USE OF ICT IN TEACHING MATHEMATICS

A THESIS

BY

CHANDRAKALA TIWARI

FOR THE PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE

DEGREE OF MASTER OF MATHEMATICS EDUCATION

SUBMITTED

TO

DEPARTMENT OF MATHEMATICS EDUCATION

CENTRAL DEPARTMENT OF EDUCATION

UNIVERSITY CAMPUS

KIRTIPUR, KATHMANDU

2019

Letter of Certificate

This is certify that Ms. Chandrakala Tiwari, a student of Academic Year 2071/2072 with campus Roll. No 023, Thesis No 1373, Exam Roll No: 28710273 and T.U. Regd. No. 9-2-599-159-2010 has completed this thesis under the supervision and guidance of Dr. Ganesh Prasad Adhikari, during the period prescribed by the rules and regulations of Tribhuvan University, Kirtipur, Nepal. This thesis entitled **"Use of ICT in Teaching Mathematics"** has been prepared based on the results of her investigation conducted during the prescribed period of 2019. I recommend and forward that her thesis be submitted for the evaluation and to award the degree of Master of Education.

……..

Assoc. Prof. Laxmi Narayan Yadav

(Head)

Date: ……

Letter of Approval

Thesis Submitted

By

Chandrakala Tiwari

Entitled

"Use of ICT in Teaching Mathematics" has been approved in partial fulfillment of the requirements for the Master's Degree in Mathematics Education.

Viva- Voce Committee	**Signature**
Assoc. Prof. Laxmi Narayan Yadav (Chairman)	…….....
Mr. Baikuntha Khanal (External)	……
Dr. Ganesh Parsad Adhikari (Supervisor)	……

Date: …….

Recommendation for Acceptance

This is certify that Ms. Chandrakala Tiwari, has completed her M.Ed. thesis entitled **"Use of ICT in teaching Mathematics"** under my supervision during the period by rules and regulation prescribed by the department of Tribhuvan University, Kirtipur, Kathmandu, Nepal. I recommend and forward her thesis to the Department of Mathematics Education to organize final viva-voce.

……..

Dr. Ganesh Prasad Adhikari

(Supervisor)

Date: …….

Defence Date: 2075/12/22

Declarations

The thesis entitled **"Use of ICT in Teaching Mathematics"** conducted under the supervision of Dr. Ganesh Parsad Adhikari, in the Department of Mathematics Education, Tribhuvan University, Kritipur, Nepal.

I declare that the information reported in the current paper is the result of my own work, except where due to reference is made. This thesis has not been accepted for any degree and is not being currently submitted to any candidature for any other degree.

……

Chandrakala Tiwari

Date: ……

Dedication

This thesis dedicated first and foremost to my parents for their love, patience, kindness and support. Also to my husband Dr. Sagar Kumar Neupane who has always been my greatest inspiration.

ACKNOWLEDEMENT

I would like to take this opportunity to thank many people for their diverse contributions in various ways to carried out this study. I express my apology for not being able to mention everyone's name here but you are in my heart.

Thank you so much my supervisor Dr. Ganesh Parsad Adhikari, Department of Mathematics Education, Kirtipur, for your guardianship, invaluable time, constructive feedback, inspiring, insight and encouragement. I am very much delighted to express my heartfelt gratitude to the respected Assoc. Prof. Laxmi Narayan Yadav, Head of the Department of Mathematics Education, Kirtipur, who provided me the opportunity to write this thesis. I equally owe my sincere gratitude to all the respected Professors and Lecturers of Department of Mathematics Education, Kirtipur, for their valuable co-operation, comments and suggestions. I would like to thank you Mr. Hari Bista School Inspector of DEO, Rupandehi, who provided me invaluable information about Public Secondary Schools' of Rupandehi District; without his information this thesis wasn't bring in this present form.

I wish to acknowledge and express my profound gratitude to all the Head Teachers and Mathematics teachers of selected schools who were participated in this work. Thank you for your invaluable information; without your cooperation this study was not possible.

I am forever indebted to my father Jyotish Shree Tol Parsad Tiwari for his love, support and inspiration. I would like to thank my father-in-law and his family, who support me in every way.

Finally, special thanks go to my husband Dr. Sagar Kumar Neupane, who supports me by providing his valuable time to complete my research work. Thank you!

.....

April, 2019 Chandrakala Tiwari

Abstract

This study "Use of ICT in teaching mathematics" is aimed to investigate status of using ICT in teaching mathematics; to find the influencing factors of using ICT in teaching mathematics. The study adopted Rogers' diffusion theory, whereby the user or adopter is critical in the whole process. A mixed method research design and three instruments: an observation checklist, questionnaire and semi- structured interview were used to determine the result. According to DEO Rupandehi, in this financial year 2074/75 they provided a grant for 34 public secondary schools to facilitate ICT in teaching and learning. The researcher was selected these all 34 schools for her research and data was collected by purposively from 34 mathematics teachers and Head Teachers from these schools.

The finding indicated that the use of ICT in Rupandehi district were not so good, it was still in early phase. Mathematics teachers were not prepared to use ICT in teaching. Researcher found some factors that influencing use of ICT in teaching and divide into three different areas; 1) Teacher related factors; teachers' personal characteristics, teachers' knowledge and skill on ICT, teachers' training, overburden teaching. 2) School related factors; access, funding and supervision, support, schools' plan on ICT. 3) System related factors; structure of curriculum and traditional evaluation system. This study suggested that curriculum should be changed and new curriculum should be based on technology; NCED and other connected bodies should give information, training, orientation and discussion programs on ICT for Head Teacher, mathematics teachers and other stakeholders; mathematics teachers should be self motivate to usages ICT in their teaching also school management should provide enough opportunities and encourage them for using available ICT tools in their teaching.

Table of Content

List of Figure

List of Table

Abbreviations

CAI	Computer Assisted Instruction
CDC	Curriculum Development Centre
DEO	District Education Office
DIT	Department of Information Technology
DOE	Department of Education
DOI	Diffusion of Innovation
IAI	Internet Assisted Instruction
ICT	Information and Communication Technology
IT	Information Technology
INGOs	International Non-governmental Organizations
MCIT	Ministry of Communication and Information Technology
MHRD	Ministry of Human Resource Development
M.ICTEd	Master in Information and Communication Technology Education
MOE	Ministry of Education
MOES	Ministry of Education and Sports
NCED	National Centre for Educational Development
NGOs	Non-governmental Organizsations
TUFOE	Tribhuvan University Faculty of Education

Chapter I

Introduction

Background of the Study

Information and communication technology (ICT) is modern conception in the field of education. It makes easy to understand new concept, knowledge, skill related to daily life circumstances.

The term ICT refers to forms of technology that are used for communication and to transmit, store, create, share or exchange information. The broad definition of ICT includes technologies such as; radio, television, video, telephone, computer, network hardware and software as well as the equipment and services associated with these technologies. ICT in education is understood as technology- assisted instruction like Radio Assisted Instruction (RAI), Television Assisted Instruction (TAI), Computer Assisted Instruction (CAI) and Internet Assisted Instruction (IAI). This instruction refers to teaching methods or models of instruction delivery that employ ICT in supporting, enhancing and enabling course delivery (UNESCO, 2014) and it includes any, all or combination of aforementioned technology assistance.

According to Miles and Singal (2010), ICT stand for many different types of electronic system which include LCD projectors, IPads, smart boards, fax machines, cyber schools, printers, scanners, television, DVDs, landline cellular phones, calculators and networks and various computer software, video conferencing, instant- messaging, blog and e- mail.

We live in dynamic society with knowledge increasing at a un- predictable rate and it is the time for scientific knowledge and information communication and technological invention. Mathematics is also directly influenced by the development of technology. It is quite clear that if technological development is to be achieved, proficiency in mathematics must be achieved.

Batiku (2002) is of view that mathematics is a useful tool in the society, more so in the present technology age. Babalola (1991) viewed mathematics as a basic tool in development of science based knowledge such as technology, industry and even for sound analytical reasoning in daily living in a modern society such as ours. Anibueze (2015) stated that mathematics plays important roles in the following areas; mathematics as core skill for life, mathematics as key to economic prosperity and mathematics full of beauty and mathematics education (as cited in Bature, 2016).

Mathematics education has obtained new height due to development of technology. There are several benefits of using ICT in teaching and learning Mathematics. ICT has the potential to transform the nature of education; improving teacher's design work, enhancing the roles of students and teachers in the learning process and helping to create a collaborative learning environment (Sheila, 2016) as a result, the integrating of ICT in teaching and learning is high on the educational reform agenda of develop and developing countries.

Nepal's journey towards ICT has started with the use of computer that was in rent, to process census data in 1992. Later government purchased the machine for further data processing in the Bureau of statistics and established a separated organization call electronic data processing centre in 1995. In Nepal, first IT policy was announced in the year 2000 with the vision of placing Nepal on the global map of IT within next five years. In 2007, Ministry of Education (MOE) initiated a School Reform Project in which ICT- assisted and 'child- friendly' teaching and learning are encouraged in all schools. MOE has implemented some of programs related to ICT in education. Some NGOs have developed integrative digital learning materials for the school students in mathematics. Under the matching grant schemes (2007 and 2010), Department of Education (DOE) provided two computers and one printer to 3038 schools (DOE, 2010).

Under the formative research project of Education for All program 2004- 2009, MOE provided one computer and one printer to each 62 schools. Beside, some NGOs, trusts and individuals have provided computers and other accessories to some schools and basic computer training to teachers (MOE, 2013).

During the fiscal year 2010 and 2011, the government of Nepal has supported for ICT related infrastructure and internet connectivity to 785 schools. Policymakers have to decide appropriate methods and technology to be integrated in curriculum and need based curriculum can be developed to address new technology, which may more beneficial for the proper adjustments of learners in future. ICT has integrated several streams for secondary education in Nepal. Computer education is a separate additional subject in secondary level (class 6 to 10). Distance education and open learning division under NCED has been developing some mathematics, science and English curriculum related audio visual documentaries since few years and broadcasting by Radio Nepal and Nepal Television for the support of school students. National curriculum framework has taken ICT as a tool for educational transformation (CDC, 2005). In addition, DOE provided with internet connectivity to 85 secondary schools to conducting distance education program for secondary level (DOE, 2012). To improve educational management and delivery system, the MOE has provided some additional ICT related equipment to all District Education Offices and lunched website in each District Education Office. In June, 2012, the MOE has endorsed a guideline for the implementation of ICT in school in Nepal.

ICT is dynamism that has changed many aspects of the way we live. The impact of ICT across the past decades has been enormous. The traditional methods of teaching and learning are still dominant in Nepalese schools and most of the teachers focused on the examination and

result oriented teaching. So, the role of ICT in teaching and learning is non- existent. Some private and public schools do have computer and such setting. And they attempts to motivate students to use this technology; however, these efforts are limited in very basic ways, for example: student do word processing, work with spreadsheets and access the internet. The government of Nepal and several NGO/INGOs conduct different types program and training for teachers to use ICT tools in teaching. In this situation, I am interested to studying if mathematics teachers use ICT; how they use and what these ICT tools are and what factors influence the use of ICT in mathematics classroom.

Statement of the Problem

Education comforts to develop technology and technology support to develop different pedagogical thoughts in education. Most of the education related experts agreed that proper use of ICT hold great promises to improve teaching and learning in addition to sapping workforce opportunities (Joshi, 2016). Present education system should extend such concept from basic to higher stage. Maximum numbers of the countries have incorporated ICT in their course from primary to higher education level; even there are numerous organizations in the world providing formal education through online. Accordingly there are several sites which have integrated verities of information of different subject matter. ICT has several roles in education like as instructive, cultural, communal, professional and administrative.

A few years ago, when I was in Bachelor I served as a mathematics teacher in Shree Janakalyan Secondary School, Rupandehi. At that time, that school had six desktop and one projector. Computer teacher used computer for their teaching, but he didn't used projector. Other subject teachers teach their subject by traditional teaching method, even I was also unknown about ICT tools and there used in mathematics teaching and learning. That time, I thought how

we could use these tools (computer, projector, internet etc.) to teaching and learning mathematics. When I was starting my master degree in mathematics education, I feel the use of technology in mathematics education played a vital role. The way of conducting lesson, learning lesson and collecting resources are easily accessed by all through ICT. To teach Mathematics, the use of the ICT can be effective nowadays. So, it is essential to study on Use of ICT in teaching and learning mathematics. The problem of this study is concerned with the existing situation for practices of ICT in mathematics. Therefore, the research question for the study was recognized by researcher which is given as:

- What are the ICT tools used in teaching mathematics?
- How teachers do used ICT tools in teaching mathematics?
- What factors influences the use of ICT in teaching mathematics?

Objectives of the Study

The objectives of the study are as follows:

- To investigate the status of using ICT in teaching mathematics in public secondary schools of Rupandehi district.
- To find the influencing factors of using ICT in teaching mathematics.

Significance of the study

The twenty-first century is called information age. In this century, the development level of countries is directly related to the importance that they give to education, human beings and information. Currently, information is accepted as the most important key factor for the economic development of the countries and people can access the information easily and quickly by means of technology. Therefore, educational systems aim to bring up individuals who can get the information, use the information to make a decision, and find solutions to problems in the

information age. Not only is information and communication technology (ICT) the essence of learning environment, but also it enables students to broaden their horizons, foster students' knowledge, gain new occupational skills, and to have life-long learning skills. The contribution of ICT to provide education facilities for distant rural areas is so great that it can't be ignored (Güzeller & Akin, 2014).

The recent developments in ICT have also affected the learning and teaching process of mathematics. In the past, the teacher was the speaker and the student was the listener during the mathematics lessons. Currently, mathematics is taught with computer-based materials in elementary and secondary mathematics classes hence, it gives an opportunity to take individual differences among students into account seriously. This study concerns with the use of ICT in teaching mathematics. This study tries to know why the ICT tools did not used in teaching mathematics; and what factors influence the use of ICT in mathematics classroom. The significance of this study is mentioned as below:

- This study would be provided information on the use of ICT in teaching mathematics in secondary schools.
- It may enable mathematics teachers to become better instructors in the subjects, through the use of ICTs infrastructures that might be available to them.
- Student would concern use of ICT tools as a medium of teaching learning mathematics.
- It would benefit school administration, educational planners and policy makers to make appropriate decisions in integration of ICT in teaching and learning mathematics; also it might increase efficiency in their training and selection of mathematics teachers; and encourage teachers to have more interest towards, integration of ICT in mathematics.
- It would help to stimulate further research in ICT with other related subjects and fields.

Delimitation of the Study

Every research has delimitation in terms of time, research, finance and others. This study has following delimitations:

- This study was conduct in Rupandehi district.
- This study was focused in only one subject area; mathematics.
- This study was conducted only those public secondary schools that had computers laboratories.
- This study was limited on Mixed Method research design (Semi-structured Interview, Observation checklist and questionnaire).
- Information was collected from Teachers and Head Teacher.

Operational Definition of Key Terms

Definition of key terms refers to concepts or key words that are observable and operation in this study with precisely single meaning. The key terms of this study were defined as below:

Information and communication technology (ICT) The forms of technologies such as; radio, television, videos, telephone, mobile phone, computer, internet, network hardware and software that are used for communication and transmit, store, create, share or exchange information.

ICT tools An instrument like radio, television, mobile phone, laptops, computer, projector etc. which are used to learn and teach mathematics.

Public school Those schools which receive the government grant for the salary of teachers and other purpose.

Chapter II

Review of Related Literature

This chapter includes description of the different literature, theories and also includes conceptual mapping which shows the process of the research and theoretical understanding. Review of literature is a key step in research process. It involves the systematic identification and analysis of documents related to the study under taken review of the previous studies helps to conduct new research in systematic manner by providing the general outline of the research study and avoid the unnecessary duplications. Realizing the importance of the literature review some effort are mode here to present the significant result or conclusions of different studies mainly focusing to the opinions towards use of ICT in mathematics with these assumptions. Some works in opinions and the related topic are presented here.

Empirical Literature

Timilsena (2017) present a study "Attitude of teachers toward ICT in teaching mathematics" to find the existing situation and attitude of teachers towards ICT in relation to improve student's mathematical achievement and analyzed the effort of ICT in motivating students to learn mathematics. This study adopted descriptive survey design and conducted in Surkhet district. The information was collected by questionnaire. The result of this study showed that the school has sufficient ICT tool, teachers have positive opinion towards the practices of e-learning in mathematics. All the teachers and students agreed that the ICT tools are very useful for high achievement as well as higher study.

Joshi (2016) carried out a study entitled "Status of use of ICT by secondary school students of Nepal" The main objectives of the study are to study the status of ICT instruments with secondary school students and use of ICT by secondary school students at their home and

school. The study focused in use of ICT with respect to students of class nine and ten from secondary school of Kathmandu, Nepal. Responses of 106 students were taken and Data were collected by questionnaires from the students in the classroom by taking permission and help of Head Teacher and class teacher. Data has analyzed by using percentage, mean, SD and Mann Whitney U test. The findings concluded that most of students are poor in technological feature. Private and public school students do not differ in the use ICT at home and same result was found in case of boys and girls students. In case of use of ICT at school significant result was found in case of private and public school students even that result is not differ in case of boys and girls students. This study suggest that school, guardians, governmental and non governmental bodies, policy maker, financers and other related stakeholders should make excellent plan for the improvement of learners ICT skills for their future development.

Amuko, Miheso & Ndeuthi (2015) carried out a research article "Opportunities and challenges: Integration of ICT in teaching and learning mathematics in secondary school, Nairobi, Kenya." The purpose of this study was to explore the various opportunities and challenges influencing integration of ICT in teaching and learning mathematics in secondary schools in Nairobi country. The study adopted a descriptive survey design and data collection was conducted on twenty four Mathematics teachers from twelve secondary schools in Nairobi County. Purposive sampling was used to select teachers from the twelve schools. The researcher developed a questionnaire, an interview schedule and an observation check list for collect a data and data was analyzed by using descriptive statistics like frequencies, mean and percentage. The findings from the study indicated that teachers face major challenges such as developing their own technological skills and knowledge as well as self- training in the use of ICTs in their teaching. The study concluded those teachers to be trained on how to use ICT infrastructure, on a

regular basis and training to be done at Zonal levels, at least after every six months and the government of Kenya to provide schools with ICT infrastructure to enable teachers to integrate ICT in their teaching and learning.

Shrestha (2015) conduct a case study on "Status of ICT use in teaching/learning Mathematics" at Heartland Children's Academy from Kathmandu District. The objective of the study was to investigate the use of ICT in mathematics teaching and learning. Participants were sampled Mathematics students and teacher of Heart Children's Academy. The study founds there was neither any plan on the use of educational technology tools in mathematics teaching and learning, nor adequate teachers' training on the use of educational technologies. And also founds that there was a lack of relevant educational technology tools for school.

