondary schools at Dhanusha (Janakpur) and demonstrating that basic electrical infrastructure is generally in place to integrate ICT in the classroom.

From above figure 2 shows the availability of telephone line/ADSL/mobile in 18 school and the broadband in 5 school, the fixed wireless in 7 school to communicate with one another at the school for teacher and students. The researcher found one school had no communication channel in any form as mention in above figure.

Frequency of Using ICT Tools

The following tables present the frequency of ICT tools by the students of different gender, different age group and different class.

Table 1. Frequency of ICT tool by different gender

	Frequency	Percent
male	20	62.5
female	12	37.5
Total	32	100.0

From "appendix-A" the participant studentson the basis of genders there were 62.5 % male and 37.5% female was using ICT tools for their study or other purpose in or out side of the school or home.

Table 2.Frequency of ICT tools by different age group

Participants students (Age)	Frequency	Percent
13th years old	1	3.1
14th years old	6	18.8
15th years old	13	40.6
16th years old	8	25.0
17th years old	2	6.3
18th years old	2	6.3
Total	32	100.0

Table 2 shows there was ICT tools user from different age group of the participant where the majority of 15th years was 13(40.6%), 16th years students was 8(25%), third highest from 14th year student was 6(18.8%), and the 17th, 18th years student was 2(6.3%) each and the last 13th years old student was 1(3.1%) out of 32 participants.

Table 3. Frequency of ICT tools by different grade

		Frequency	Percent	Valid Percent	Cumulative Percent
	8th class students	10	31.3	31.3	31.3
	9th class students	13	40.6	40.6	71.9
Valid	10th class students	4	12.5	12.5	84.4
	11th class students	5	15.6	15.6	100.0
	Total	32	100.0	100.0	

On the basis of Grades table 3 explain there were 31.25% from 8th grade, 40.63% from 9th grade, 12.5% from 10th grade and 15.63% from 11th grade were using ICT tools for their different purpose.

The response of the students in question "Do you know ICT?" are presented in the following. The positive thing was that most of the respondent (more than 68%) out of 32 students replay that they was familiar with the ICT. For the second question about computer that 'Do you have a computer at home?' then the respond with yes was almost 63% and among them 41% were connected to the internet and some of the respondent reply as they were connected to the internet but not through computer but though different device like 9% smartphone. And for the question "Do you use your computer at home for your schoolwork? If yes, please explain what type ..." most of them (66%) responded they were not used a computer at home but 25% responded yes they were and 9% were responded they used mostly smart phone for their homework.

Table 4.Students Response Towards the Use of ICT Tools

Statements	χ^2 value-	SD	D	U	A	SA
1. It is important that I use computers in my learning because it make my school work easy	25.750	-	2 (6.3%)	3 (9.4%)	20 (62.5%)	7 (21.9%)
2. Using computers at school improves my learning.	10.813	8 (25%)	1 (3.1%)	4 (12.5%)	12 (37.5%)	7 (21.9%)
3. When I use computers at they make learning more interesting.	17.313			2 6.3%	21 65.6%	9 28.1%
4. I make good use of internet at school.	19.00		2 6.3%	4 12.5%	18 56.3%	8 25%
5. I make good use of email at school.	7.688	7 21.9%	11 34.4%	8 25%	4 12.4%	2 6.3%
6. I can get a access to computers at school whenever I need to	16.750		17 53.1%	2 6.3%	4 12.5%	9 28.1%

7. I think ICT are essential for education	9.813			6 18.4%	19 59.4%	7 21.9%

The above table 4 shows that the each statement be measured on the basis of $\Re^2$- test at 0.05 level of significance. All the statements in this area are significant at 0.05 levels. This means all statements are capable to measure student's response, view and perception with different opinions.

The statements 1 (table 4) "It is important that I use computers in my learning because it make my school work easy" is significant statement with $\Re^2$-value 25.750. It shows that there were highly significant opinions of students towards in this statement. Also above 84% (62.5% agree and 21.9% strongly agree) of students were agreed on this statement which shows that the ICT Tools helps the students to facilitate their classwork and homework.

For the statement 2 and 7, 'using computers at school improves my learning and I think ICT are essential for education' are significant statement with $\Re^2$-value 10.813 and 9.813 respectively. It shows that were supposed to be higher opinion of the students toward this statement. With this statement there were 59.4% and 81.3% are agree respectively. So the majority of the student were agree with this statement. It means they were supposed to be improved by using computer at schooland their perception be it was essential for education also. Statement 3 and 6, 'when I use computer at they make learning more interesting and I can get a access to computers at school whenever I need to' with the $\Re^2$-value 17.313 and 16.759 respectively are significant at 0.05 level of significance about 93.7% and 40.6% students agree with this student which shows that the ICT tools help them to access easily and make learning more interesting. The same argument respond by the student when the

interview conducted with the question "Is ICT tool helps you for your study that you make enjoyable?" and one student reply "yea, it absolutely helps my learning and my learning capability really improving since I started to use it, my friends surprised from my result" so its response matches with each other. Hence ICT tools helps the student to learn interestingly.