Alharbi (2014) did a study on the topic "A study on the use of ICT in teaching in secondary school in Kuwait." This research examines how ICT is applied in the classroom of Kuwaiti schools from the perspective of students, teachers and decision-makers. Based on four fundamental research questions, the aim is to analyze the level and impact of ICT on teachers' pedagogy, the students' perception of ICT use in the classroom and to seek out any fundamental differences in public and private education, as well as across genders. The research adopted a mixed-methods approach to data gathering, using questionnaires and semi-structured interviews to gather data from students, teachers and policy-makers in Kuwait. The results show a sporadic use of ICT in Kuwaiti secondary schools and suggest that when employed, evidence is mixed as to whether there is indeed a positive or negative impact from ICT use. The research does suggest there is capacity in the skills of teachers and students to employ ICT effectively, at least on a fundamental or technical level. There remains a significant gap between possessing these schools and applying them in the school setting. Alongside this, there is some support and recognition of

the benefits associated with ICT use, and there are some teachers who recognize the importance of ICT in developing more constructivist methods in the classroom. The research therefore implies both a potential failure of Government and the profession itself to effectively implement ICT in the Kuwaiti classroom.

Rana (2014) studied on "ICT (I See It) in Math Education" The aim of this paper is too look at some suggestions for answering what is ICT? What role it can play? And what are the challenges for implication of ICTs? in the context of Math Education in India. According to this paper ICTs generally refers to computers and computing related activities. Individualization of learning, Pedagogical gains, High speed delivery, wide reach at low per unit cost, distance and climate insensitive, serve multiple teaching functions and diverse audiences and uniform quality are the some strengths of ICTs. In India, policy framework, financial support and guideline ensure a national standard of education is provided by the Government of India through the Ministry of Human Resource Development (MHRD). The implementation of the policies and guidelines is primarily alone at the state level through the various state level departments in the country. The National Council of Educational Research and Training (NCERT) is an autonomous organization under the MHRD to assist the central as well as the state government in implementing policies and programs pertaining to education, particularly school education. The Department of Information Technology (DIT) in the Ministry of Communication and Information Technology (MCIT) is responsible for formulating, implementing and reviewing national policies pertaining to information technology. The impact of ICT use to date on learning outcomes is negligible in most places, at least partially attributable to the fact that, in most places, computers are only used to teach literacy. High infrastructure and start up cost; not ideally located and problem sensitive; problems of reach, access, remain; Tend to create new

class of knowledge rich/ knowledge poor; Essentially delivery systems; Hard to assess are the some challenges of implementation of ICTs.

Khan, Hasan, & Clement (2012) conducted a study entitled "Barriers to the introduction of ICT into education in developing countries: the example of Bangladesh" Bangladesh is one of the developing countries in the world with a growth rate of GDP around 5.6% and having poor ICT infrastructure like the other less developed countries. The government of Bangladesh has emphasized the implementation of ICT in all sectors including education. In spite of this effect and initiative; there are still some limitations in the effective use and spread of ICT. The main reason is poverty, which restricts the free flow of information either the government may not be in position to part with information or may not do so intentionally, due to corrupt practices. Then conflict may also impose restrictions on free access to information. The government of Bangladesh is committed to implementing ICT in education; the process is hindered by a number of barriers. The barriers are categorized as external (first order) and internal (second order). In this study, According to Snoeyink and Ertmer (2001), first order barriers include lack of equipment, lack of technical support and other resource-related. Second-order barriers include both school level factors, such as organizational culture and teacher level factors, such as beliefs about teaching and technology and openness to change. This paper also offers a number of recommendations to reduce these barriers and maximize the beneficial use of ICT on education.

Chong, Horani & Daniel (2005) studied on "A study on the use of ICT in mathematics teaching" The main objective of this study was to help mathematics teachers in the integration of ICT into their teaching. This research deployed a survey method to investigate the use of ICT and the barriers of integrating ICT into the teaching of mathematics in Malaysia. The survey was carried out during a mathematics in-service course conducted by the State Education

Department. Responses of 111 teachers were taken and the questionnaire was adapted from the Teacher Technology Survey by the American Institute for Research (AIR, 1998). From this study Six major barriers were identified: lack of time in the school schedule for projects involving ICT, insufficient teacher training opportunities for ICT projects, inadequate technical support for these projects, lack of knowledge about ways to integrate ICT to enhance the curriculum, difficulty in integrating and using different ICT tools in a single lesson and unavailability of resources at home for the students to access the necessary educational materials. To encourage more teachers to integrate ICT into mathematics lessons, the devised programmed must be user friendly. The findings 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.

Aduwa & Iyamu (2005) did a research on a topic "Using Information and Communication Technology in Secondary Schools in Nigeria: Problems and Prospects" Nigeria is on the wrong side of the international digital divide, as it has not made significant efforts to integrate ICT into secondary school curriculum. A great deal of instructional and administrative work in secondary school in Nigeria is still carried out manually. Therefore, this study examines the major obstacles militating against the use of ICT in secondary education in Nigeria. This study identifies the high cost of computer hardware and software; weak infrastructure; lack of human skills and knowledge in ICT; lack of relevant software appropriate and culturally suitable to Nigeria as the major stumbling block of the adoption of ICT in secondary education in Nigeria. Also, secondary schools in Nigeria are not given adequate funds to provide furniture, relevant textbooks and adequate classroom let alone being given adequate funds for high- tech

equipment. At present the cost of subscribing to the internet is too high for many of the impoverished secondary schools in Nigeria. In modern society, Nigeria needs ICT to aid teaching and learning and educational management.

From the above literature review, it indicated that the use of ICT in teaching and learning mathematics in developing country like; India, Bangladesh, Malaysia, Kenya, Nigeria etc. was not so good. There are many obstacles like; adequate infrastructure, training, access, support, plan etc. for using ICT in teaching only the governmental effort did not work properly. Similarly in the context of Nepal, some researcher did a research on using ICT in teaching and learning. The above mentioned literatures stated that in the several district like; Kathmandu, Surkhet etc. the status of using ICT in teaching and learning mathematics was poor, here were many more problems like the other developing country. Now, by this research I was seek what was the status of public secondary schools' in Rupandehi district on using ICT in teaching mathematics.

Theoretical Review

The theoretical framework is the structure that can hold or support a research study. And introduces and describes the theory that explains why the research problem under study exists. In this study I was follow the theory diffusion of innovation developed by an eminent American communication theorist and Sociologist Everett M. Rogers.

Diffusion of Innovation Theory

Diffusion of Innovation (DOI) Theory, developed by E.M. Rogers in 1962, is one of the oldest social science theories. It originated in communication to explain how over time an idea or product gains momentum and diffuses through a specific population or social system. The main four elements in the Diffusion of Innovation are Innovation itself, communication channels, time and social system. The end result of this diffusion is that people, as part of a social system adopt

a new idea, behavior or product (Rogers, 1983). Adoption means that a person does something differently than what they had previously. The key to adoption is that the person must perceive the idea, behavior or product as new or innovative.

Rogers further argues that an individual might reject an innovation at any time during or after the adoption process. This process is called the Diffusion of Innovation process. In this process there is five- steps process. These are:

- Knowledge- here, the individual or organization is exposed to the innovation for the first time but does not have concrete information about it and is therefore inspired to find out more about the innovation.
- Persuasion- at this stage would be users develop a keen interest in the innovation and the individual actively seeks detailed information about it.
- Decision- here, the decision on whether or not to adopt the innovation is reached based on the supposed merits, comparative advantage and demerits of using it.
- Implementation- at this stage, the individual puts the innovation into practice and assesses its usefulness depending on the situation and may be spurred into seeking more information about it.
- Confirmation- at this stage the individual makes up his/ her mind on whether to continue using the innovation or not. He/ she may decide to use the innovation optimally, sparingly or reject it.

Achieving complete success (if at all) in the adoption of a new innovation might usually take a considerably long time and sometimes this adoption is met with a lot of resistance from certain quarters of the society in which the innovation is to be diffused. And as Niccolo Machiavelli (1513) succinctly explains: “There is nothing more difficult to plan, more doubtful

of success, nor more dangerous to manage than the creation of a new order of things…" Medlin (2001) & Parisot (1995) have suggested that Rogers' diffusion of innovations theory is the most appropriate theory for the investigation of technology use in educational environments. The "old order" of things in academe insofar as knowledge dissemination goes is the teacher standing in front of a class facing the students and imparting knowledge. The teacher in this old order is the "all-knowing" custodian of knowledge and the student the passive receiver or in some instances just a knowledge repository. In this old order, the use of chalk and talk method, variously referred to as the exposition method of teaching, has been the predominant way of this kind of knowledge dissemination in schools (Opati, 2013).

Integration of ICT in Mathematics education is a technological innovation. Rogers asserts that implementation of an innovation is just one phase of a five stage process of diffusion of communication channels over time among the members of a social system (i.e., Mathematics learning environment). His theory argues that potential adopters of a technology progress over time through five stages in the diffusion process (Mathematics learning process). First, the Mathematics teachers and learners must learn about the innovation (knowledge); second, they must be persuaded of the value of the innovation (persuasion); third, they must decide to adopt it in teaching and learning Mathematics (decision); fourth, the innovation must be implemented by the Mathematics teachers (implementation); and finally, the decision of using ICT in teaching and learning Mathematics must be reaffirmed or rejected (confirmation) because Mathematics teachers and learners are critical in the whole process (teaching and learning Mathematics using ICT).

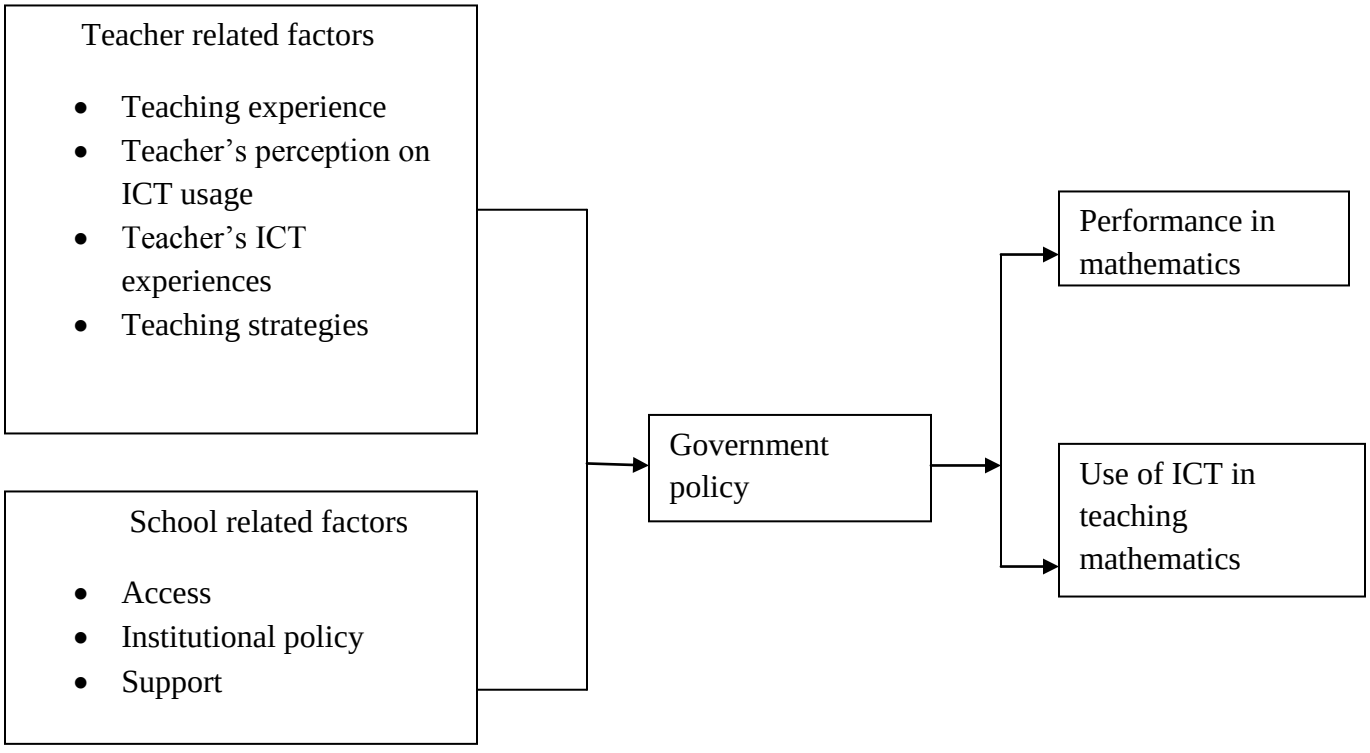
Conceptual Framework of the Study

This study was conceptualized on the teacher and schools related factors as the main factors that may influence integration of ICT in teaching mathematics in particular. The teacher related factors are those that directly influence teacher's use of ICT in the teaching process and include: teacher's knowledge and skills in the use of ICT, perception of teachers towards teaching by using ICT and teacher's experiences, among others.

On the other hand, school related factors refer to factors influenced by the institution. They include: support given to teachers by the school management which has a bearing on access to ICT facilities, school ICT policy, technical support in term of availability of experts and software required to keep the ICT tools functioning.

Government policies influence both the adoption of new technologies by the teachers and the schools, which in term, affected the extent of integration of ICT in teaching mathematics. The following figure summaries the conceptual framework for this study.

Figure 2.1: Conceptual Framework of the study



Adoption of ICT in teaching and learning was depending on both the teacher and school factors. For instance, if a teacher has the necessary skills and knowledge on how to integrate ICT in pedagogical practice then he or she was willing to try out this innovation and with time, he/she become confident in using ICT in teaching.

Chapter III

Method and Procedure

This chapter briefly presents the different methods and procedure will be used by the researcher in the investigation. It contains the research design, sample of the study, the instruments used in the collection and gathering of data, as well as the statistical tools used in processing and analyzing the data.

Research Design

This study had adopted mixed method research design. A mixed method research design included both qualitative and quantitative data. Creswell and Plano Clark (2007) state:

Mixed methods research is a research design with philosophical assumptions as well as methods of inquiry. As a methodology, involves philosophical assumptions that guide the direction of the collection and analysis of data and the mixture of qualitative and quantitative approaches in many phases in the research process. As a method, it focuses on collecting, analyzing, and mixing both quantitative and qualitative data in a single study or series of studies. Its central premise is that the use of quantitative and qualitative in approaches in combination provides a better understanding of research problems than either approach alone.

A mixed research methodology is employed in this study, because it balances the strengths and weaknesses of both quantitative and qualitative research (Creswell & Plano Clark 2007). There are many advantages to using a mixed method approach for this particular research focus, which is the effectiveness of ICT teaching method in secondary classrooms. This mixed method approach provides the best opportunities for answering the important research questions of this study, the answers of which rely upon a variety of forms of data. The quantitative section includes observation checklist and questionnaire. The qualitative section includes semi-

structured interviews. Creswell (2012) identifies three approaches of mixed method research design. They are:

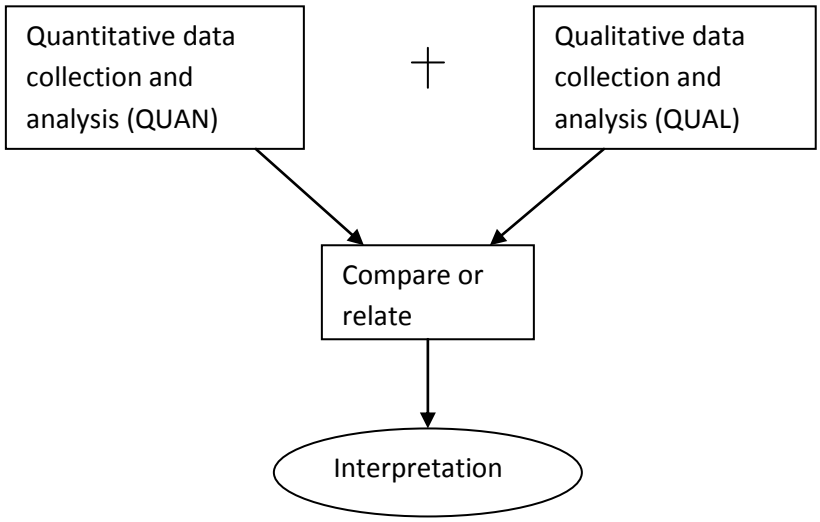
a) Concurrent or convergent or parallel design

b) Sequential design

c) Embedded design

The mixed method research design approach that is used in the study is concurrent design which is one of the classifications of mixed method research design identified by Creswell. According to Creswell, this design employs both qualitative and quantitative approaches concurrently.

Figurer 3.1 Concurrent design for this study



Location of the Study

The study was conducted in Rupandehi district. Rupandehi is one of the South Western district of Nepal; bordering India in south and Palpa, Nawalparasi and Kapilvastu in the North, East and West respectively. The district is divided into Ten Rural Municipality, five Municipalities and one sub- Metropolitan city.

Rupandehi is renowned at national level on education sectors for its infrastructure and achievements. District Education Office, Rupandehi under the Ministry of Education manages and governs the education in the district. There are more than 745 educational institutions in the district including public and private primary schools, secondary schools, higher secondary schools, campus, technical education and Madrassa. In the Rupandehi district there are 390 public schools including primary, lower- secondary, secondary; 264 public and private secondary schools wherever there are 145 public secondary schools.

Selection of Participant

This study totally related to ICT and their use in teaching Mathematics. According to DEO Rupandehi, in this financial year 2074/75 there was 34 public secondary schools that have received grants for ICT laboratories. From DEO, I received a list of those schools and observed. There are 54 mathematics teachers in 34 public secondary schools who teach class nine and class ten. From those teachers, I selected 34 mathematics teachers by purposively and entire Head teachers from selected schools.

Head teachers	34
Teachers	34

Tools of Study

Data for this was collected using an observation checklist, questionnaire and semi-structured interview developed by the researcher on the basis of research objective. In this research there were two objectives. For the first objective researcher used observation checklist, questionnaire and semi-structure interview. For second objective researcher used questionnaire and semi-structure interview.

Semi-Structured Interview

Interview is a kind of widely used data collection method of educational research. It is also a kind of oral questionnaire, which helps us to obtain detailed information about personal feelings, perceptions and opinions. The interview was semi- structured; it is a meeting in which the interviewer does not strictly follow a formalized list of questions. They will ask more open ended questions, allowing for a discussion with the interviewee rather than a straightforward question and answer format.

The interviewer prepare a list of question but does not necessary ask them all or touch on them in any particular order, using them instead to guide the conversation. In some cases, interviewer was prepared only a list of general topics to be addressed, called an interview guide.

In this research, researcher was prepared a set of interview guideline for Head teacher (Appendix D) and mathematics teacher (Appendix C) relevant to the study objectives. These interviews were recorded in the mobile phone and then transcribed and analyzed for common themes and participant experiences.

Observation Checklist

Observation is a systematic data collection approach. Researchers use all of their senses to examine people and things in natural setting or naturally occurring situations. Observation checklist enables the researcher to obtain first hand information on the ICT facilities in the school. Researcher was prepared a checklist (Appendix A) to find the condition of different ICT tools which are available in school.

Questionnaire

A questionnaire is a research instrument consisting of a series of questions for the purpose of gathering information from respondents. One form of questionnaire (Appendix B)

were developed which is given to mathematics teachers. This questionnaire was structured composed of close format, open- ended and rating scale type of questions.

Reliability and Validity of Tools

This study made on the basis of observation checklist, questionnaire and semi-structured interview. The format of those all tools prepared on the basis of review of related literature, conceptual framework and consult with supervisor.

Data Collection Procedure

Data collection procedure is a technique to collect data to fulfill the research objective. There are different methods to collect the data. In this research data was collected by semi-structured interview, observation checklist and questionnaire. In the process of data collection researcher spend almost one month from 2075/2/30.

For the collection of data first of all, researcher was visited the sample schools with authorized letter from Department of Mathematics Education and meet the responsible administrative staff, head teacher and mathematics teachers and ask permission for collect data. After getting the verbal permission researcher was observed the ICT laboratories of 34 public secondary schools. Secondly, in each school researcher requested with one mathematics teacher and give questionnaire after they fills up researcher collect that questionnaire and instantly took semi- structured interview with him/her. At last, researcher conducted semi-structure interview with Head teachers of 34 public secondary schools. The interviews were recorded in the mobile.

Data Analysis Procedure

Data analysis is the process of bringing order, structure and meaning to the mass of information collected (Mogire, 2013). Qualitative data refers to non- numerical information such as interview transcripts, notes, videos and audio recording, image and text documents. These types of data can be conducted through; developing and applying codes, identifying themes, patterns and relationships at last summarizing the data. In this research the qualitative data obtain from semi-structure interview were presented in different theme.

Quantitative data refers to numerical information. These types of data can be conducted through calculate mean, median, mode, percentage, standard deviation etc. In this research quantitative data obtain from observation and questionnaire. The data from observation was categories in interval and calculate frequency, percentage and presented by pie chat. In order to Yes/No type data researcher give number; Yes=1 and No=0 then calculate frequency, percentage and presented by pie chat. The data obtain from questionnaire was categories in discrete data or interval data then calculate frequency, percentage and presented by pie chat or bar graph. In order to determine teacher's perception toward ICT; researcher used following Likert five points scale.

Meaning Scales	**Scores**
Strongly agree	5
Agree	4
Undecided	3
Disagree	2
Strongly disagree	1

The collected data on teachers' perception were calculated by Frequency, Arithmetic Mean and Percentages.

Furthermore, an arbitrary 'level' was identified (strongly positive, positive and low) based on the average mean: (5+4+3+2+1)/5 = 3

This is used to organize and summarize data to provide a simple indication of the level of the means associated with each response. We can define greater than three as a "strongly positive" response, exactly three as a "positive" response and less than three as a "low" response.

Scale value	Response level
X<3	Low
X=3	Positive
X >3	Strongly positive

Note: X= mean of each statement.

At last, the whole data analysis process was guided from the figure 3.1.

Chapter IV

Analysis and Interpretation

This chapter deals with the analysis and interpretation of the data. According to the set of objectives of the study, researcher marked the responses of the Head Teacher and teachers very carefully and noted their outcomes systematically. Then on the basis of the observed and noted information the analysis and interpretation was carried out.

Physical Features

According to DEO Rupandehi, in this financial year they give 6,50,000/- rupees for 34 public school to facilitate ICT based teaching and learning. From this grant schools managed computer laboratory, add computer, laptop, and projectors. In the physical feature researcher present the schools' status on ICT tools and their use.

Figure 4.1 No. of computers in schools

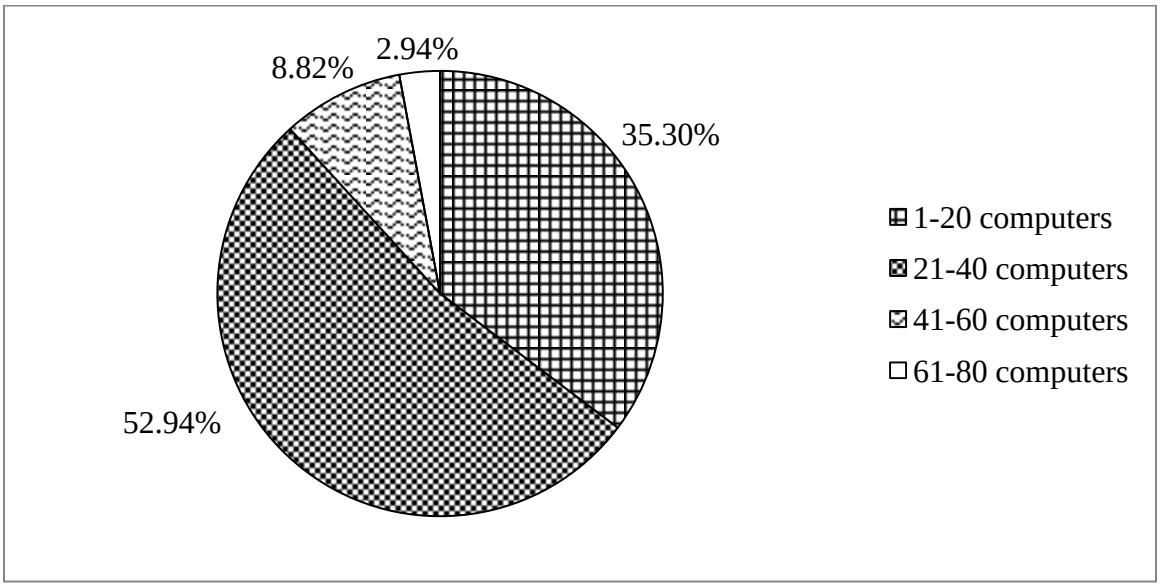


Figure 4.1 shows that 35.30% of school had 1-20 computers, 52.94% school had 21-40 computers, and 8.82% school had 41-60 computers while 2.94% school had 61-80 computers in computer laboratories.

In the public schools there were 50-60 students in each class. The school which had 1-20 computers, it indicated that the ratio of students in one computer was very high. On this situation one Head Teacher stated that:

"We have 10 computers in computer laboratory and minimum 45 students in each class. To handle this situation, teachers make a group, each group contains four to five students and they do practical classes." *(Head Teacher's view)*

The DEO's grant was fruitful for those schools that had few numbers of computers. The schools which had more than 40 computers that school teach technical subject like agriculture, computer science, civil engineer etc. in secondary level. From the research data, researcher found eight (see in figure 4.18) mathematics teachers used computer in their teaching. On the use of computer one mathematics teacher replied that:

"Our school is technical school teach computer engineer in secondary level but I teach mathematics in non technical classes and I did not use computer in my teaching time. I did not know how to use computer, projector and other tools on mathematics teaching. I only know about calculator which I used." *(Teacher's view)*

The DOI theory tells that when the teacher had knowledge and skill on how to ICT tools work and how we integrate ICT in pedagogical practices then he/she definitely try out this innovation. From the analyzing of above teacher's view, researcher concluded that He had knowledge about calculator, skill on how it works then he said I used calculator. If he had knowledge about how to use computer on teaching mathematics then at least he try to use this tool on teaching.

Figure 4.2 No. of laptops in schools

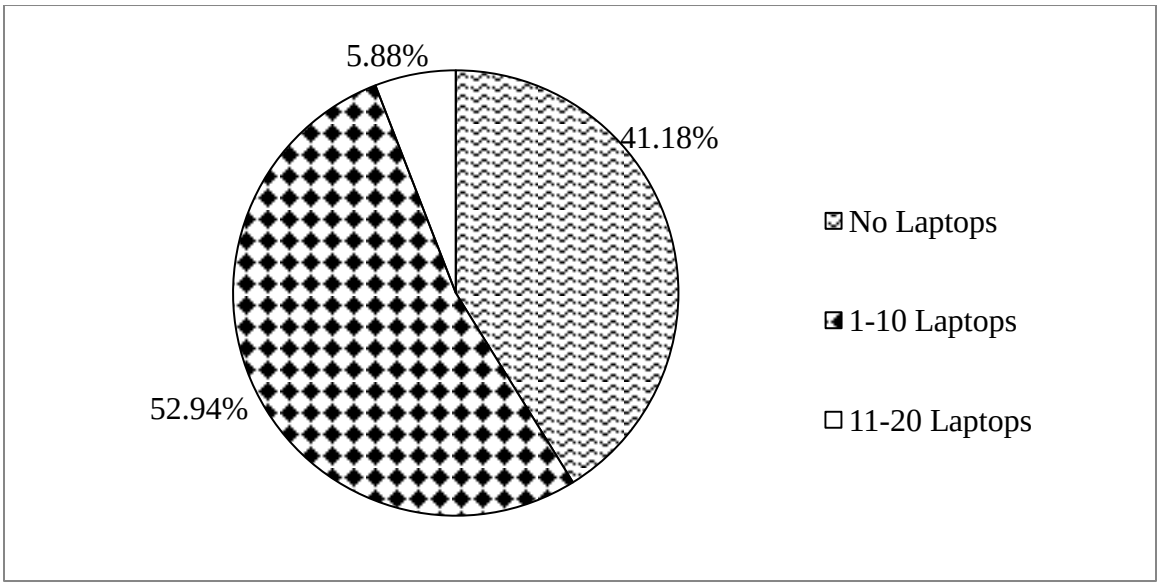


Figure 4.2 shows that among the 34 schools 41.18% of schools did not have laptops, 52.94% had 1-10 laptops, and 5.88% of schools had 11-20 laptops.

From the observation researcher found that only 11.76% of schools use these laptops for primary level students. They put laptops in classroom and taught from different videos. And remaining 88.24% of schools use laptops for alternating use of desktop. On questionnaire only six (see figure 4.18) mathematics teachers respond they used laptops in their teaching.

From the interview with mathematics teachers' researcher found that Mathematics teachers did not have access in ICT tools; if school management provides one/one laptops for each mathematics teachers then they would practice and use it in their teaching.

Figure 4.3 No. of projectors in schools

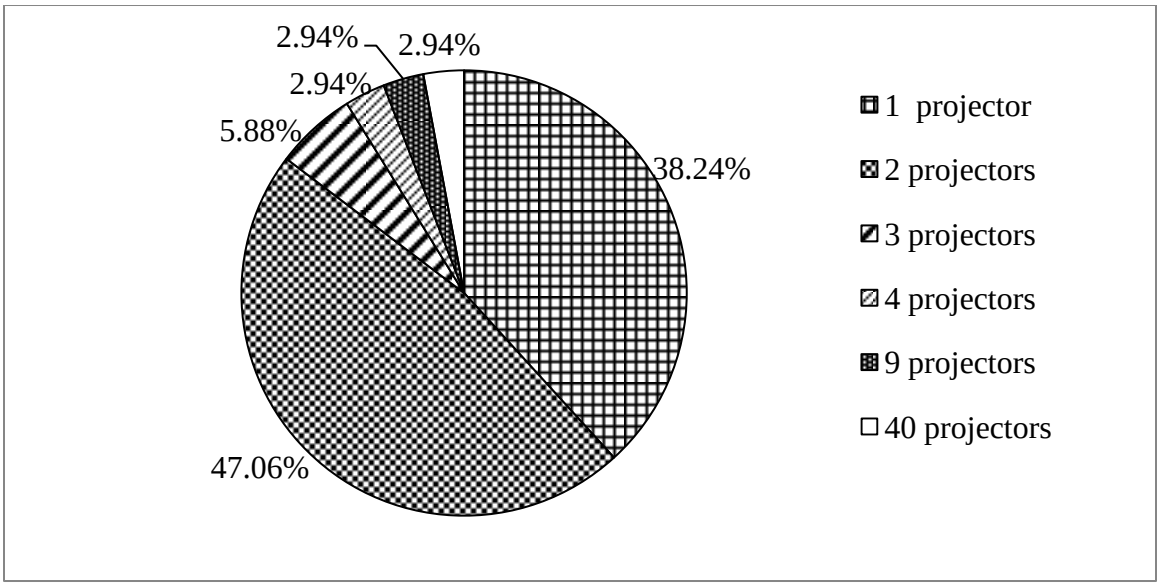


Figure 4.3 shows that 38.24% schools had one projector, 47.06% schools had two projectors, 5.88% schools had three projectors and three schools had four, six and forty projectors respectively which were 2.94% of total schools.

From the research, researcher found eight (see figure 4.18) mathematics teachers used projectors in their teaching. On the use of projector one mathematics teacher replied that:

"When our school bought a projector that time only our science teacher had knowledge about it. Then by the help of him I also learned. Nowadays sometime I used it to demonstrate download videos which is related to mathematical content." *(Teacher's view)*

Most of the schools did not use the projector frequently. Sometime science teacher, English teacher used this for their lesson. The school which has forty projectors, they taught technical subjects in secondary level like; computer engineer, civil engineer. And they put projector in their classroom. In these schools also mathematics teachers did not use projector frequently in their teaching because all teachers did not have knowledge about it.

Figure 4.4 No. of smart board in schools

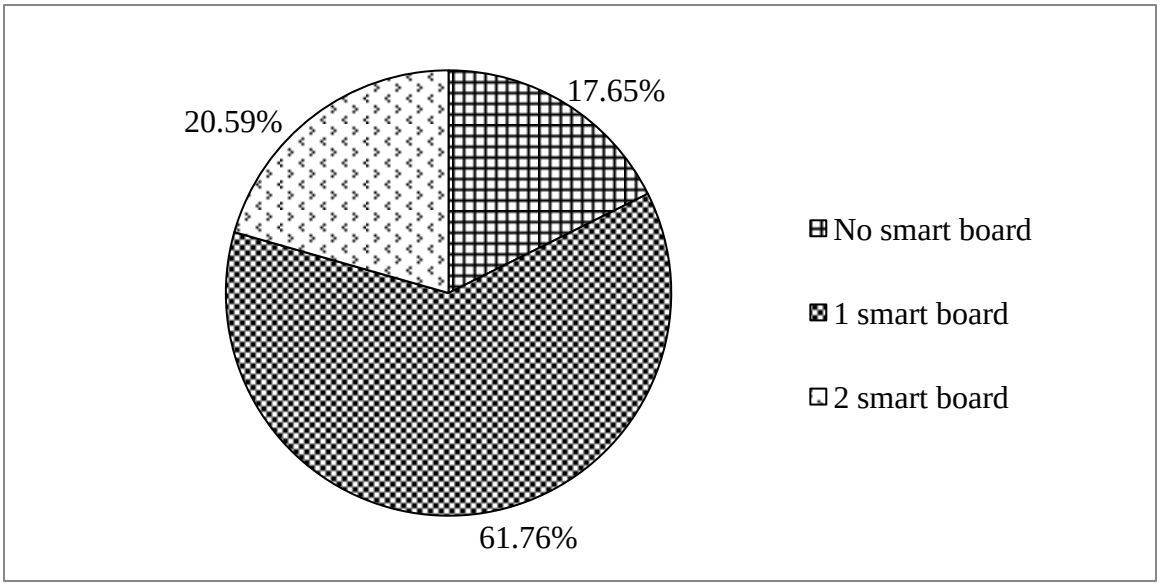


Figure 4.4 shows that 61.76% schools had one smart board, 20.59% schools had two smart boards and 17.65% schools did not have smart board.

This data reveals that 82.35% schools had smart board but from the interview researcher found that none (see figure 4.18) of mathematics teachers used smart board in their teaching. On the use of smart board one mathematics teacher stated that:

"Our school has two smart boards. I have little more skill and still practiced on it. I did not use this in my classroom teaching." (Teacher's view)

That mathematics teacher stated that he learned some skills on smart board by the help of school's ICT lab head sir and with the help of internet. On the use of smart board one Head Teacher stated that:

"We have smart board but we did not have manpower that has skill on it. We are waiting for training on use of ICT tools when DEO or NGO/INGOs conduct it." (Head Teacher's view)

Smart board, projector are the new concept in public secondary schools of Nepal. The government make a policy on ICT based teaching and learning program but did not make a plan to introduce ICT tools, training for its use. The schools bought ICT tools from the grant of government but they did not have manpower to use that tool.

Figure 4.5 computers bought by DEO's grant

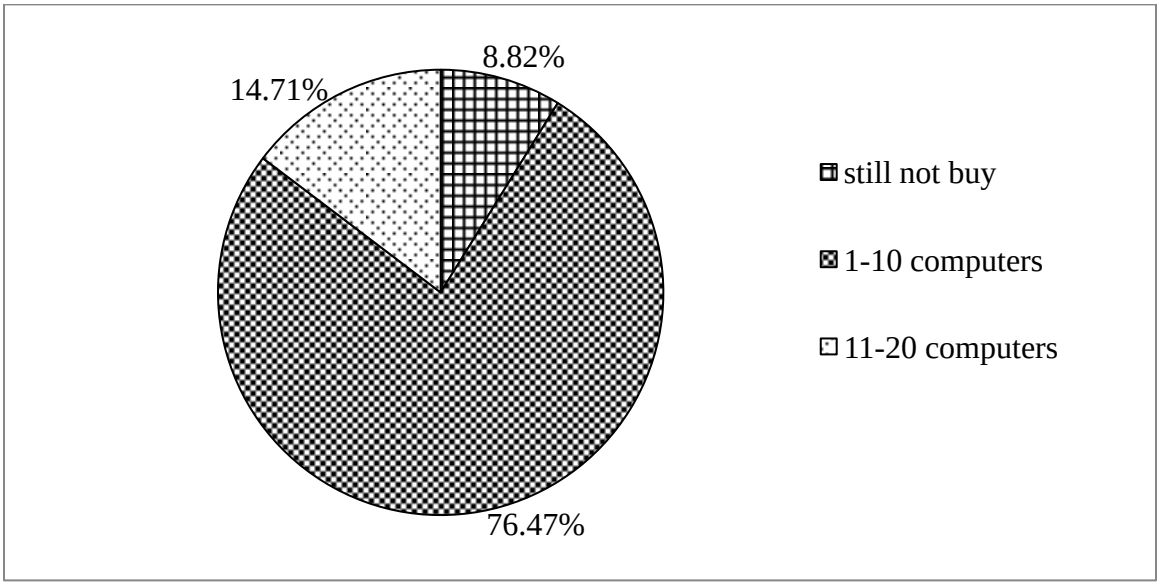


Figure 4.5 show that 8.82% of schools did not buy computers. These schools still did not use the grant which is given by DEO. In interview the Head teachers of these schools replied that:

"We are in the process of built new computer laboratories, rooms are almost ready. In 2-3 days we set furniture and then we sift current laboratory and add some new computers by the DEO's grant. We finished all these work under this financial year." (Head Teacher's view)

From above data 76.47% of schools add 1-10 computers, while 14.71% of schools buy 11-20 computers. In the interview some Head Teachers stated that:

"*The DEO's grant was not sufficient. From the grant we bought at most 12 computers. If we want to buy laptops, projectors, smart board then how can we buy." (Head Teacher's view)*

From the discussion research conclude that first of all DEO understand the schools necessity and economic condition then they distribute the sufficient grant and be good supervision. So, the grant/fund from government or different agencies also influences Integration ICT in teaching.