Chai square value 19, which is significant at 0.05 level of significance about 81.3% students agree with the statement 4 as 'I make good use of internet at school' and chai square value 7.688 is significant at 0.05 level of significance about 18.8% students agree with this statement 'I make good use of email at school' which shows the ICT tools helps them to facilitate internet and its use.

Table 5. Use of computer at school

8. I use computer at school to do the following	x^2-value	Daily	Weekly	Monthly	Less than four times a year	Never
a. Writing	9.250	3 (9.4%)	11 (34.4%)	3 (9.4%)	5 (15.6%)	10 (31.3%)
b. Email	35.813	2 (6.3%)	2 (6.3%)	8 (25%)	1 (3.1%)	19 (59.4%)
c. World Wide Web(WWW)	16.438	2 (6.3%)	6 (18.8%)	10 (31.3%)	1 (3.1%)	13 (40.8%)
d. Mathematics	8.313	5	8	3	4	12

Learning		(15.6%)	(25%)	(9.4%)	(12.5%)	(37.5%)
e. Playing games	8.625	1 (3.1%)	9 (28.1%)	9 (28.1%)	4 (12.5%)	9 (28.1%)
f. Others	6.250	5 (15.6%)	3 (9.4%)	8 (25%)	4 (12.5%)	9 (28.1%)

Above table explain that the uses of ICT tools at school in the form of computer for writing, email, world wide web, mathematics learning, playing games and others activities on the basis of daily, weekly, monthly, less than four times a year and never. The all respondent was 32, in the table the missing value was the no response learners.

There was majority of students mathematical learning and other activities on the basis of daily user was 15.6%, similarly on the basis of weekly uses writing and playing with 34.4% and 28.1%, and for monthly basis www and playing games with 31.3% and 28.1% respectively.(table 5)

Table 6. Use of computer at home

I use computer at home to do the following.	Daily	Weekly	Monthly	Less than four times a	Never	χ^2 value-
a. Writing	17 (53.1%)	4 (12.5%)	1 (3.1%)	1 (3.1%)	9 (28.1%)	28.625
b. Email	6	9	6	2	9	5.187

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	(18.8%)	(28.1%)	(18.8%)	(6.3%)	(28.1%)	
c. WWW	11 (34.4%)	9 (28.1%)	4 (12.5%)	2 (6.3%)	5 (15.6%)	14.500
d. Mathematics Learning	12 (37.5%)	7 (21.9%)	2 (6.3%)	5 (15.6%)	6 (18.8%)	8.313
e. Playing games	7 (21.9%)	16 (50%)	3 (9.4%)	2 (6.3%)	4 (12.5%)	20.187
f. Others	9 (28.1%)	9 (28.1%)	3 (9.4%)	2 (6.3%)	8 (25%)	13.000

From above table for daily basis most of the students uses writing (53.1%), mathematical learning (37.5%) then others (28.1%) and on the weekly basis playing games (50%), email, www, and others with 28.1% user at home of ICT tools. On the monthly basis most of the student uses e-mail(18.8%) and www(12.5%).

From appendix C, 96.4% teachers were responded that they have access to the internet at school for teaching and learning. When the question about the technology that exist in the school responded through teacher are TVs (53.6%), overhead projector (46.4%), video machine(46.4% good condition) and calculator (100%) in their institute. But when the researcher observed (from appendix-D) it shows little bit different there were the presence of ICT tool in the sampled school are as; radio (46.9%), projector(43.8%), computer(100%), internet(78.1%), CCTV(37.5%), telephone(81.3% but due to the construction 50% had only) and tape recorder(56.3%) found. Which show the there were some lack in physical resources similarly the

researcher observed about the computer lab and found 96.9% was good and similarly lighting in the lab(93.8% acceptable and 6.3% was excellent) and for 90.6% good, 9.4% was very good found computers positioned in the lab, 84.4 % was good and 12.5% was very good but 3.1% was not good in condition for learners sitting arrangements', for the condition of the computers it was found working(78.1%), very good working (18.8%) and 3.1% not working in condition. It's all observed by visiting these sampled school.

From appendix-C, 92.9% teacher responded that they have a computer at home, among of them 85.7% uses internet also at home. For the training about the teacher to use ICT in the mathematics class 64.3% responded yes they had got but not from the school side they responded in the further question about "how many days you have been trained" then most of the teacher responded that they got training from the outside the school, from personal fund. Similar response come out when the researcher conducted the interview, most of the teacher reply they didn't get any training especially to integrate ICT tools into the mathematics class for special teaching with special software. For the question about the skill before training, they responded that they(50%) had basic skill like-wise how to operate computer, 39.3% teacher respond that they had a skill of special program operating skill and 10.7% was replied as they had no skill.

When the teacher asked in which you were trained in? as mentioned in appendix-C question 7, they reply 96.4% agreed for word processing, 92.9% agreed for spread sheet, 85.7% agreed for presentation skill, 85.7% agreed for using the internet to find information, 75% agreed for using web resources, 32.1% reply for designing web pages, 14.3% for databases and 25% trained for information skills. For

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the question face to face training in how many days/ 46.7% reply for 7 days, 35.7% reply for 15 days, 10.7% respond for 3 month and 7.1% reply for 6 months.

The question asked to the teacher 'do you use /collect the information from the internet for teaching and learning?', then 89.3% teacher respond as yes they use but 7.1% did not. And the question asked(appendix-C) about the any barrier at the time of using ICT tools or education technology? Then they reply 71.5% as yes they say the barrier and challenges when integrate ICT in the mathematics class. From appendix-B, the researcher asked "have you faced any challenges during the integration of ICT in mathematics class?' one teacher reply *'oh yea, its sometime irritate me if I need a computer or laptop urgent to use and I open it and booting the system very hang full'*

Another teacher reply *'I have got many challenges as sometime loadshedding disturb to operate the devices, sometime bad and unusual connection make short circuit, at the time of teaching very few time for presentation individually among 40 to 50 students, it disturb very badly'*. Similarly another teacher reply *'due to the bad connection of network and expensiveness of devices many people very far from the developed world and so no reason to integrate it, maximum teacher have the idea to do but the organization or institution not supporting the teacher to progress the professional development through participating the us into different program, training that's why it seems to be difficult'* it's absolutely true the teachers thought about the challenges they gave the key of the barriers of the integrating the ICT into the classroom.

When the teacher asked 'during/after the use of ICT tools, what are the benefits have you got/experienced?' the teacher replied *'yes, many benefits I've experienced during the integration ICT tools into the class, I've got students are very*

responsive and focused when the presentation was going on they looks very excited and surprised that what the next will appear on the screen, its beneficial for the teacher and students and institutions also'. next teacher reply *'benefit depend upon the content and the tool used to present the data in front of receive, if they know the costiveness of the tools that work fast with the help some special type of skill then it will certainly benefit us, modern world changes because of the new emerged technology into the different field to work fast easy."*

Table 7.Use of ICTby teacher atclassroom

	Daily	Weekly	Monthly	four times a year	Never	No response
Word processing	8 (28.6%)	11 (39.3%)	5(17.9%)		2(7.1%)	2(7.1%)
Spreadsheet	3 (10.7%)	7 (25.7%)	10(35.7%)	1(3.6%)	2(7.1%)	5(17.9%)
Databases		6(21.4%)	10(35.7%)	4(14.3%)	3(10.7%)	5(17.9%)
Presentation software	4 (14.3%)	5(17.9%)	10(35.7%)	1(3.6%)	2(7.1%)	6(21.4%)
Email	14(50%)	9(32.1%)	3(10.7%)	1(3.6%)	1(3.6%)	
World Wide Web for research and information	17 (60.7%)	5(17.9%)	2(7.1%)		2(7.1%)	2(7.1%)
Drill and practice programs	8 (28.6%)	8 (28.6%)	10 (35.7%)		2 (7.1%)	
Games	6 (21.4%)	7 (25.7%)	3 (10.7%)	1 (3.6%)	6 (21.4%)	5 (17.9%)
Overhead projector	8 (28.6%)	5 (17.9%)		3 (10.7%)	2 (7.1%)	3(10.7%)

T.V video	11 (39.3%)	4 (14.3%)	4 (14.3%)	4 (14.3%)		5 (17.9%)
Calculators	17 (60.7%)	3 (10.7%)	2 (7.1%)	1 (3.6%)		5 (17.9%)
Other, please specify	21 (75%)	1 (3.6%)		1 (3.6%)		5 (17.9%)

Table 7 reveal that how often the teacher uses for their students, which is from teacher questionnaire form (appendix-C) it describe on the daily basis teacher uses mostly other activities (75%) then www (60.7%) and calculator (60.7%) , email uses by 50% on daily basis, which shows that they use ICT tools to improve skill of the teacher and make them to engage with the benefit of the tools.