Figure 4.6 computers are in the ICT laboratories

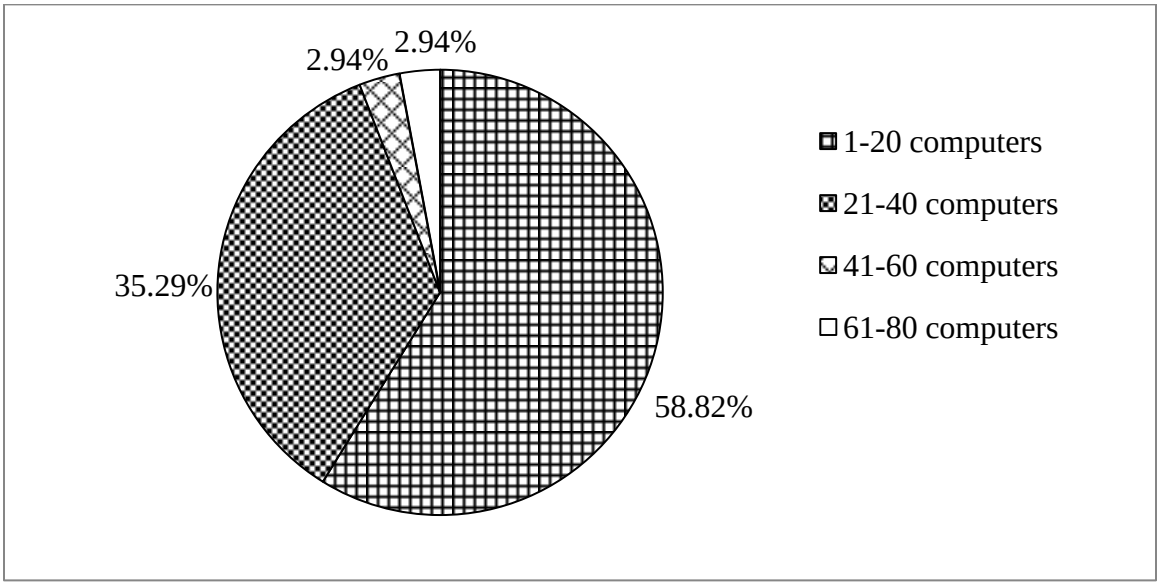


Figure 4.6 revels that 58.82% of schools had 1-20 computers in their computer laboratory. The 35.29% of schools had 21-40 computers and 2.94% of schools had 41-60 computers and only 2.94% had 61-80 computers in computer laboratory.

All most Head teachers stated that they had at least two or three computers in their account section and in library also. They do their administrative work by using computer. But in public secondary schools there are 50-60 students in each class then the schools which had 1-20 computers and 21-40 computers; how they give one/one computer to practice their students in ICT laboratory. If school start computer based teaching then firstly they had sufficient number of computers in their ICT laboratory. So, the sufficient number of computers also affect in use of ICT in teaching mathematics.

Figure 4.7 computers are in good condition

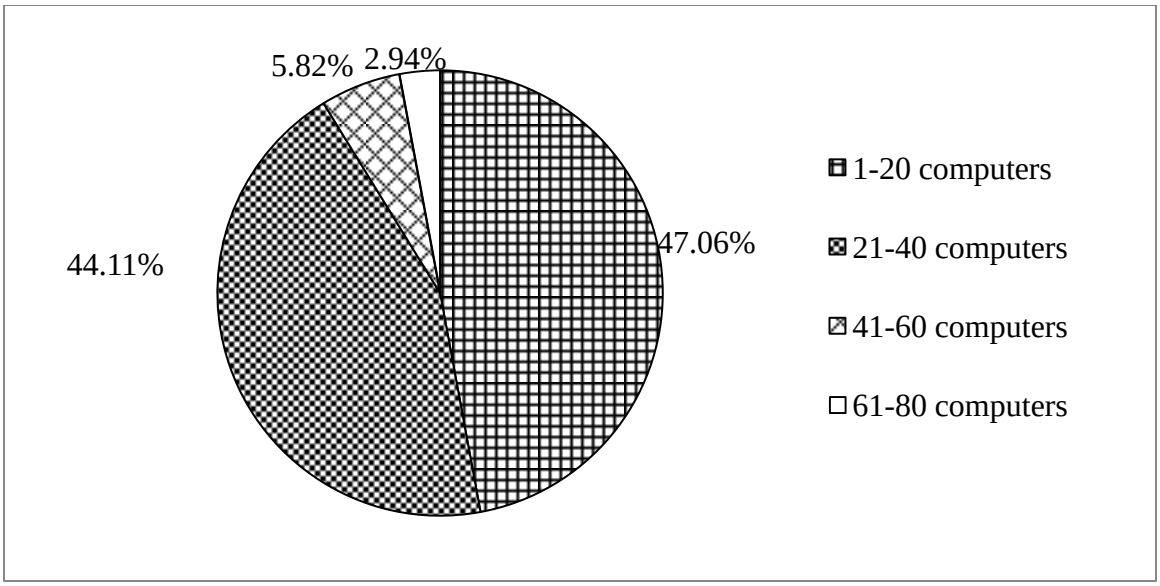


Figure 4.7 shows that 47.06% of schools had 1-20 computers in good condition, 44.11% of schools had 21-40 computers and 5.82% of schools had 41-60 computers in good condition while 2.94% of schools had 61-80 computers in good condition. From the figure 4.1; the 52.94% of schools had 21-40 computers but 44.11% of schools had 21-40 computers in good condition it shows that there are some computers which are did not work that need to repair.

From the observation all most schools had four to five computers which was did not work, that was need to repair. On this situation one Head Teacher stated that:

"Nobody notice there, we spend 10-20 thousand monthly to repair computers. We did not have technician in school. We call him to repair and pay money which was costly. We feel the DEO and also school management community beyond this situation." (Head Teacher's view)

The DEO give grant for add new computer but they did not care the situation of maintenance, technician, cost etc. if they help schools to make ICT based teaching and learning program then they also provide one computer technician.

Figure 4.8 Internet connectivity

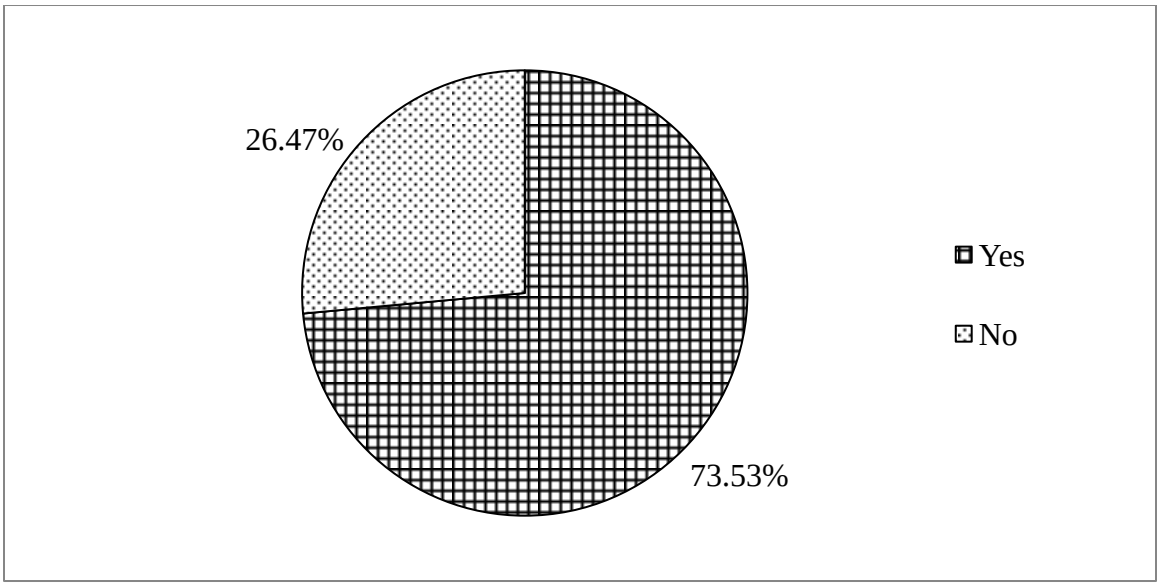


Figure 4.8 shows that 73.53% schools had internet connectivity and only 26.47% schools did not have internet connectivity. In the conversation with Head teachers they stated that:

"We are connecting Internet in our office and staff room, it was very slow and it did not work properly. Government did not support for internet connection. We are self buy but we did not afford high speed internet." *(Head Teacher's view)*

"We did not have internet connection. After few days, I am calling for technician to connect internet but he did not come." *(Head Teacher's view)*

73.53% of schools had internet connection; among these schools only 10 schools had internet connection in ICT laboratories. Other 15 schools connect internet in their office room and account section. From the interview with teachers' they stated that:

"Our schools connect internet in staff room. When I have free time I try to open facebook, YouTube but it take more time, if it open then it did not work properly. So I am used my mobile data." *(Teacher's view)*

The schools which taught technical subject, there Head teacher stated they connect internet in their computer laboratories and student use it. But the mathematics teachers stated that:

"Our school connect internet in ICT laboratories, it work properly but I did not use it in mathematics teaching because I did not have time to practice with internet and ICT tools. At 6 am I entre at school and teach till 6 pm then when I practice with internet at school."

(Teacher's view)

From the analysis of above data 73.53% of the schools had internet connection. But it work slowly. The government did not help for internet. Due to the economic condition schools did not afford high speed internet connection. Mathematics teachers stated that although there have internet connection they did not get time to practice with internet and ICT tools. So, the access internet, time, practice also affect the use of ICT in teaching mathematics.

Environment of Computer Laboratories

Here environment of computer laboratories means the condition of computers arrangement, furniture, ventilations, lighting, temperature and cleanness etc. in computer laboratory, which was important aspect of the day-to-day environment for students.

From the observation of schools' researcher found there was the bad condition of computer laboratory. The computer laboratory was small in size. Due to the lake of classroom some schools made computer laboratory and library in same classroom (see Appendix-H). In some schools Computers and chairs were not managed by systematically way, Cables was not put safely (see Appendix-I). In some schools ventilation in classroom was good, classroom was small but the windows were big in size, from these windows fresh air passing through in the classroom and looking clear (see Appendix-J). Among the 34 schools five schools start to build

new computer laboratory, made new style furniture, spread carpet but still they did not know when they finished decoration and start to use this laboratory. Three schools have good computer laboratory they have sufficient computers, attractive decoration, good ventilation and lighting (see Appendix-k). Only one school has air condition in computer laboratory, good lighting (see Appendix-L) and school managed high power generator for power backup. But other school worried about the electricity and week internet connectivity. All most schools did not care about cleanness in computer laboratory. On the floor, table and also desktop have dust, the laboratory look alike it did not use from several days.

Background Information of Teachers

There are 54 mathematics teachers in 34 public schools who teach mathematics at secondary level. Researcher was interviewed only the 34 mathematics teachers. These teachers are selected by purposively. Teachers were required to indicate their gender, age and teaching experience as a source of their background information. This was to establish their experience, age and gender.

Figure4.9 Teachers' age

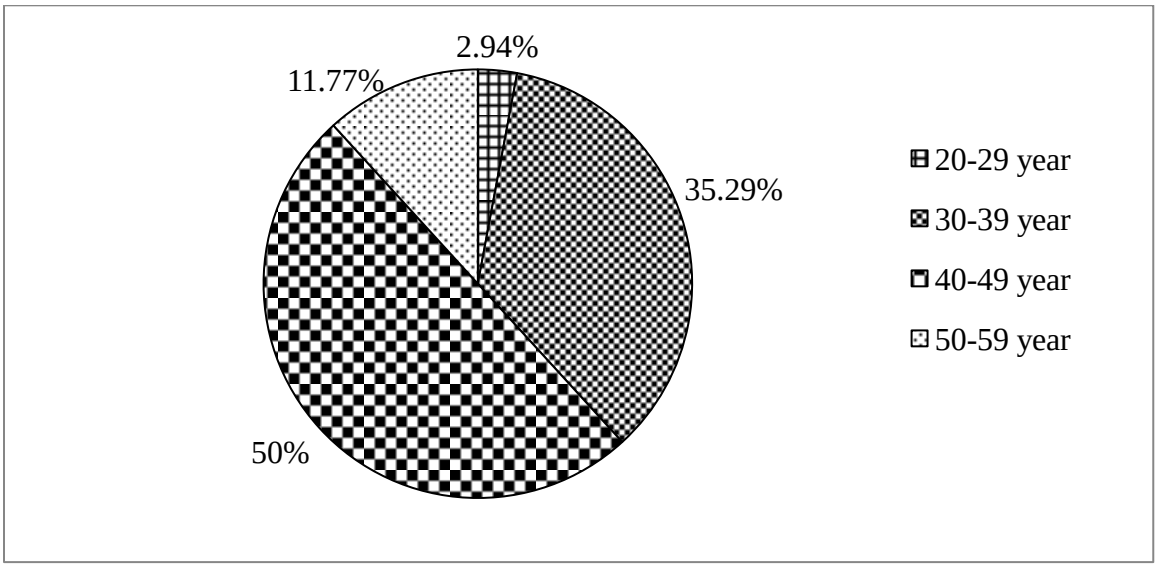


Figure 4.9 revels that 35.29% of participants were aged 30-39 years. Teachers were between the age 40-49 and 50-59 are 50% and 11.77% respectively. Only the 2.94% of teachers were aged 20-29.The finding indicated that 61.77% of the mathematics teachers were the aged above 40 years.

Sheila (2016) claim that younger teachers were more responsive in using ICTs facilities than older teachers in Kenya. But the finding indicated that in Rupandehi district older teachers were more responsive in using ICTs facilities than younger teachers.

In the research time researcher found 53 years old mathematics teacher. On the use of ICT tools that teacher stated that:

"I had 28 years experiences on mathematics teaching. In 2050BS, I finished my B.Ed. program. That time we did not have mobile, computer, internet etc. our teachers teach by using chalk, duster, black board, and calculator. I also use those tools but nowadays it's little change that is now; I use white board in my teaching." (Teacher's view)

Almost mathematics teachers were 40 years older in age and they were educated by people who became educators before the arrival of computer in teaching. The older teacher did not want to use ICT tools in their teaching. They stated they had old age and they face difficulties to practice with ICT tools. So, the age factor also influences the use of ICT in teaching mathematics.

Figure 4.10 Teachers' gender

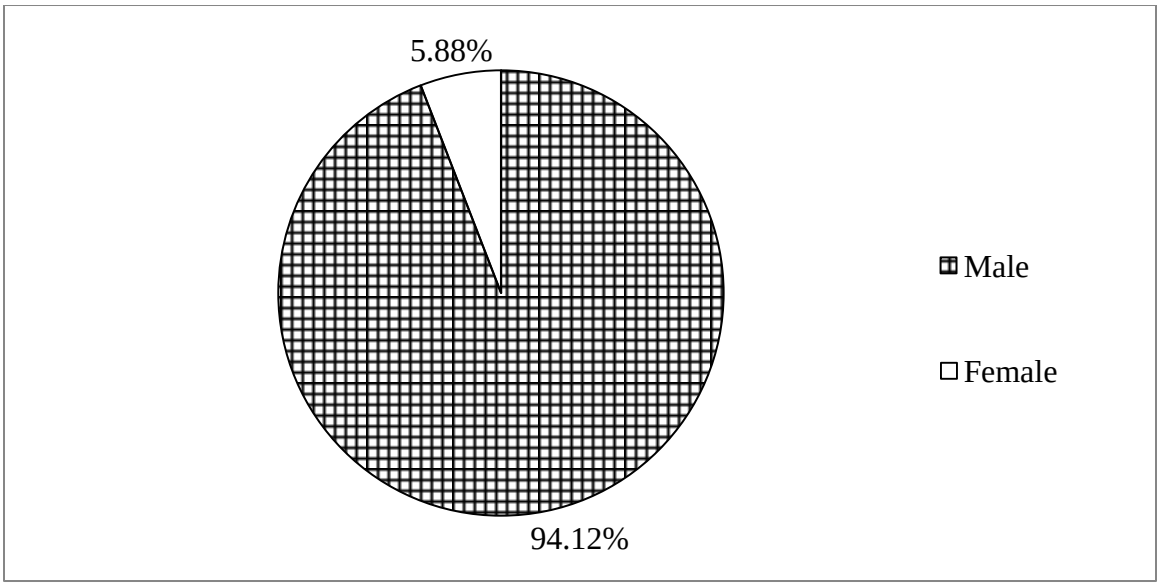


Figure 4.10 shows that 94.12% of mathematics teachers were male and 5.88% of mathematics teacher were female. About the use of computer female mathematics teachers responded that:

"Honestly, I didn't know how to open computer. I didn't have time to practice with computer. After school I spend some time with my child and family. Then I have no time."

(Female Teacher's view)

"I have internet at home. We can search information on the websites, but I have not done that. I even do not have good skills and confidence on it. If it had come in our time, we would have good knowledge and skills of the computer. It came later, and we are late."

(Female Teacher's view)

These above results indicate that mathematics teaching in Rupandehi district is done mainly by male teachers. Out of 34 schools only two schools had female mathematics teacher. And they did not have sufficient knowledge on computer. In the interview they stated that they did not use computer because they had no more skill on computer and they did not have time to

practice with it. Research studies revealed that male teachers used more ICT in their teaching and learning processes than their female counterparts (Kay, 2006; Wozney, Venkatesh, & Abrami, 2006). It is also true in Rupandehi district because female mathematics teachers did not use internet although they have internet at home and did not used computer in their professional work. They did not have any more time and did not have good skill on computer use, so that researcher conclude that gender, time, interest influence the use of ICT in teaching mathematics.

Figure 4.11 Professional Qualification of Teachers'

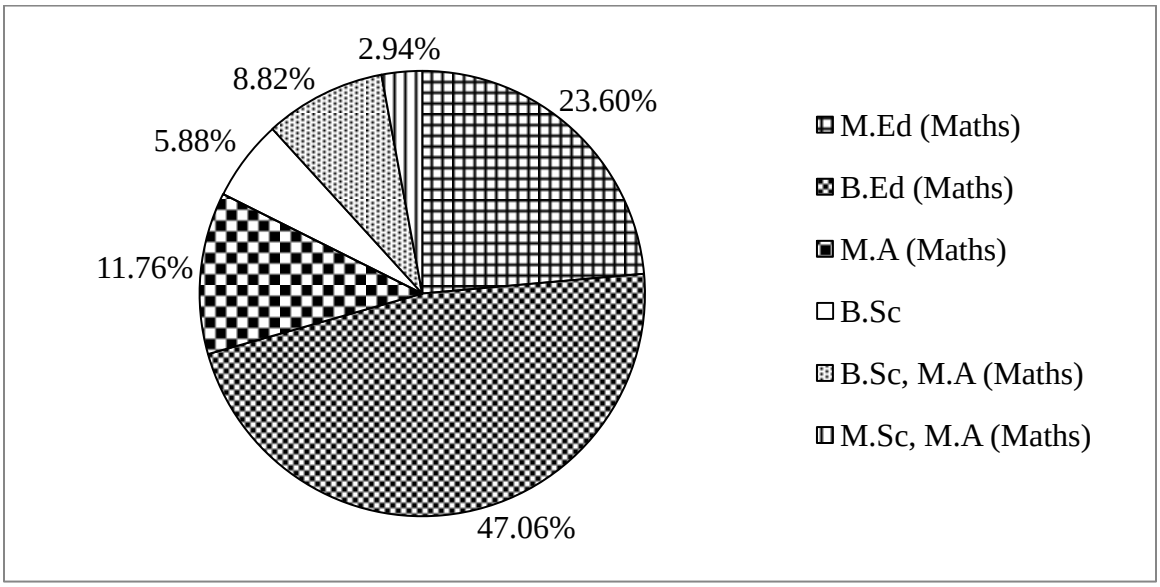


Figure 4.11 show that 23.60% teachers had M.Ed. (Maths), 47.06% teacher had B.Ed. (Maths), 11.76% teachers had M.A. (Maths), 5.88% teachers had B.Sc, 8.82% teacher had B.Sc and M.A (Maths) and 2.94% teachers had M.Sc and M.A (Maths). 70.6% mathematics teachers are from education faculty.