From appendix-C the teacher asked for "how do you use ICTs in your Class?" with different favorable option then the result on the basis of their responses as 82.1% uses it to organize and store information, 78.6% responses to support individual learning, 75% to support co-operative learning, 71.4% to create visual display of data/information, 67.9% uses to manipulate/analyze/ interpret data, 64.3% uses to collect data and perform measurement, 60.7% uses to communicate information as the result of investigation, to perform calculation and for remediation of basic skills, for other works 25% uses ICT in their class. These all above data are overlapped because its depend upon the choices of teacher's performed task in their class for students. For the question 'how do you use internet in your class?' the responses in two option mention in the appendix-C as 'gather information from a variety of sources' it collects 21.5% with agree opinion, 60.7% with disagree opinion and 17.9% with no response similarly the second choice be 'communicate with others outside the school' for this

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71.4% teacher agree, 25% with disagree and 3.6% with no response opinion by them. For the last option 'other' they responded as 64.3% be agree, 28.8% be disagree and 7.1% be no response. These opinion shows that they use internet for different purpose the option which was given and match some desire with 21.5% and 71.4% agree to the given statement.

Table 8.Teachers Perception Towards Education Technology

Statements	SD	D	U	A	SA	$\aleph^2$ - Value
1. Educational technologies engages learners attention and motivate them				18 (64.3%)	10 (35.7%)	2.286
2. Educational technologies improves learners test and exams results			2 (7.1%)	21 (75%)	5 (17.9%)	22.357
3. Educational technology stimulate learners curiosity			1 (3.6%)	20 (71.4%)	7 (25%)	20.214
4. Educational technologies encourage learners to develop their problem solving strategies			1 (3.6%)	21 (75%)	6 (21.4%)	23.214
5. Educational technology provide models and images which aid learners in concept formation		1 (3.6%)	5 (17.9%)	16 (57.1%)	6 (21.4%)	17.429
6. Educational technologies			1	13	14	

Statement						χ²
improve the teachers efficiency			(3.6%)	(46.4%)	(50%)	11.214
7. Educational technologies reduce the teachers administration burden		4 (14.3%)	10 (35.7%)	10 (35.7%)	4 (14.3%)	5.143
8. Educational technologies provide better records of learners progress		2 (7.1%)	3 (10.7%)	18 (64.3%)	5 (17.9%)	23.714
9. Technology assisted instruction is more effective than the traditional method of instruction			1 (3.6%)	15 (53.6%)	12 (42.9%)	11.643
10. The internet has proved to be a useful source of ideas and information for teachers		1 (3.6%)		18 (64.3%)	9 (32.1%)	15.500
11. Computers will gradually replace teachers	11 (39.3%)	4 (14.3%)	5 (17.9%)	7 (25%)	1 (3.6%)	9.857
12. Educational technology support individualized learning (NR-2(7.2%))	1 (3.6%)	2 (7.1%)	2 (7.1%)	15 (53.6%)	6 (21.4%)	30.714

13. Educational technologies improve teachers approach and understanding of teaching approach		3 (10.7%)	20 (71.4%)	5 (17.9%)	18.500
14. Using educational technology is an important aspect of teachers work.	1 (3.6%)		21 (75%)	6 (21.4%)	23.214

From the appendix-C the teacher perception was also evaluated on the basis of $\Re^2$ test in which each statement be calculated by their response opinion. Statement 1(table 8) as "Educational technologies engages learner's attention and motivate them" with $\Re^2$ value 2.286 the all respondent deliver their opinion through tick mark on the desired option where 100.0% was (64.3% agree and 35.7% was strongly agree). The statement was positive accordance to the respondent and it was very significant to the 0.05 level of confidence interval. Statement 2, 'educational technologies improves learners test and exams results' with $\Re^2$ value 22.357, which is significant at 0.05 level of significance about 92.9% teachers agree with this statement which shows that the ICT tools really improves students test and exams. Chai square value 20.214, which is significant at 0.05 level of significance about 96.4% teachers agree with this 3rd statement which shows that the educational technology stimulate learners curiosity. When the interview conducted with teacher by asking '*During/After the use of ICT tools, what are the benefits' have you got/experienced?'* the teacher immediately reply '*its increase the students desire to learn and understand easily through educational technology, it motivate and stimulate them to engage in learning by searching, organizing,*

collecting, synthesizing the data or information that being searched for their current or further study" which response match with the above statement of the teachers perception towards the educational technology. The statement 4th with $\Re^2$ value 23.214 at 0.05 level of significant about 96.4% teachers agree with this statement which show that educational technology encourage learners to develop their problem solving strategies. Similarly statement 5th and 6th has $\Re^2$ value 17.429 and 11.214 which are significant at 0.05 level of significance about 78.5% and 96.4% teachers agree with this statement which shows that the educational technology helps the students concept formation by providing different models and images also it improve the teachers efficiency. Chai square value 5.143 which is significant at 0.05 level of significance about 50% teachers agree with this statement 7th that it reduce the teachers administration burden but one teacher asked about the challenges he reply *'at school or home the technology is the burden with different types of daily problem I really have to throw it outside the door or kick out, it always make noise and call the technician to operate it properly and always I lose money for that, some time student broke the keyboard, mouse etc. lab become the dumping cite which make me irritating about the technology in education field'* that is the opinion is really different and somewhere teacher felt helpful with this technology in academic field, with the supporting reply of teachers about the benefit of educational technology as, *'I personally feel very helpful and say thanks to them who developed to make us in modern age, it introduces us to the new world of development and information and make an ability to fit into the new developed society like the technological application in teaching and other field'*. It's a positive view of teacher that excite him to use ICT tools into the teaching and learning. The statement 8th with $\Re^2$ value 23.714 which

is significant at 0.05 level of significance about 82.2% teachers agree with this statement which show that ICT tools provide batter records of learners progress. Chai square ($\Re^2$) value 11.643 and 15.500 for 9th and 10th statement are significant at 0.05 level of significance about 96.5% and 96.4% teachers agree with these statement which show that ICT Tools change the teaching style into modern instruction and it's a useful collection of ideas for teachers. The statement 11th has $\Re^2$ value 9.857 which is significant at 0.05 level of significance about 28% teachers agree with this statement which show that most of the people disagree with this statement that computers will gradually replace teachers. The 12th statement has a $\Re^2$ value 30.714 which is significant at o.o5 level of significance about 75% teachers agree with this statement which mean the majority of teachers perception that technology support individualized learning. The 13th statement with $\Re^2$ value 18.500 which is significant at 0.05 level of significance 89.3% teacher agree which mean majority of teacher agree that ICT tool improve teachers approach and understanding of teaching approach. The last statement with $\Re^2$ value 23.214 which is significant at 0.05 level of significance about 96.4% teachers agree which mean the majority of teachers agree with using educational technology is an important aspect of teachers work. According to the teachers perception the majority of the teachers have positive opinion towards the educational technology that is the good result of the perception of the teacher.

Table 9.Teachers Educational Technology Competency

Statement	SD	D	U	A	SA	$\Re^2$ - Value
1. I feel competent using application			3	21	4	

			(10.7%)	75%	(14.3%)	21.929
programs to develop lesson plans						
2. I feel competent using emails to communicate with colleagues			2 (7.1%)	20 (71.4%)	6 (21.4%)	19.143
3. I feel competent constructing and implementing project-based learning lesson in which learners use a range of information technologies			4 (14.3%)	17 (60.7%)	7 (25%)	9.929
4. I feel competent to help learners to solve problems, accomplish tasks and use higher order thinking skills in an information technology environment	1 (3.6%)			19 (67.9%)	8 (28.6%)	17.643
5. I feel competent about teaching learners appropriate information technology skills and knowledge			3 (10.7%)	18 (64.3%)	7 (25%)	12.929
6. I feel competent working with learners with learners in various	3 (10.7%)	2 (7.1%)	16 (57.1%)	7 (25%)		17.429

information technology environment						

From appendix-C, (table 9) in this section there are six statement in which each wasscored on the basis of a point 1 points for strongly agree, 2 point for agree, 3 point for undecided, 4 point for disagree, 5 point for strongly disagree and 0 for no response and evaluated through $\mathfrak{R}^2$ test, the first statement in this section was "I feel competent using applications to develop lesson plans having 21.929 chai square value, with 2 degree of freedom and 10.7% undecided, 75% agree and 14.3% strongly agree opinion. The overall 89.3% of teachers agree with this statement which mean they feel competent using application programs to develop lesson plans. The 2nd statement with its $\mathfrak{R}^2$ value 19.143 which is significant at 0.05 level of significance about 92.8% teachers agree which mean the majority of teacher are more competent with this statement i.e they are using emails to communicate with colleagues. The statement 3rd having the $\mathfrak{R}^2$ value 9.929 which is significant at 0.05 level of significance about 85.7% teachers agree that they feel competent for constructing and implementing project-based lesson in which learners use a range of information technologies. The fourth statement with $\mathfrak{R}^2$ value 17.643 which is significant at 0.05 level of significance about 96.5% teacher agree that they are competent to help learners to solve problems, accomplish tasks and use higher order thinking skills in an information. The statement 5, with $\mathfrak{R}^2$ value 12.929 which is significant at 0.05 level of significance about 89.3% teachers agree to feel competent about teaching learners appropriate information technology skills. The statement 6, with $\mathfrak{R}^2$ value 17.429 which is significant at 0.05 level of significance about 82.1% teachers agree which mean the majority of the respondent as a teacher