Mogire (2013) state that in secondary schools of Kisii Central District Kenya 59.4% Mathematics teachers had B.Ed. Education and only 12.5% teachers had M.Ed. Education. From this result researcher conclude that Rupandehi District had a good number of qualified mathematics teachers. On the use of ICT in mathematics teaching M.Ed teacher stated that:

"I had doing my Master from Tahachal campus. That time we did not studied about ICT on education faculty. Teachers also did not use any ICT tools for teaching. But I have knowledge on computer from the intuitions I learned basic three months course on computer. When our school bought projectors then from internet I learned litter more knowledge on it but I did not used in teaching." *(M. Ed Teacher's view)*

"In 2050 BS, I had doing my B.ED from Butwal Multipal campus. That time we did not studied by using computer. From teachers and students I hear about computer and mobile phones they told from mobile we are call America, we are talk there but nowadays, it is common. Everyone know about Facebook, YouTube, Viber etc. I want to use this application so I practice with my children and friends also. But in mathematics teaching, I did not want to use computer and projector. I feel comfortable with my traditional teaching." *(B.Ed Teacher's view)*

"I am studying M.SC in Butwal Multiple campus but I was doing my M.A from Pokhara University. I used computer and it is very helpful in my study. I also have skill on projector but I still did not use it in teaching because I did not have time to make materials on computer."

(M.Sc, M.A Teacher's view)

Tribhuvan University Faculty of Education (TUFOE) has started a new course in both Bachelor and Master's level on Information and Communication Technology Education since 2013 (MICTED, 2013). Faculty of Education started M.ICTEd. programmes in Sanothimi Campus Department of Information and Communication Technology, Bhaktapur, Nepal. M.ICTEd. course is designed to meet the needs of Information Technology professionals. The basic objective of this program is to prepare skilled and qualified instructors and teachers for ICT (Dhakal & Pant, 2016)

From the above data researcher conclude that none of the mathematics teacher studied B.ICTEd. and M.ICTEd. The participant mathematics teachers all know about the importance of ICT in teaching but they did not have skill on how the technologies used in teaching process. The younger B.Ed, M.Ed, B.Sc, M.A, M.Sc teachers are stated that if they get training on ICT use, get time to practice with ICT then they used ICT tools in teaching mathematics. So, the researcher concludes that only qualification did not influence the use of ICT in teaching it influence if qualification and age, training, time, access, interest came together.

Figure 4.12 How long have you served as a mathematics teacher?

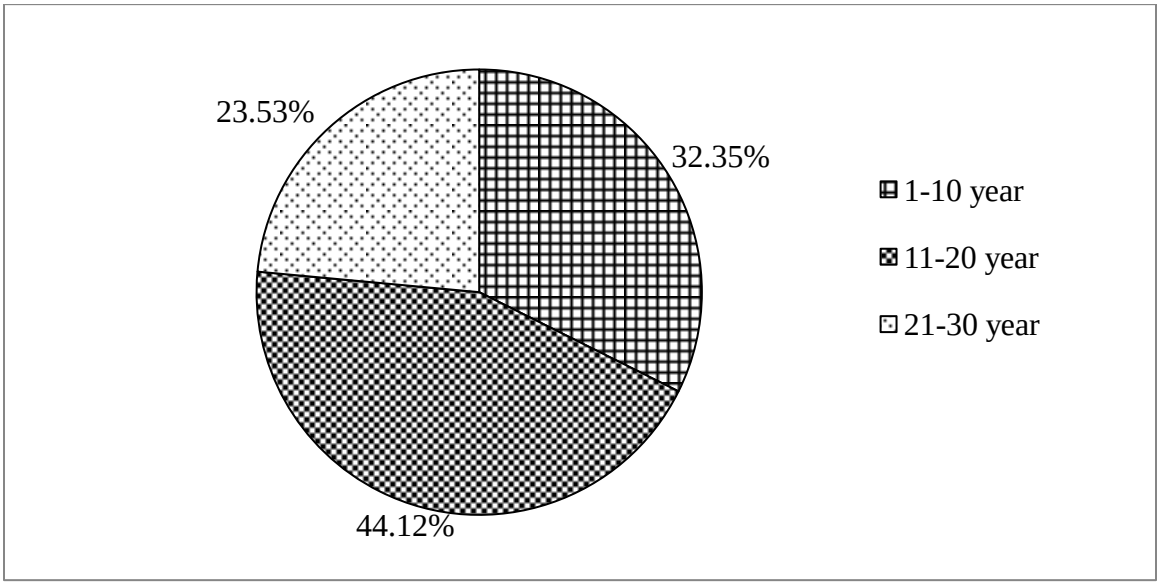


Figure 4.12 Shows that 32.35% of teachers served 1-10 year as a mathematics teacher. 44.12% served 11-20 year while 23.53% served 21-30 year as a mathematics teacher. Here was the high percentage of teacher who served 11-20 year as a mathematics teacher. On the experiences of mathematics teaching teacher stated that:

"I have 28 year of experiences on mathematics teaching. When I started teaching that time student are few in number, they sit on the floor. We are teaching by using chalk, duster and used calculator to solve numerical problem in mathematics but nowadays I hear government

start a new concept on mathematics teaching. Our school also buy computer, projector. I did not have knowledge on computer and other technology. Now, I did not want to practice with these tools." *(Teacher's view)*

"Next year I stated job as a mathematics teacher in this school. I have a little more knowledge on computer and projector. I still did not use these tools in teaching time. If I get training, information and time to practice, I definitely use these tools in my teaching time." *(Teacher's view)*

Most research showed that teaching experience influences the successful use of ICT in classrooms (Wong & Li, 2008; Giordano, 2007; Hernandez-Ramos, 2005). Baek, Jong & Kim (2008) claimed that experienced teachers are less ready to integrate ICT into their teaching. Similarly, in United States, the U.S National Centre for Education Statistics, 2000 reported that teachers with less experience in teaching were more likely to integrate computers in their teaching than teachers with more experience in teaching.

Here, in our context all most teachers have more than 10 year's experiences. They have confidence on their teaching and have more experiences on dealing with students. From their stating they use traditional teaching method. So, they did not want to adopt the new teaching style. But the less experience young teacher wants to change the teaching method if they get training and more information about it. So, by the above discussion researcher conclude that teaching experiences, teaching method, time, knowledge, skill and interest influence the use of ICT in teaching mathematics.

Figure 4.13 Do you know about ICT

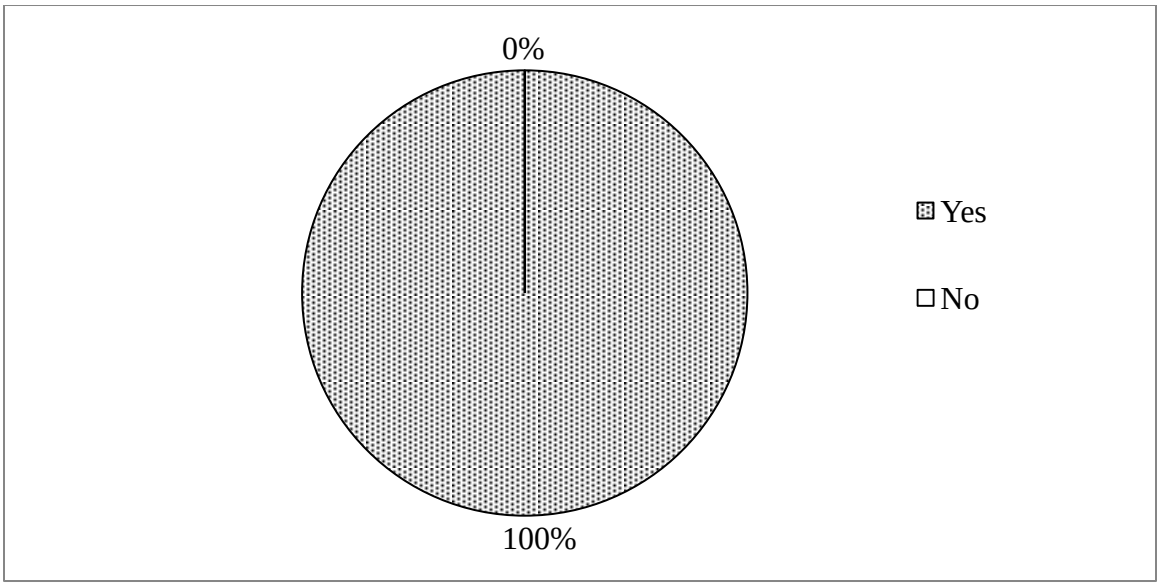


Figure 4.13 shows that all 34 teachers know about ICT. In interview with them, they define ICT in different ways:

"ICT is knowledge about computer and applications which are include in computer like Microsoft word, excel, PowerPoint, facebook, YouTube and many more." (Teacher's view)

"ICT is the Use of Multimedia." (Teacher's view)

"In the context of education ICT means that electronic tools which support teaching and learning process like calculator, radio, television, computer, projector etc." (Teacher's view)

The mathematics teachers who teach mathematics in secondary level they know about what ICT is and what is its importance in classroom teaching but they did not have enough knowledge and skill about their use. They were failed on the implementation of ICT tools. By the DOL theory, mathematics teachers had knowledge about what are ICT tools and what its importance. They persuaded the value of ICT but they can't decide using ICT in teaching and learning mathematics because they did not have the idea how they implement ICT tools in teaching and learning mathematics. So, firstly it is necessary to conduct training on ICT

integration in teaching. Thus knowledge and training on ICT use influence most to integration ICT in teaching.

Figure 4.14 Do you have computer knowledge?

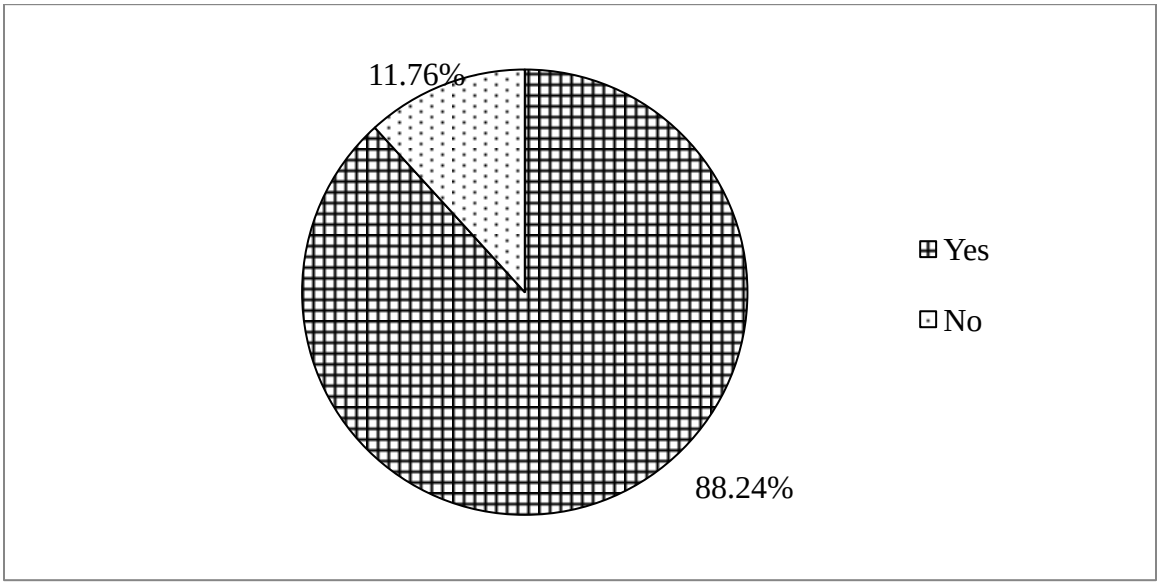


Figure 4.14 shows that 88.24% teachers had computer knowledge and 11.76% teacher did not have computer knowledge. Mathematics teachers who had knowledge about computer they used the following application which is present in percentage.

Table 4.1 percentages of teachers who used computer application

Applications	**Percentages (%) (N=30)**
Microsoft word	100
Excel	36.67
Power point	16.67
Email	50
Game	20
World Wide Web	60
Facebook	66.67

Table 4.1 show that 100% of mathematics teachers who know about computer they use Microsoft word. The 36.67% of teachers use excel, 50% of teachers use Email, 60% and 66.67% of teachers use World Wide Web and Facebook respectively. While 20% of mathematics teachers use Game and only 16.67% of teacher use Power point on their computer.

Researcher asked to mathematics teachers "Do you have computer knowledge?" teachers replied that:

"Yes I have, I use Word Processing, Power Point, Facebook, You Tube and some time World Wide Web on my computer. I want to use these applications on my teaching but I did not have sufficient time and did not have laptops to practice with these. If I get time and laptop then I used computer, projector and smart board also." *(Teacher's view)*

"Yes I have computer knowledge but I did not get training on computer use. When my children are practice with computer, I saw and I practiced at my free time." *(Teacher's view)*

"*No I did not have knowledge on computer use. Nowadays computer knowledge is essential part for everybody, sometime I feel I did competent with other teacher because I did not have those types of knowledge."* *(Teacher's view)*

The analysis of above data reveals that 88.24% of mathematics teachers had knowledge on using computer out of them 100% use Microsoft Word and 36.67% teachers use Excel for their professional work like making question paper, making result etc. only 16.67% mathematics use Power point on their computer. They stated that they did not use computer and their application on their classroom teaching. It is happening because of lack of sufficient knowledge, did not access on ICTs, lack of time and lack of training on use of ICT tools. So, knowledge, access, time and training are the influencing factors on using ICT in teaching mathematics.

Figure 4.15 Do you have training on computer use?

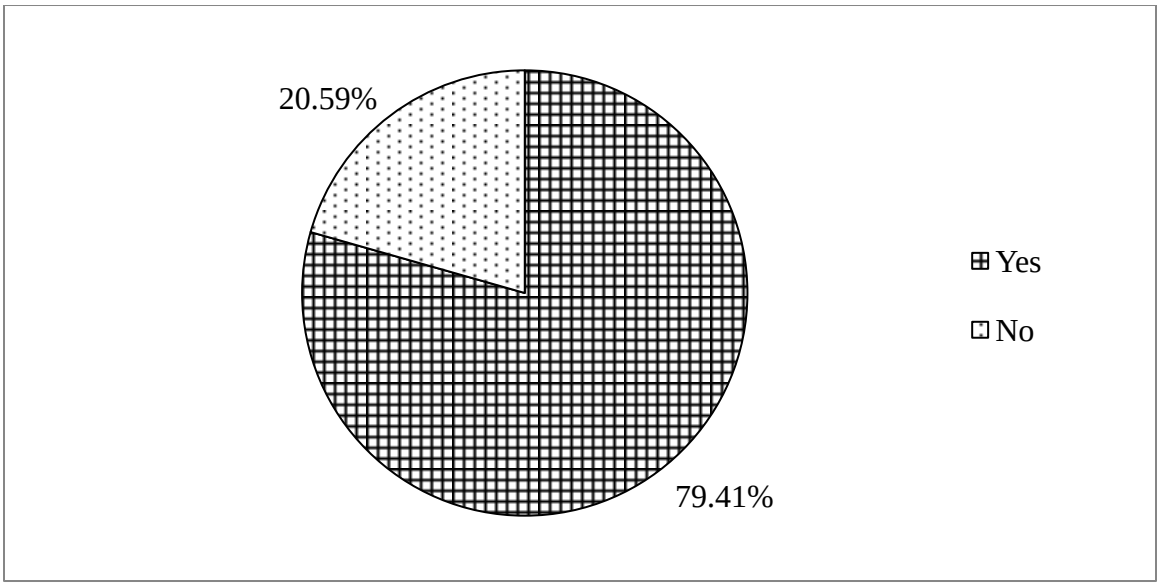


Figure 4.15 shows that 79.41% mathematics teacher had training on computer use and only 20.59% did not have training on computer use. Mathematics teachers who get training on computer they had different course on computer. This is in the following table:

Table 4.2 percentage of teachers who had computer course

Computer course	**Percentage (%) (N=27)**
Basic	77.78
Basic + Tally	14.81
Basic + Advanced	3.70
Basic + Tally + Advanced	3.70

Table 4.2 shows that 77.78% of mathematics teachers did Basic computer course. 14.81% did basic and tally. While 3.70 % of mathematics teachers did Basic and Advance course. Similarly 3.70% of teacher did Basic, Tally and Advanced course. In the interview with them

they stated that they get this training from institution or from TPD. On the computer training mathematics teacher stated that:

"I have done basic three- month computer training while I was doing my B.Ed., but I forgot most of it. I forgot most of the skills." *(Teacher's view)*

"I have got an opportunity to participate on TPD training conduct at Kalika secondary school. That time we were 20 mathematics teachers from 20 public secondary schools. it was a training on basic computer course where we learned typing question paper, making mark sheet, store data, making slide etc. after that time I feel, we all teachers should have knowledge on computer and it is very important in mathematics teaching also." *(Teacher's view)*

From the above discussion researcher conclude that 79.41% of mathematics teacher had basic computer knowledge. They use Microsoft word, power point, excel, email etc. but they did not have how these applications used on their teaching. It is indicated that training on ICT use, practice with ICT tools and supervision from related agencies are affect the use of ICT in teaching. So, the school management community and the responsive agencies give attention on it.

Figure 4.16 Do you have training on integration ICT in mathematics teaching?

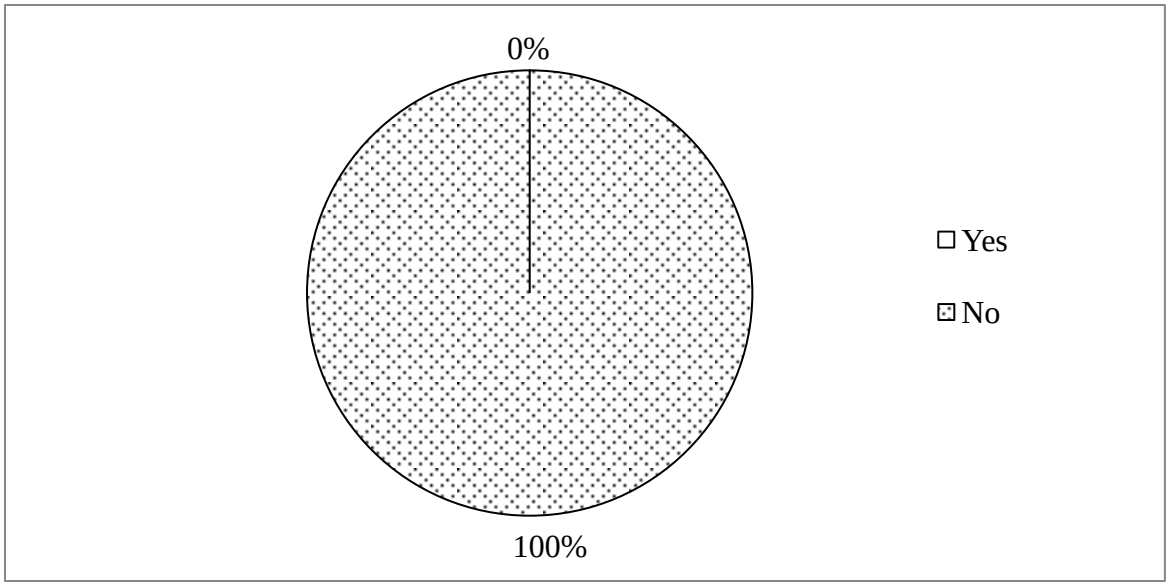


Figure 4.16 show that none of the mathematics teachers had training on ICT integration in mathematics. Researcher asked to participant teachers "Do you have training on integration ICT in mathematics teaching? One participant teacher replied that:

"I got an opportunity for training in basic computer skills from the school. After a long time I got computer training. There were teachers from 20 secondary schools. They talk about teaching lessons using computer technology but it was more about how to store school data on software. We prepared a simple plan, slide and presented in the hall. It was not a very effective and practical activity. Government projects are like that. They just taught us how to fill in the data and how to keep children's information but not for how to use ICT in teaching and learning." *(Teacher's view)*

In 2071, British Council gives 3 days' basic computer training for Head Teachers and accountant at Kalika secondary school, Butwal where all most Head Teacher was participates. But for the mathematics teacher any NGO/INGOs and DEO did not provide computer training. One mathematics teachers responded on it:

"I did not have training on integration ICT in teaching and learning mathematics. We have ICT tools and we know the importance of ICT in teaching so, the responsible agencies conduct training on it. We are waiting for training." *(Teacher's view)*

National Centre for Educational Development (NCED) under the Ministry of Education is responsible for generic in-service teacher training it develops training programmes for early childhood, primary and secondary school teachers and conducts training in the schools (NCED, 2017). However, the training does not cover ICT integration in pedagogy. NCED organizes teacher professional development (TPD) for teachers through Resource Centers. The participants in this study received in- service training provided by government but do not cover ICT training.

Mathematics teachers have little more knowledge on computer. They used some application on computer. From interview with them it is noticed that they want training on ICT tools and their use. Also they indicated they did not get time to practice with ICT tools. So, the training on using ICTs in teaching and learning mathematics and get time to practice with ICT are the essential factors of integrate ICT in mathematics teaching.

Use of ICT tools in Mathematics Class

ICT which is the necessary equipment of teaching and learning activities, has a significant role in improving knowledge and skills of teachers and students apart from preparing them for the life in the education and training (Aşkar & Olkun, 2005). It is necessary to understand how ICT is used in the classrooms, which educational purposes it serves, what role it plays for the success of the learning process, educational program and educational policy (Papanastasiou, Zembylas, & Vrasidas, 2005).

In this study researcher try to know in Rupandehi district, what is the status of mathematics teachers in the use of ICT tools in their teaching? For this, researcher fills up

questionnaire from mathematics teachers and conduct semi- structure interview with them. Here researcher presents the obtained data.

Figure 4.17 Do you use ICT tools in mathematic teaching?

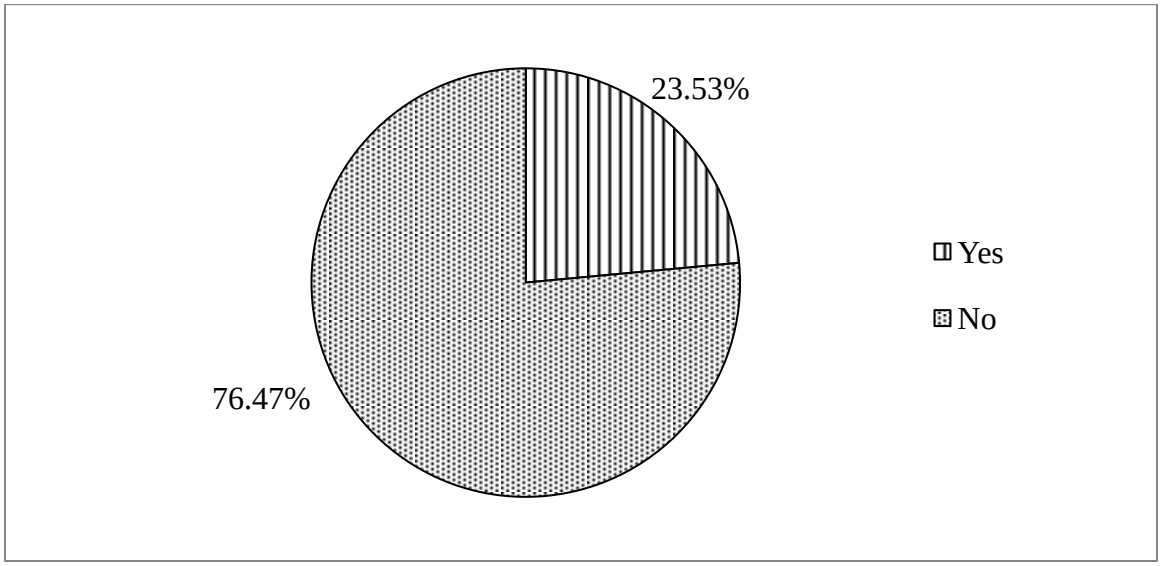


Figure 4.17 show that 23.53% of mathematics teachers used ICT tools in classroom teaching and 76.47% of mathematics teachers did not use ICT tools in mathematics teaching. The 23.53% of mathematics teachers used the following ICT tools.

Figure 4.18 Technologies used in classroom for teaching mathematics (N=8)

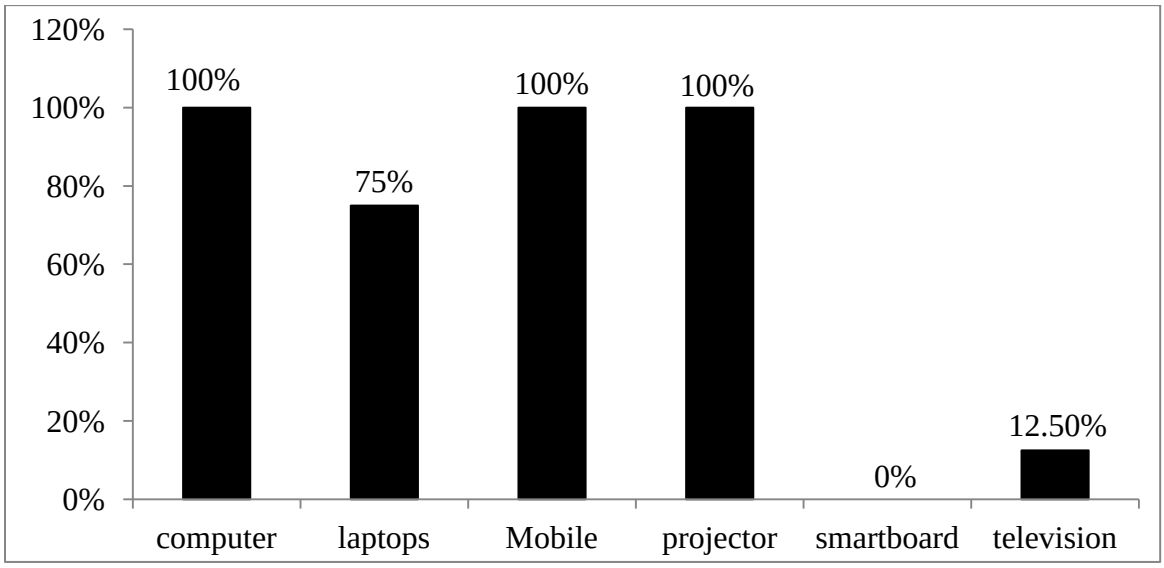


Figure 4.17 show that in 23.53% of mathematics 100% of mathematics teacher used computer in teaching mathematics. The 75% of teacher used laptops, 100% teacher used projector in their teaching. In the questionnaire teachers who tick on computer they also tick on mobile, projector. It concluded that teacher who used computer in mathematics teaching that also used projector in teaching. And 12.50% of mathematics teachers used television but none of the mathematics teachers used smart board in their teaching.

Alharbi (2014) found that mathematics teachers in Kuwait include projector based software/hardware, internet and movie/subject based software in their teaching. In our context only 23.53% of mathematics teachers used ICT tools in their teaching. They used computer, laptops, projector, mobile, television etc. The mathematics teachers who stated they used ICT tools in their teaching also they did not used these tools frequently. It indicated that our status on use of ICT in teaching mathematics was not good.

On the use of ICT tools in mathematics teaching teachers' stated that:

"Sometime I used computer and projector in classroom teaching because I did not have time to prepare with computer. I teach secondary level mathematics and our student face SEE exam. So, we are conduct extra classes for their and then we are also work hard."

(Teacher's view)

"I used mobile to download content related YouTube videos and demonstrate that videos by using projector. I did not found material for all mathematical content and did not have time to present all; we have pressure to finish the course in time." (Teacher's view)

"I used only calculator but it is not daily some time when I need. Other ICT tools; no I did not have knowledge how to use these on mathematics teaching. But one thing, if I used ICT tools and teach mathematics content with ICT then our evaluation system evaluate this?. It is not

because in our context the evaluation system was paper-pencil test. So, firstly government change the curriculum and evaluation system then they called we are ready to integrate ICT on teaching mathematics. Then we; mathematics teacher are also try to learned how to use ICT tools on teaching." *(Teacher's view)*

From above, researcher concluded that the DEO give a grant and school bought the ICT tools but nobody cares about the curriculum structure, evaluation system. Our curriculum did not focus on ICT based teaching, if teacher teach by using ICT tools, students are face the paper-pencil test then what was the result? So, curriculum, evaluation system, time influences use of ICT in teaching mathematics.

Figure 4.19 How long have you been use ICT tools to teach mathematics?

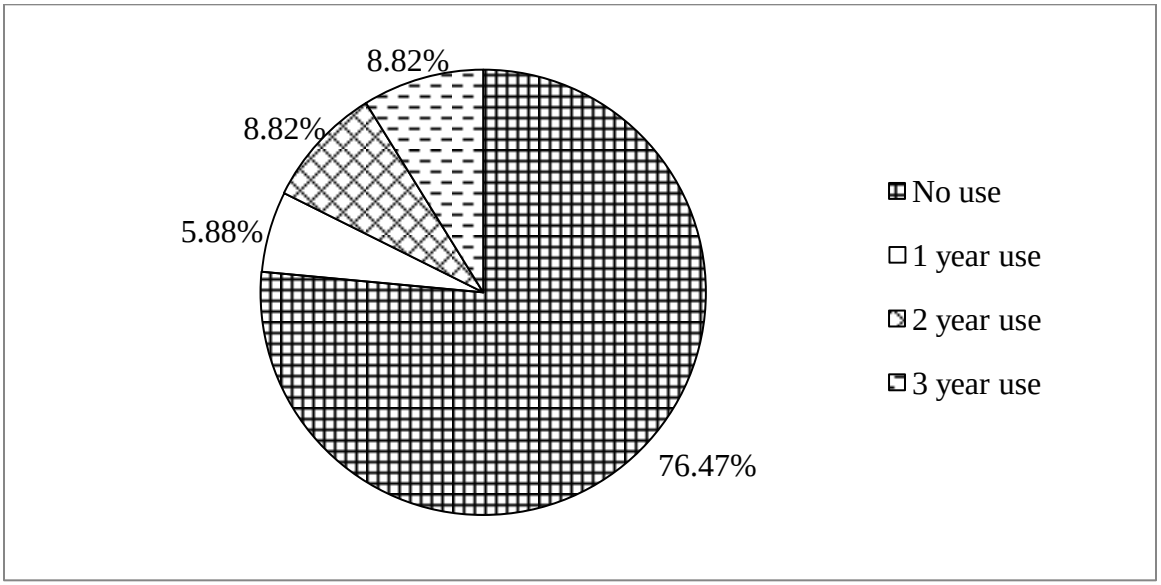


Figure 4.18 Shows that 76.47% of mathematics teachers did not used other ICT tools in their classroom teaching. But 5.88% of teachers used ICT tools before 1 year, 8.82% of teachers used before 2 years, while 8.82% of mathematics teachers used ICT tools before 3 years.

According to Peralta & Costa (2007), teachers with more experience with computers have greater confidence in their ability to use them effectively. But from the above data,

mathematics teachers did not have more than 3 years experiences with computers and other ICT tools. Researcher asked "How long have you been use ICT tools to teach mathematics?" teacher replied:

"I have 26 years experiences in teaching mathematics, I used chalk and talk method, students are happy and satisfied from my teaching strategy, result was also good and still I did not use computer or any software to teach mathematics so I did not have experience on using ICT tools in teaching mathematics." *(Teacher's view)*

"I have only one years of teaching experience with computer. I use computer lab sometime in a month or six-month. Some mathematical problems are difficult to explain like: construction, theorems. I search this problem on Google and download video on my mobile. Next day, I take my students in computer lab and demonstrate this video with the help of projector. *(Teacher's view)*

"Calculator was necessary tool in teaching and learning mathematics. So, I used calculator to solved numerical problem. Even I have litter more knowledge on ICT I did not use these in my teaching. Because I did not have time to practice with computer, morning 5 am I came here we are teach extra classes for SEE students till 6 pm I am here. And then when I practice. " *(Teacher's view)*

From the analyzing the above data, in Repandehi district mathematics teachers were did not have more than 3 year experiences on using ICT in mathematics teaching. They stated that they each have 15- 26 years teaching experience. And they did not studied by using ICT tools and they did not have skill to use ICT tools. Teachers were indicating our week education system and claim that the responsible agencies concerned in this situation. Also they stated that they had no more experience with computer, did not have time to practice, they face overload of teaching.

So, they don't want to take risk by adoption of ICT in teaching mathematics. Thus, experience on ICT tools, practice, time, overload teaching influence on use of ICT in mathematics teaching.

Mathematical Software

Mathematical software is software used to model, analyze or calculate numeric symbolic or geometric data. It is a type of application software which is used for solving mathematical problems or mathematical study. Some mathematical software were freely available and use offline like GeoGebra, Smath studio etc. these software help to solved numerical problems, geometrical construction, matrix, trigonometric functions etc. and also solved most of the exercises in today's mathematics textbooks.

From the observation researcher found none of the public secondary schools of Rupandehi district have any mathematical software in their computer. Mathematics teachers teach mathematics without using mathematical software and student also did not use any software to learn mathematics. Teacher teaches mathematics by traditional methods. In the questionnaire participants respond that;

Figure 4.20 Do you know about mathematical software?

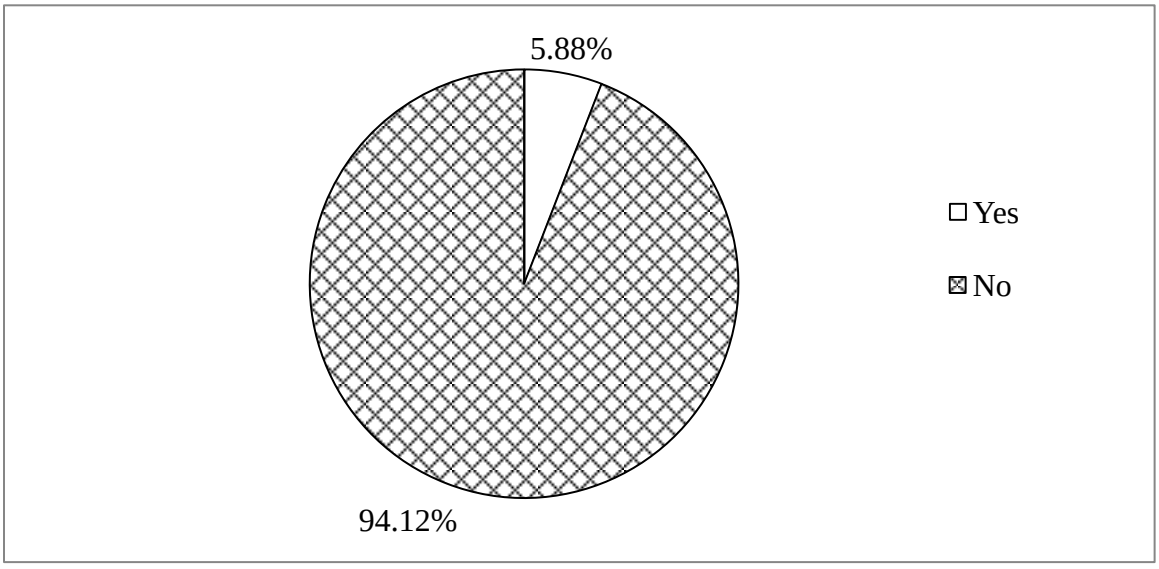


Figure 4.19 shows that only 5.88% of mathematics teachers know about mathematical software. And 94.12% of teachers did not know about mathematical software. Researcher asked question for mathematics teachers "Do you know about mathematics software" they replied that:

"I did not know about any mathematics software." (Teacher's view)

"I know about one mathematics software 'GeoGebra' which is in my laptop I did not use it on classroom teaching. I still practice it, myself." (Teacher's view)

"I didn't have knowledge about any mathematical software. Sometime I use YouTube videos to teach some mathematical problems. When I demonstrate this video students are concentrate and they understand easily in a short time. Due to the lack of materials and lack of knowledge about ICTs, mathematical software I didn't use ICT into teaching mathematical content." (Teacher's view)

From the observation checklist, only three schools have a teaching material in computers which was given by curriculum development centre (CDC) and Midas that was fruitful for primary level. But none of the school installed mathematical software on their computer that was used to teaching and learning mathematics in secondary level. Because schools cannot afford mathematical software and they did not know about the free available software. Also they did not have manpower that had skill on software. It indicated that mathematical software, manpower, skill, knowledge are the influencing factors on use of ICT in mathematics teaching.

Teachers' Perception on ICT usage

The interview questions focused much on teachers' perceptions on ICT usage. From the responses, it became evident that teachers had positive perception on usage ICT in teaching and learning mathematics even though almost all of them had very little access or no access to computers in their school. Researcher used five point Likert scale to get more information on

teachers' perception on ICT usage. The response of teachers was calculated in Mean and Percentage.