that they feel competent for working with learners in various information technology environment.

The researcher conduct observation for the use of ICTs in class on the basis of excellent use, acceptable use and not use for different five statement, in which first statement 'Media and technology that is specific to the content area' the researcher found 28.1% acceptable use for second statement, 'Include integrated teaching and learning experiences using internet and other technologies' the researcher found 3.1% excellent use and 50% acceptable use, similarly for third statement, 'Provided opportunities for learners to use the internet as a source of information' 6.3% as excellent use and 50% as acceptable use. The last two statement, 'Integrate the internet to stimulate real world problems' and 'Allow learners to discover, share and create things using computers Maths' programs' the researcher found 9.4% and 21.9% as acceptable use of ICT in class.

Chapter- V

SUMMARY, CONCLUSION AND RECOMMENDATIONS

The purpose of this chapter is to present as overall summary of the study. The findings of the study are summarized, conclusions are drawn, and some recommendations are made.

Summary of Findings

In the process of investigating opportunities and challenges to integrate ICT into the teaching of mathematics class, the researcher found that in this regard, Mathematics teachers were affected by a number of issues regarding the integration of ICT in schools in general. The findings of this study indicated that teachers in Secondary schools lacked the necessary skills and knowledge for using ICT during their lesson presentations. They indicated that ICT integration did not really take place even though they were aware of some positive impacts that ICT could bring about in mathematics learning. Some of the positive impacts include motivation of learners, eagerness of learners to explore and discover new knowledge, excitement on the part of learner's enrichment.

As found in this study through interviews with Mathematics teachers, there were different area that become a barrier or challenges to integrate ICT into the Mathematics Class. The first challenge was teachers' Lack of infrastructure to add or operate ICT Tools, after that lack of training. Lack of training of teachers was found to be a crucial aspect which needs to be seriously considered during policy formulation or implementation. ICT is a new development in the education sector and most of the teachers were overwhelmed or rather shocked by the idea of including it in their lesson presentations. At the time this study was conducted, only a few teachers had been trained in which most of them was trained from private institute on

the basis of their interest not trained from governmental or specially to make the teacher curious to teach the students, but even then, they were not integrating ICT into their lessons as there was no on-going support to strengthen what had been learned. The second challenge identified was inability to operate ICT facilities. Teachers were willing to integrate ICT in their Mathematics lesson to improve reading and writing and solve difficult problem, but even though they were supplied with the necessary facilities, they were unable to operate them.

The third challenge was lack of ICT resources in schools. Most of the schools, especially in rural areas, were faced with this challenge and could not integrate ICT effectively. As a result, the available resources were placed in computer laboratories or libraries. Teachers preferred ICTs to be placed in their classrooms to maximize the opportunities for curriculum activities.

The fourth challenge was theft. Most of the expensive tools was stolen from school. Schools became targets for thief who stole and sold ICT resources. These resources kept disappearing from schools because there was no proper control and monitoring.

The fifth challenge was lack of motivation or inspiration from the school management. The management of the schools did not put emphasis on the integration of ICT, and there was no proper monitoring, thus leading to teachers becoming unwilling to use ICT technology.

The sixth challenge was lack of parental involvement or support. Parents had little knowledge about the importance of ICT in education, and this was the main reason they did not offer a helping hand in contributing towards the purchase of these facilities for the schools.

The seventh challenge was the language barrier. Teachers and learners faced the problem of the complex language of ICT, as they encountered difficult terminology in different program has different structural steps and process. Learners in the lower grades were the most disadvantaged group because they were taught through mother-tongues as medium of instruction and thus could not understand the English used in ICT. But it was helpful for the computer major students.

The eighth challenge was overcrowded classrooms. Most classes comprised of approximately 40 to 50 learners, making it impracticable for ICT to be used since teachers found it difficult to pay attention to all learners in a period of 40 to 45 minutes, especially considering the issue of limited resources.