Table 4.3 Teachers' perception toward ICT

Statement	Percentage (%) (N=34)							
	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree	**Total marks**	**Mean**	**Level of Perception**
1. ICT engages learner's attention and motivate them	_	_	_	64.70	35.29	148	4.35	Strongly positive
2. ICT improve learner's test and exam result	_	_	20.59	76.47	2.94	130	3.82	Strongly positive
3. ICT stimulate learner's curiosity	_	_	11.76	85.29	2.94	133	3.91	Strongly positive
4. ICT encourage learners to develop their problem solving strategies	_	17.65	11.76	67.65	2.94	121	3.56	Strongly positive
5. ICT improve the teacher's efficiency	_	_	8.82	61.76	29.41	137	4.03	Strongly positive
6. Technology assisted instruction is more effective than the traditional method of instruction	_	20.59	_	29.41	50	139	4.09	Strongly positive

7. The internet has proved to be a useful source of ideas and information for teachers	_	_	_	55.88	44.12	151	4.44	Strongly positive
8. Computer will gradually replace teacher	50	41.18	8.82	_	_	54	1.59	Low
9. ICT support co- operating learning	_	_	_	41.18	58.82	156	4.59	Strongly positive
10. ICT support individualized learning	_	_	_	82.35	17.65	142	4.18	Strongly positive
11. ICT improve teacher's understanding of teaching approach	_	_	5.88	91.18	2.94	135	3.97	Strongly positive
12. Using ICT is an important aspect of teachers work	_	_	_	94.12	5.88	138	4.06	Strongly positive
13. ICT provide models and images which aid learners in concept formation	_	_	_	44.18	55.88	155	4.56	Strongly positive

It is notable from Table 4.3 that teachers' perception on "ICT engages learner's attention and motivate them" was strongly positive with an arithmetic mean of 4.35 and 64.70% of mathematics teachers was agreed with this statement. On the statement "ICT improve learner's test and exam result" teachers' perception was strongly positive with arithmetic mean 3.82.

20.59% of mathematics teachers were undecided and 79.41% of teachers were agreed with this statement. 88.24% of mathematics teachers were agreed with the statement "ICT stimulate learner's curiosity" and teachers were strongly positive with arithmetic mean 3.91. Teachers had strongly positive with arithmetic mean 3.56 on the statement "ICT encourage learners to develop their problem solving strategies";17.65% of mathematics teachers was disagreed and 11.76% of teachers were undecided. The statement "ICT improve the teacher's efficiency" had mean 4.03 with strongly positive perception. "The internet has proved to be a useful source of ideas and information for teachers" was the third statement where arithmetic mean was 4.44 with a 55.88% and 44.12 % of responded was agreed and strongly agreed respectively with that statement. Only one statement "Computer will gradually replace teacher" had low level of perception with 1.65 arithmetic mean and 50% of responded was strongly agree. The results also show that the highest perception level in the teachers response was "ICT support co- operating learning" where the arithmetic mean was 4.59 and the percentage response rate of strongly agree is 58.82%. The level of perception on "ICT provide models and images which aid learners in concept formation" was strongly positive where the arithmetic mean was 4.56 with a percentage response rate of 55.88% strongly agree and 44.18% agree. At last researcher conclude that the teachers' perception on ICT usage was strongly positive with an overall mean 3.93.

Timilsena (2017) found that in a Surkhet district mathematics teachers had positive opinion toward the practices of e-learning in mathematics. Shrestha (2015) conduct a case study at Heartland children's academy in Kathmandu district. She found that all the mathematics teachers of that school had strong positive perception about computer usage in mathematics teaching and learning.

Similarly, from the analysis of above data researcher conclude that even mathematics teachers did not use ICT tools in their teaching they had strong positive perception on ICT usage in mathematics teaching. Almost teachers perceived that the computer and other ICT tools be a good and useful tool in mathematics teaching; due to the teachers' interest, skill, knowledge on ICT, training, time, examination system etc. they did not used these in their teaching.

Background Information of Head Teachers

The schools' Head Teachers are the key change agent of staff development if he/she involved in ICT leadership, teachers are try to implement new ideas in teaching. A leader who implements technology plans and also shares a common vision with the teachers stimulate them to use technology in their lessons. In the study there were 34 Head Teacher participants. Among them only one Head Teacher was female.

Economic Condition of Schools

Economy is the fundamental factor of school's development. In order to research, researcher asked for the economic condition of schools Head teachers was not told details about it. Head Teachers stated that:

"What I tell the economic condition of our schools, you see our building, we did not have sufficient classroom, classrooms are small in size, we make library and computer lab in one classroom. Our school did not have income source. Our students are belongs to poor family then we cannot take fee with them. We are totally dependent on government." (Head teacher's view)

"We have not facilitated classroom but we have sufficient rooms. We have one 'bigaha' land with the name of school which was in rent; from this land we get yearly 2-3 lakhs. We teach in English medium from nursery to eight so, we collect some fee from students. Sometime we get local fund, in this way we manage our economic situation." (Head Teacher's view)

"The policy of government is not clear, government give equal grant for all those schools which have vast difference between students ratios, teacher employees and economic condition." (Head Teacher's view)

"The DEO give only 6,50,000/- what we are doing this money. If we bought ten laptops then this money is finished. We have 60- 70 student in each classes and how we give a practical knowledge to these student when we have only ten laptops." (Head Teacher's view)

When I visit those schools, I found the physical environment of the schools not so good. From the conversation with teachers', Head teachers' and observation of schools environment researcher concluded that about 41% of schools had poor economic condition. Their building was not so good, their classroom and computer laboratory were also unmanaged. Other almost 35% of schools had medium economic condition. The schools which had medium economic condition, these schools manage their computer laboratory properly and have good number of computers. The remaining 24% of schools had good economic condition. They had sufficient classroom, big and managed computer laboratory and had schools buses also. Out of these 24% of schools six schools teach technical subject like agriculture, computer science, civil engineer etc.

From the analysis of teachers', Head Teachers' view and the observation of schools environment researcher conclude that in Rupandehi district overall economic condition of public secondary schools was medium. And the economic condition of school also influence on use of ICT in teaching mathematics.

Supported Agencies

On the supported agencies Head Teacher responded that:

"None of the agencies came to help for ICT integration. Only the DEO help to facilitate computer laboratories and our parents are paid some money for their child because they want their child get good education." *(Head Teacher's view)*

"*There is the SMC but just for formality. The community cares only about negative things but never thinks what they can do for school education. They are much more aware of school budget, expenditure and other logistics. This is not going to improve education and society.*"

(Head Teacher's view)

"*Before 3 years ago, we make a plan to facilitate ICT based classroom teaching for class 1-7. We decorate computer lab by furniture from collecting the students' fee and playing 'Bhailo' on the festival Tihar. After this, several times we are going at Municipality office to demand some computer and projectors. They make hope actually they are interested on our plan and they help but still they didn't do something. In this financial year DEO give some grant and we make a small computer lab. Also the Municipality agreement they help 12 laptops and 12 projectors in next financial year 2075/76. We are happy for this.*" *(Head Teacher's view)*

From the responds of Head Teachers the Sub-Metropolitan city, Municipality and Rural Municipality are interested to help schools for ICT but they didn't do easily. Only the parents are paid the computer lab charge for their children. This is the supported part of schools. None of the NGO/INGOs help schools to facilitate ICT into teaching but only The British Council give a three days training on BS. 2071 after this time this is also passive in this district. So, support was also the influencing factor on use of ICT in teaching mathematics.

School's Policy on ICT

It is important that each school must have won vision on integration ICT in teaching and learning. Schools have different view on that. In the interview with Head Teachers they stated that:

"We did not make any policy on integration ICT in teaching and learning mathematics. After this fund, we have 15 computers. Now we started easily to teach computer subject from class six to eight." *(Head Teacher's view)*

"After the DEO's grant we have 70 computers and 40 projectors. It is sufficient for laboratories. Now, we have a plan for ICT based teaching on every subject and join CC cameras in each class. It is fulfill when we success to give training for our teachers but we did not have trainer. If we get support from DEO it is possible." *(Head Teacher's view)*

"In this time we did not have any policy on ICT. The DEO give grant it is helpful for us. Now, we are waiting for training. If DEO gave grant then definitely they also conduct training on use of ICT in teaching. After that we thought about policy." *(Head Teacher's view)*

From the interview with Head teacher researcher conclude that schools did not have won policy they totally depend on government. Only two/ three schools have planned to integrate ICT in teaching but almost did not have special plan for it. They use their computer laboratories for practice on computer subject. When DEO make plan and implement this plan they all waiting for that time. Thus, the school's policy also affect on use of ICT in teaching.

Chapter V

Summary, Finding, Conclusion and Recommendation

The purpose of this study was to investigate the status of using ICT in teaching mathematics in public schools of Rupandehi district. This chapter presents a brief summary of the study, states the finding, gives concluding paragraph of the results of the study and suggests possible directions for future studies as recommendation.

Summary

The study was undertaken to investigate the practices of ICT in mathematics. Especially the objectives of this study were:

- To investigate the status of using ICT in teaching mathematics in Rupandehi district.
- To find the influencing factors of using ICT in teaching mathematics.

The methodological design of study was mixed method design. The participant of the study was consisted from 34 public secondary schools of Rupandehi district which have computer laboratories. The entire Head Teacher and 34 mathematics teachers (teach class 9 and 10) were selected purposively for data. To achieve the objectives of the study, data and information were collected through observation checklist, questionnaire and semi- structure interview. The study found out that:

Finding on Current Status of using ICT in Teaching Mathematics

On the current status of using ICT in teaching mathematics researcher point out the following lines:

- According to DEO Rupandehi in this financial year 2074/75 they distribute 6,50,000/- rupees for 34 public secondary schools to facilitate ICT based teaching and learning programs. From this grant schools managed computer laboratory, add computers, laptops

and projectors. But 8.82% of schools did not use this grant still the ending time of financial year because they re-built their ICT laboratory. Only 14.71% of school bought more than 10 computers.

- By the observation researcher found 35.30% of schools had less than 20 computers and 52.94% had less than 40 computers. The 41.18% of schools did not have laptops. Only 2.94% schools had 20 laptops for alternating use of desktop. It indicated that public secondary schools did not have sufficient number of computers.
- Projectors and smart boards are the ICT tools which was new practice for Nepalese public schools. In public secondary schools of Rupandehi, researcher found 38.24% schools had one projector. But the schools where they taught technical subjects they had more than 4 projectors. Similarly, 17.65% schools did not have smart board and 82.35% had smart board but did not have skilled manpower.
- The 58.82% of schools had 1-20 computers in their ICT laboratory it was the very bad condition of schools because in public secondary schools there are minimum 50-60 students in each classes then how they do practical with computer. Only 2.94% of schools had 41-60 and also 2.94% had 61-80 computers in their ICT laboratory.
- The 47.06% of schools had 1-20 computers in good condition. And 5.82% of schools had 41-60 computers in good condition. From the interview with Head Teachers they stated that they spend 10 to 20 thousand rupees monthly to maintain these computers. They also suggest government provide computer technician for schools.
- For the use of ICT tools the most important thing is internet connectivity. In those 34 schools 73.53% had internet connectivity and remaining 26.47% did not have connection. But only 29.41% (10) of schools connect internet in their ICT laboratory. In the

conversation with Head teachers they stated that connected internet was very slow and they did not afford high speed internet.

- From the observation researcher found that none of the schools install mathematical software on their computer. In questionnaire only 5.88% of mathematics teachers respond that they know about mathematical software Geogebra. But they stated that they did not have skill on how to use that software in their teaching. They also stated that they still practice on that software.
- Researcher found that 61.77% of mathematics teachers were the aged above 40 years. The finding indicated that in Rupandehi district older teachers were more responsible on using ICTs facilities than younger teachers. Out of 34 mathematics teachers only 5.88% were female. Result on teachers' qualification, 23.60% of mathematics teachers had M.Ed. (Maths) and 47.06% teachers had B.Ed. (Maths). 11.76% of teachers had M.A. (Maths), 8.82% of mathematics teachers had B.Sc. and M.A. (Maths). It is a good number of qualified teachers but the research reveals that the teachers' qualification separately did not affect the use of ICT in teaching and learning mathematics because these mathematics teachers did not studied ICT in their college and they did not get training on use of ICT in teaching. So, if the teacher had time, access internet, had training then the low qualified teacher or the teacher from whichever faculties also use the ICT in their teaching.
- The 88.24% of teachers had computer knowledge and 20.59% of teachers did not get training on computer use. 8.82% of mathematics teachers they did not get training on computer use but they have knowledge on computer use. Mathematics teacher who had knowledge on computer they used Microsoft word, facebook, World Wide Web, email on

their computer or mobile. But only 23.53% of mathematics teachers used ICT tools like computer, laptops, projectors, mobile and television on their teaching. 76.47% mathematics teacher did not used ICT tools in mathematics teaching. But none of the mathematics teacher used smart board on their teaching because they did not have knowledge and skill on it.

- In the public secondary schools of Rupandehi district 23.53% of mathematics teacher had more than 20 year experiences on teaching mathematics. This shows that mathematics teachers had confidence on their teaching and had more experiences on dealing with students but only 8.82% of mathematics teachers had 3 year experiences, 5.88% had 2 year experiences and 76.47% of mathematics teachers did not have experiences on use of ICT in their classroom teaching.
- Mathematics teacher did not use computer laboratory. The computer laboratories were not accessible to student whenever they need. They enter computer laboratories only the period of computer subject or given permission from lab related teacher. In conversation with mathematics teachers they stated that they mostly use calculator for their teaching. Only 23.53% of mathematics teacher use internet, YouTube videos, computer and projector to demonstrate the content related videos.
- Even mathematics teachers did not have enough knowledge, skill on ICT use and they did not use ICT tools in their teaching they had strong positive perception on ICT usages in mathematics teaching. Teachers' perception on ICT usage was strongly positive with an overall arithmetic mean 3.93. All the mathematics teachers perceived that the computer and other ICT tools be a good and useful tool for teaching mathematics.

Finding on Influencing Factors of using ICT in Teaching Mathematics

From the research researcher found some factors that influence using ICT in teaching mathematics. Researcher divided these factors in three different titles. They are: Teacher related factors, schools related factors and system related factors.

Teacher Related Factors

Teacher was the main person who uses the educational technology. When teacher face the problems to use ICT tools then the school did not success to integrate ICT in teaching process. Here are the some points which influenced mathematics teachers to using ICT in their teaching:

Teachers' Personal Characteristics

Personal characteristics mean age, gender, interest, teaching experiences etc. of teachers. These all factors influence the adoption and integration of a technology in teaching.

Teacher with fewer years of experiences were more likely to use computer technology than teacher with more years of experiences. Teacher who were experienced 15 year or more were least likely to use computer in classroom. These teachers were also older in age and they were educated by people who became educators before the arrival of computer in teaching. So, they did not want to use ICT in their teaching. If the mathematics teachers have basic skill in computer and they belong to young generation then they definitely try ICT in their teaching.

The gender also influence on use of ICT in teaching because female teacher had spend their extra time to their child and their family then they did not spend time with ICT at home. And teachers' interest on ICT also influence on use of ICT in teaching and learning mathematics because none of the mathematics teacher studied use of ICT in mathematics and did not had training but teacher who had interest on ICT they used ICT tools.

Teachers' Knowledge and skill on ICT

According to E.M. Rogers the diffusion of innovation process was start from knowledge. If educational technology available at school and teacher has good knowledge and information about this then he/she definitely try this into classroom teaching. Teachers' knowledge on how to use these technologies in teaching-learning process has an important effect on using them effectively.

From the response of teachers in questionnaire 88.24% of mathematics teachers had computer knowledge. They use Facebook, World Wide Web, Microsoft Word and some teachers used Email for send Mail to their friends. From the interview with mathematics teachers' researcher found they have low level of knowledge on computer use in teaching mathematics. They type question paper, making mark sheet on their computer. But they did not have knowledge, skill on use of projector, smart board and they did not know about any mathematical software, then how they use this ICT tools in their teaching. The limitation in teachers ICT knowledge makes them feel anxious about using ICT in the classroom and thus not confident to use it in their teaching. So, knowledge and skill on ICT also influence on use of ICT in mathematics teaching.

Teachers' Training

From the Mathematics teachers' responses, it was indicated that all most teachers have basic computer skills. They use Microsoft word, PowerPoint and view YouTube program in computer. Mathematics teacher has this skill from self-practice, institute and TPD training from government. The ICT tools; projector, smart board, internet etc. are the new concept for teachers in teaching program. Fundamentally, when there are new tools and approaches on teaching; teacher training is essential. If teachers are trained on ICT tools and new approaches then they

integrate these into their teaching. So, the training is influencing factor on integration ICT in teaching mathematics.

Overburden Teaching

Schools are normally begun at 10 am and end at 4 pm. Schools operate six days a week. School time is divided into different 'periods,' each period consisting of 40 or 45 minutes. There is a tea break in the middle of the day. Typically, there are four periods before the tea break and three periods after that break. Friday is a half working day, with only four periods of teaching. Altogether there are 39 periods in a week. Thus, if a teacher is assigned full teaching load, he or she will have a total teaching load of 39 periods in a week. Teachers consider a weekly load of 25 periods or less as 'desirable', 26 to 30 periods as 'somehow manageable'.

A mathematics teacher taught extra time daily. For the good result on SEE they have extra responsibilities and doing more work. After the discussion of School management community, Parents and Teachers school start extra class or couching classes. Then teacher taught extra 3-4 hours daily. They focused on result and he/she did hard work. Teachers spend almost time in classroom teaching. They feel physically and mentally stress then they did not spent time for their extra activities, did not get time to practice with new technology. So, the high load of teaching also influences using ICT in teaching.

School Related Factors

School is the main centre of formal education. Every school should gives quality education for their students. It is possible if the school get support from government, different agencies and from parents. It is the time of information and communication technology, in that time school start to give education and doing other administrative work from using technology. From the Teachers' and Head Teachers' interview researcher analyzed that there are the some

factors that influence integration ICT on teaching mathematics as well as other subjects. They are:

Access

Access to ICT infrastructure and resources in schools is a necessary condition to the integration of ICT in education. Effective adoption and integration of ICT into teaching in schools depends mainly on the availability and accessibility of ICT resources such as hardware, software, etc. Obviously, if teachers cannot access ICT resources, then they will not use them. Schools should Endeavour to provide staff members with adequate access to ICT facilities for the purpose of planning and preparing for their teaching and also provide time to practice with ICT tools. Therefore, access to computers, updated software and hardware, access to internet are key elements to successful adoption and integration of technology.

Funding and supervision

Although the government developed a policy of integrating ICT in instructional activities in community schools, there has been no funding for the schools to develop ICT infrastructure. There are some public secondary schools who have received Rs 6,50,000/- on condition of purchase computers, laptops, projectors and smart board.

From the research researcher found that in Rupandehi district the economic condition of public schools' not so good. There were low and middle in-come schools; the grant available from DEO was often not sufficient to manage computer laboratories and buy expansive technology. From the Head Teachers' interview researcher found that 8.82% of schools did use the grant because they did not have good furniture and have small size room. Only the DEO's funding did not sufficient to facilitate ICT. From the interview with Head Teachers researcher found that almost 76% of schools depend economically on government. So, the government firstly knows the

condition of schools, create a limitation and divide the sufficient grant. And also if the government distribute grant then they did good supervision. If there was no supervision, then schools did not make good use of that grant. Thus, funding and supervision also influence on integration ICT in mathematics teaching.