Conclusion

This study exposed something strange about ICT tools which was very unexpectedly in use among the teachers and students but it also unveil that ICT integration in education still has a long way to go. Although this study revealed general issues on ICT integration, these issues also directly affected the teaching of reading and writing. This was because the majority of teachers were unable to integrate ICT in their teaching practices. The main obstacle towards the successful integration of ICT was lack of training which resulted in teachers lacking the necessary skills and competencies. The study also revealed that many of the mathematics teachers participating in the study were willing to make use of ICT for teaching and learning purposes even though they encountered many challenges in the process. They indicated that technology in education was a motivating tool both for them and for their learners as they became part of the global village where everything is technologically advanced. Although most of the schools benefitted from the deployment of ICT resources from the government, this study demonstrated that

during the distribution of these resources there were imbalances between rural and urban schools. This conclusion was drawn after it was observed that urban schools were equipped with more ICT resources than their counterparts in rural schools. The study concluded that without proper infrastructure, facilities such as electric power, connectivity and computer related materials and human support, ICT integration into teaching in general, and the teaching of mathematics lesson in particular, will not succeed.

Recommendations for educational implication

Based on the findings of this study the researcher recommends the following:

) It emerges clearly that the implementation and application of ICT resources is quite limited and premature in the Nepalese education system. However, there is a growing need to integrate ICT in the education system in an increasingly demanding ICT world.

) There is as great need to use and integrate new and updated ICT resources in the teaching of reading and writing of mathematics lession. However, there is a lack of ICT resources for the use of secondary teachers to enable the integration of ICT in their teaching practices.

) One of the major problems facing secondary teachers in providing effective mathematics teaching lessons to their learners is inadequate training in the application of ICT resources. There is thus a need to provide continuous training to all teachers to enhance the ability of learners to read and write. Moreover, teachers should also try to strengthen their professional needs related to ICT.

⟩ The government should help to distribute resources equally between rural and urban schools. Rural schools tend to be neglected because of their long distances from towns, poor electrification, etc.

⟩ School management should take a lead in encouraging the use of ICT in reading and writing lessons.

⟩ Teachers' input should be considered during policy formulation because they are aware of what their needs and those of their learners are. They will be better able to suggest how they want to integrate ICT into their mathematics lessons because they know what kind of learners they deal with on a daily basis.

Recommendations for future research

The researcher also suggests the following recommendations for future research:

⟩ A study of the impact of the Language Policy in the implementation of ICT. The Language Policy stipulates that secondary grades should be taught through mother-tongue as the medium of instruction. However, none of the languages used in ICT is in learners' mother-tongues. Research should be carried out to investigate what impact this has in the successful use of ICT in English lessons.

⟩ A study to determine the extent to which schools formulate and implement ICT in internal policy. Do schools have internal ICT policies and how effective are these policies to make ICT integration real.

⟩ A study to investigate what skills teachers and principals possess in the ICT field, and what ICT tasks they are able to perform with confidence so far.

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LEARNERS QUESTIONNAIRE FORM

NAME: AGE:

GRADE: GENDER:

<u>Yes/ No Question</u>

9. Do you know ICT?

10. Do you have a computer at home? If yes, is the computer connected to the

internet?...

11. Do you use your computer at home for your schoolwork? If yes, please explain

what type …………………………………………………………..

Please read the statement and give your judgment by tick mark ( ) in one of the five

choices.

5 = Strongly Disagree(SD), 4 = Disagree (D),3= Undecided (U), 2 = Agree (A), 1=

Strongly Agree (SA)

Statements	SD	D	U	A	SA
12. It is important that I use computers in my learning because it make my school work easy					
13. Using computers at school improves my learning.					
14. When I use computers at they make learning more					

interesting.					
15. I make good use of internet at school.					
16. I make good use of email at school.					
17. I can get a access to computers at school whenever I need to					
18. I think ICT are essential for education					
19. I use computer at school to do the following	Daily	Weekly	Monthly	Less than four times a year	Never
g. Writing					
h. Email					
i. World Wide Web(WWW)					
j. Mathematics Learning					
k. Playing games					
l. Others					

20. I use computer at home to do the following.	Daily	Weekly	Monthly	Less than four times a year	Never
g. Writing					
h. Email					
i. WWW					
j. Mathematics Learning					
k. Playing games					
l. Others					

Appendix-B

TEACHER'S INTERVIEW GUIDE LINE

Name :   Address:

Education (ED. Or Non ED):   Age:

Trained/Untrained: Experience:

� Do you have any idea about ICT use in teaching?

� Have you ever try to use ICT Tools during math class/teaching? If yes then mention its' name, if not then why?

⏎ During/After the use of ICT tools, what are the benefits' have you got/experienced?

⟩ Have you faced any challenges during the integration of ICT in

Mathematics Class?

⟩ What are the ICT tools in your school? If there is then mention which of

them are usable or not?

⟩ Have you ever thinking to add New ICT tools in your schools' math class to

encourage student, parent or other to match our step with international trend

in Mathematics Class?

Appendix-C

EDUCATORS' QUESTIONNAIRE FORM

A. School Resources

Name of teacher:

School Address:

7. How many computers does your school have for teaching and learning?

8. Do you have access to the internet? If yes, how many teaching and learning computers are connected?

9. Which of the following technologies exist in your school for teaching and learning and how did you get them?

a. TVs   c. Video machine(s)

b. Overhead Projector(s)   d. Calculator(s)

B. Training of Teachers

10. Do you have computer at home? If yes, it is connected to the internet?

11. Have you been trained for ICT use in mathematics class?

12. Did you have any computer skill before the training? If Yes, please specify……………………………………………………………

13. Which of the following were you trained in?

Word processing

Spreadsheet

Presentation skills

Using the internet to find information

Using web resources

Designing web pages

Databases

Information skills

Other training, please specify……………………………………..

14. How many days did you have a face to face training?

15. How often did you have computer practice after training?

16. Were you trained in technical support for your school? if no, why

    not…………………………………………………………………

17. Do you use/collect information from the internet for teaching purpose?

a.   Yes   b. No

18. Do you see any barriers to your use of technology?

a.   Yes   b. No

C. Use of educational technology in the Classroom

19. How often do you use each of the following with your students?

	Daily	Weekly	Monthly	four times a year	Less than	Never
Word processing						
Spreadsheet						
Databases						
Presentation software						
Email						
World Wide Web for research and information						
Drill and practice programs						

Games					
Overhead projector					
T.V video					
Calculators					
Other, please specify					

20. How do you use ICT's in your classes?

To support individual learning …….

To support co-operative learning……

To organize and store information……

To collect data and perform measurement…….

To manipulate/ analyze/ interpret data…….

To communicate information as the result of investigation………

To create visual display of data/ information…..

(e.g. charts, graphs, maps)

To perform calculations ……

For remediation of basic skills……

Other, please specify………

21. How do you use Internet in your class (es)?

Gather information from a verity of sources ……

Communicate with others outside the school…..

Other, please specify…………………………………………………..

D. Teachers Perception Towards Education Technology

Statements	SD	D	U	A	SA
22. Educational technologies engages learners attention and motivate them					
23. Educational technologies improves learners test and exams results					
24. Educational technology stimulate learners curiosity					
25. Educational technologies encourage learners to develop their problem solving strategies					
26. Educational technology provide models and images which aid learners in concept formation					
27. Educational technologies improve the teachers efficiency					
28. Educational technologies reduce the teachers administration burden					
29. Educational technologies provide better records of learners progress					
30. Technology assisted instruction is more effective than the traditional method of instruction					
31. The internet has proved to be a useful					

source of ideas and information for teachers					
32. Computers will gradually replace teachers					
33. Educational technology support individualized learning					
34. Educational technologies improve teachers approach and understanding of teaching approach					
35. Using educational technology is an important aspect of teachers work.					

E. Teachers Educational Technology Competency

36. I feel competent using application programs to develop lesson plans					
37. I feel competent using emails to communicate with colleagues					
38. I feel competent constructing and implementing project-based learning lesson in which learners use a range of information technologies					
39. I feel competent to help learners to solve problems, accomplish tasks and use higher order thinking skills in an information technology environment					
40. I feel competent about teaching learners appropriate information technology skills and knowledge					
41. I feel competent working with learners with learners in various information technology environment					

Appendix-D

OBSERVATION CHECKLIST

A. Physical features

    a. ICT Tools: Radio, Projector, Computer, Internet etc.

    b. Computer lab

    c. Lighting in the lab

    d. Computers positioned in the lab

    e. Learners sitting arrangements

    f. Condition of the computers

    g. No. of operational computers

    h. No. of computers connected to a printer and internet

    i. Name of applicable system available in computer

    j. Name of Maths' software programs available

B. Use of ICTs in class

	Excellent use	Acceptable use	Not use
a. Media and technology that is specific to the content area			
b. Include integrated teaching and learning experiences using internet and other technologies			
c. Provided opportunities for learners to use the internet as a source of information			
d. Integrate the internet to stimulate real world problems			

e. Allow learners to discover, share and create things using computers ad Maths' programs.			