Support

Here the term, 'Support' is used in this briefing to describe the resources and services that are available from different agencies to schools which assist them in their provision of ICT. These services include those which provide support for schools' ICT equipment, as well as those which assist schools in developing, planning and implementing the ICT. From this research, researcher analyzed different areas of ICT support:

- Support from Teacher Parents Association
- Support from school management community
- Support from Local Government
- Support from NGO/INGOs

The researcher found that only the parents are regular supporter by economically and physically. The Sub-Metropolitan city, Municipality and Rural Municipality are interested to help schools for ICT but they didn't do easily. None of the NGO/INGOs help schools to facilitate ICT into teaching but The British Council give a three days training on BS. 2071 after this time this is also passive in this district. If the related agencies support to integrate ICT in teaching and learning, schools get success.

Schools' Plan on ICT

It is important that each school must have won vision on integration ICT in teaching and learning. From the interview with Head teachers' researcher found that schools did not have won

plan on integration ICT in teaching they totally depend on government policy. Only two/ three schools have planned to integrate ICT in teaching, plan to conduct ICT training for teachers but almost did not have special plan for it. They use their computer laboratories to practice on computer subject. If schools did not made won plan or policy on ICT, only the government's effort on ICT based teaching and learning was not success. So, school compulsory made won plan on ICT.

System Related Factors

In the interview with Head Teachers and mathematics teachers they stated our school curriculum, evaluation system and teaching technique was still going traditional way. This affects the effective use of ICT in teaching and learning process. Also the researcher observed the schools environment and realized there were some factors that influence use of ICT in teaching and learning process. These are:

Structure of Curriculum

The Curriculum Development Centre (CDC) is responsible for developing curriculum for schools and is one of the central divisions of Department of Education in Ministry of Education. School education has been defined as basic (Grade 1 to 8) and high school (Grades 9 to 12). The National Curriculum Framework for School Education, 2005 included ICT for the first time (MOES, 2005). The curriculum tried to address the needs of the 21st century and of globalization of education (MOES, 2005). It suggested that schools use ICT in three ways:

a) as a tool for delivering information and services, including school administration;

b) as a tool for teaching other subjects; and

c) as a separate subject.

Although few schools have incorporated ICT in their teaching and learning activities, the role of ICT in preparing a skilled workforce has gradually been given greater importance. The reformed National Curriculum Framework for School Education, 2007 reiterated the objective but it raised some issues (MOES, 2007):

a) The curriculum has not properly addressed ICT.
b) The curriculum has not properly defined ICT as a subject or as a tool for teaching and learning.
c) There is no bottom-up consistency in the order of technical subjects including computer education.
d) There is a lack of adequate physical infrastructure, conductive environment and competent resource persons.

The reformed National Curriculum Framework for School Education, 2007 pointed out the problem that the curriculum lacks a precise definition of ICT in education, but re-asserted the aim to integrate the knowledge on Information and Communication Technology with other subjects.

Mathematics is a technical subject, its classes are administered in practical basis but these classes are running in theoretical basis, no such ICT tools are used. Even the private sector, there is no clear policy to use ICT in teaching mathematics. That's why without an ICT based curriculum and good policy it is difficult for the schools to come up with logical and effective plans of how to use educational technology in the classroom environment. Thus, our curriculum was the important factor which influence on use of ICT in teaching mathematics.

Traditional Evaluation System

Paper- pencil test is known as traditional technique of evaluation system. It measures only the cognitive aspect of students. The three hours paper pencil test do not measure physical, social, intellectual and emotional aspect that have contribute to learners' development. But it is dominant from primary level to university level in our country. And Mathematics cannot be detached from this system. The school examination board using the paper pencil test for evaluation system. Students appear final examination with this technique. This has created difficulties to use computer in teaching mathematics properly in class. So, our evaluation system also a factor that influences on integration ICT in teaching mathematics.

Conclusion of the Study

According to E.M. Roger, adoption of new innovation depends upon the sufficient information, knowledge, understanding and practice about these innovation. In that way, if teacher have sufficient knowledge on use of ICTs then he/she definitely try to use ICT in their teaching, and school, teachers are believed in ICT when it increases students' mathematical achievement and learning. So, there is necessity of sufficient information, knowledge and popularization among all stakeholders. The government, MOE, CDC and other connected bodies should give information, training, orientation and discussion programs about ICT.

From the above finding of this study, it is conclude that:

- In Rupandehi district, use of ICT in teaching mathematics was still in early phase.
- Participant public secondary schools lacked enough computer, mathematical software, High speed internet connectivity and lacked adequately equipped computer laboratories to ensure use of computer in teaching mathematics.

- The computer laboratories are not big enough in size to accommodate all students, indicating that average number of students per computer is very high for effective use of computer in teaching and learning mathematics. This was attributed to lack of sufficient ICT equipments and funding by government on ICT.
- Lack of information, lack of sufficient knowledge, skill and popularization about ICT.
- Lack of teachers' training on use of ICT in teaching mathematics.
- Lack of support, supervision and guidelines.
- Lack of schools' won plan on ICT integration
- Examination oriented learning.

From the foregoing summary, it can be concluded that use of ICT in teaching mathematics in the Rupandehi district suffer from inadequate ICTs infrastructure in schools, ill equipped and overburdened teaching force. There was need to address those influencing factors of using ICT in teaching Mathematics in order to integrate its use in teaching Mathematics in schools.

Recommendations

On the basis of finding of this study some measures have been recommended for the improvement of the teaching situation at secondary level classes.

- By understanding the necessity of schools' DEO should distribute sufficient fund to facilitate ICT and be good supervision.
- The Ministry of Education and NCED should organize in- service training in professional development related to the integration of ICT in teaching mathematics for mathematics teachers.

- The government, MOE, CDC and other connected bodies should give information, training, orientation and discussion programs about ICT for Head Teacher, teacher and other stakeholders.
- MOE should be able to introduce the new pedagogies which are based on educational technology.
- As school teachers cannot have enough time for preparing although they have internet to use ICT so, the school management should provide enough time for them and encourage using available ICT in their teaching.
- Mathematics teachers should be motivate self and get information about ICT tools, learn how to use these tools and demand training on ICT from school management community.
- All schools cannot be able to provide the high speed internet access. So, the school management should come up with other offline, free mathematical software like GeoGebra and other educational software which are going to support the development of higher thinking skills.

Recommendations for Further Study

- Comparative study on using ICT in teaching mathematics in private and public secondary schools of Rupandehi district.
- Attitude of teachers toward ICT in teaching mathematics.
- The existence of relationship between ICT tools usage and ICT policy.
- Similar study will be conducted in other district and result compared with this study.

Reference

Aduwa-Ogiegbaen, S. E. & Iyamu, E. O. S. (2005). *Using Information and Communication Technology in Secondary School in Nigeria: Problems and Prospects*. Educational Technology, 8(1), 104-112.

Amuko, S., Miheso, M. & Ndeuthi, S. (2015). *Opportunities and Challenges: Integration of ICT in Teaching and learning Mathematics in Secondary Schools, Nairobi, Kenya.* Journal of Education and Practice, 6(24), 1-7.

Alharbi, E. (2015). *A Study on the use of ICT in Teaching in Kuwait.* Cardiff Metropolitan University: PhD thesis.

Baek, Y.G., Jong, J., & Kim, B. (2008). *What makes teachers use of technology in the classroom? Exploring the factors affecting facilitation of technology with a Korean sample.* Computers and Education, vol.50, no. 8, pp. 224-234.

Bature, B. (2016). *The role of information and communication technology as a tool for effective teaching and learning of mathematics.* Journal of applied and computational mathematics, vol.5, no.6.

Colandrea, J. L. (2012). *The diffusion of computer- based technology in k-12 schools: teachers' Perspectives,* Fordham University: PhD thesis.

CDC. (2005). *National Curriculum Framwork for School Education (Pre- Primary-12) In Nepal.* Sanothimi: Ministry of Education and Sports, Curriculum Development Centre.

Creswell, J. (2012). *Research design: qualitative, quantitative and mixed methods approaches,* London: Sage Publication Ltd.

Creswell, J. & Plano, C. (2007). *Designing and Conducting Mixed Methods*, London: Sage Publications Ltd.

Dhakal, R. K. & Pant, B. P. (2016). *Assessment of Teacher Education Curriculum in Nepal: An ICT Perspective.* International Journal of Innovation, Creativity and Change, vol. 2, no.3, pp. 96-108.

Giordano, V. (2007). *A professional development model to promote internet integration into P-12 teachers' practice: A mixed method study.* Computers in the schools, vol. 24, no.3/4, pp.111-123.

Gorder, L. M. (2008). *A study of teacher perceptions of instructional technology integration in the classroom.* Delta Pi Epsilon Journal, vol. 50, no. 2, pp. 63-76.

Hernandez-Ramos, P. (2005). *If not here, where? Understanding teachers use of technology in Silicon valley schools.* Journal of Research on Technology in education, vol. 38, no. 1, pp. 39-64.

Joshi, D. R. (2016). *Status of use of ICT by Secondary School Students of Nepal.* International Journal for innovative research in Multidisciplinary field, 2(11), 256-262.

Kay, R. (2006). *Addressing gender differences in computer ability, attitudes and use: The laptop effect.* Journal of Educational Computing Research, vol. 34, no. 2, pp. 187-211.

K., P. H. & S., E. H. (2004). *Technology in School: Education, ICT and the Knowledge Society.*

Keong, C. C., Horani, S. & Daniel, J. (2005). *A Study on the use of ICT in Mathematics Teaching.* Malaysian Online Journal of Instructional Technology (MOJIT), 2(3), 43-51.

Khan, S. H., Hasan, M. & Clement, C. K. (2012). *Barriers to the introduction of ICT into Education in developing countries: the examples of Bangladesh.* International Journel of Instruction, 5(2), 62-80.

MICTED. (2013). *Master's degree of Information and Communication Technology Education (M.ICTEd.)* Retrieved from http://micted.weebly.com/

MOE. (2013). *Information, Communication and Technology in Education Master Plan (2013- 2017).* Kathmandu: Author.

MOE. (2014). *Nepal Education in Figure- 2014 at a Glance.* Nepal: Author.

MOES. (2005). *National Curriculum Framework for School Education (Pre-primary – 12) in Nepal*. Sanothimi, Bhaktapur: Ministry of Education and Sports, Government of Nepal.

MOES. (2007). *National Curriculum Framework for School Education in Nepal*. Sanothimi, Bhaktapur: Curriculum Development Centre, Ministry of Education and Sports.

Mogire, M. W. (2013). *Factors affecting use of computers in teaching and learning Mathematics In Secondary Schools in Kisii country, Kenya.* Kenyatta University: Master thesis.

NCED. (2017). *Introduction.* Retrieved from http://nced.gov.np/article/aW50cm9kdWN0aW9u/OTg=

Ojugo, A.A., Osika, Iyawa, I. J. B. & Yeroken, R.O. (2015). *Information and Communication Technology (ICT) Integration into Science, Technology, Engineering and Mathematics (STEM) in Nigerio.* Retrived on April 4, 2018 from https://www.ajol.info/index.php/wajiar/aritical/viewfile/86904/76697.

Opati, O.D. (2013). *The use of ICT in Teaching and Learning at Makerere University.* University of OSLO: Master thesis.

Peralta, H., Costa, F.A. (2007). *Teachers' competence and confidence regarding the use of ICT.* Educational Sciences Journal, vol. 3, pp. 75-84.

Rana, I. K. (2014). *ICT (I see it) in Math Education.* India institute of Technology Bombay, India

Roger, E.M. (2003). *Diffusion of innovations (5th ed). New York: Free press.*

Sheila, A. O. (2016). *Integrating information communication and technology in mathematics Education at secondary level, A case of Nairobi country, Kenya.* Kenyatta University: Master thesis.

Shrestha, R. (2015). *Status of ICT use in teaching/ learning mathematics.* Unpublished Master Thesis, Tribhuvan University, Kathmandu.

Timilsena, T. R. (2017). *Attitude of teachers toward ICT in teaching mathematics.* Unpublished Master Thesis, Tribhuvan University, Kathmandu.

Wong, E.M.L. & Li, S.C. (2008). *Framing ICT implementation in a context of educational change: a multilevel analysis.* School effectiveness and school improvement, 19(1), 99-120.

Wozney, L., Venkatesh, V., & Abrami, P.C. (2006). *Implementing computer technologies: Teachers' perceptions and practices.* Journal of Technology and teacher education, vol. 14, no.1, pp. 173-207.

www.deorupandehi.gov.np/allcontent/93

APPENDIX-A

Observation Checklist

Name of school:-

Date:-

Physical feature

- How many computers _____
- How many laptops _____
- How many smart boards _____
- How many projectors _____
- Computers' bought by DOE's grant _____
- Computers are in the ICT laboratories _____
- internet connectivity _____
- Computer are in good condition _____
- Name of mathematical software available on computer:

  a) b)

APENDIX- B

Questionnaire for Teachers

Teacher fills the blank by right information.

Name of School:-

Date:-

Part I: Background Information

- Name:-
- Age:-
- Profession Qualification:-
- How long have you served as a mathematics teacher? _____
- Do you know about ICT?

  Yes ☐ No ☐

- Do you have computer knowledge?

  Yes ☐ No ☐

  If yes, which applications frequently use in computer?

  a) Microsoft Word ☐

  b) Excel ☐

  c) Power point ☐

  d) Email ☐

  e) Game ☐

  f) World Wide Web ☐

  g) Facebook ☐

Part II: Teacher's Training

- Do you have training on computer use?

  Yes ☐ No ☐

If yes, which course do you have?

a) Basic ☐
b) Tally ☐
c) Advance ☐

- Do you have training on ICT integration in mathematics teaching?

  Yes ☐ No ☐

  If yes,

  a) Which agencies give these training? _____
  b) How long have you been training? _____
  c) What you learn from these training? _____

Part III: Use of ICT tools

- Do you use ICT tools in teaching mathematics?

  Yes ☐ No ☐

  If yes, which technologies you used in your classroom for teaching mathematics?

  a) Computer ☐
  b) Laptops ☐
  c) Mobile ☐
  d) Projector ☐
  e) Smart board ☐
  f) Television ☐

- How long have you been use ICT tools to teach mathematics? _____
- Do you know about mathematical software?

  Yes ☐ No ☐

  If yes, name these software's a) _____ b) _____

Part IV: Teacher's Perception toward ICT

Statement	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
1) ICT engages learners attention and motivate them					
2) ICT improve learner's test and exam result					
3) ICT stimulate learners curiosity					
4) ICT encourage learners to develop their problem solving strategies					
5) ICT improve the teacher's efficiency					
6) Technology assisted instruction is more effective than the traditional method of instruction					
7) The internet has proved to be a useful source of ideas and information for teachers					
8) Computer will gradually replace teacher					
9) ICT support co- operating learning					
10) ICT support individualized learning					
11) ICT improve teacher's understanding of teaching approach					
12) Using ICT is an important aspect of teachers work					
13) ICT provide models and images which aid learners in concept formation					

APENDIX- C

Teachers' Interview Guideline

Name of School:-

Date:-

The interview will take on the basis of following points.

- Describe ICT
- Technology used in your classroom for teaching mathematics
- Computer knowledge
- Training on ICT integration in mathematics teaching
- About mathematical software
- Influencing factors of using ICT in mathematics classroom

APENDIX- D

Head Teacher's Interview Guideline

Name of School:-

Date:-

The interview with Head Teacher will take in the basis of following points.

- Available ICT tools
- Mostly used ICT tools
- Internet facility
- Teacher's training
- School's policy on ICT
- Economic condition of school
- Supported agencies for using ICT
- Influencing factors of using ICT in school as well as mathematics classroom etc…

APPENDIX-E

Result from Observation Checklist

Physical Features

- How many computers

No. of computers	No. of schools
1-20 computers	12
21-40 computers	18
41-60 computer	3
61-80 computers	1

- How many laptops

No. of laptops	No. of schools
No laptops	14
1-10 laptops	18
11-20 laptops	2

- How many projectors

No. of projectors	No. of schools
1 projector	13
2 projectors	16
3 projectors	2
4 projectors	1
9 projectors	1
40 projectors	1

- How many smart boards

No. of smart boards	No. of schools
No smart board	6
1 smart board	21
2 smart boards	7

- Computer bought by DEO's grant

No. of computers	No. of schools
Still not buy	3
1-10 computers	26
11- 20 computers	5

- Computers are in the ICT laboratories

No. of computers	No. of schools
1-20 computers	20
21-40 computers	12
41-60 computers	1
61-80 computers	1

- Computers are in good condition

No. of computers	No. of schools
1-20 computers	16
21-40 computers	15
41-60 computers	2
61-80 computers	1

- Internet connectivity

Yes	No
25	9

APPENDIX-F

Teachers' response on Questionnaire

Part I: Background Information

- Gander

Male	Female
32	2

- Age

Age	No. of teachers
20-29 year	1
30-39 year	12
40-49 year	17
50-59 year	4

- Profession Qualification

Profession Qualification	No. of teachers
M.ED. (Maths)	8
B.ED. (Maths)	16
M.A. (Maths)	4
B.SC.	2
M.SC., M.A. (Maths)	1
B.SC., M.A. (Maths)	3

- How long have you served as a mathematics teacher?

Teaching years	No. of teachers
1-10 year	11
11-20 year	15
21-30 year	8

- Do you have computer knowledge?

Yes	No
30	4

If yes, application frequently use in computer

Name of applications	No. of teachers
Microsoft word	30
Excel	11
Power point	5
Email	15
Game	6
World wide web	18
Facebook	20

Part II: Teacher's Training

- Do you have training on computer use?

Yes	No
27	7

If yes, computer course

Name of course	No. of teachers
Basic	21
Basic + Tally	4
Basic + Advanced	1
Basic + Tally + Advanced	1

- Do you have training in ICT integration in mathematics teaching?

Yes	No
0	34

Part III: Use of ICT tools

- Do you use ICT in mathematics teaching?

Yes	No
8	26

If yes, which technologies you used in your classroom in teaching?

Name of technology	No. of teachers
Computer	8

Laptops	6
Mobile	8
Projector	8
Smart board	0
Television	1

- How long have you been use ICT tools to teach mathematics?

Years	No. of teachers
Not use	26
1 year	2
2 years	3
3 years	3

- Do you know about mathematical software?

Yes	No
2	32

Part IV: Teacher's Perception toward ICT

Teachers / Statements no.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
1	4	5	5	4	4	5	4	4	5	4	5	5	5	5	4	5	5	4	4	4	4	5	4	4	4	4	4	4	4	4	5	4	4	4
2	3	4	4	4	4	3	3	4	4	4	4	3	4	4	4	5	3	4	4	4	4	4	4	4	3	4	4	4	4	4	4	4	3	4
3	4	4	4	4	4	3	4	4	4	4	4	3	4	4	4	5	4	4	4	4	4	4	4	4	3	4	4	4	4	4	4	4	3	4
4	4	4	4	4	4	2	3	4	2	4	4	2	4	4	4	5	3	4	4	4	4	4	4	4	2	4	4	4	2	2	4	4	3	3
5	4	5	5	3	5	4	3	4	4	4	5	4	5	5	4	5	4	4	4	4	4	5	4	4	3	4	4	5	4	4	5	4	4	4
6	4	5	5	5	5	2	2	4	5	4	4	2	5	4	4	5	2	4	4	4	5	5	5	5	2	5	5	5	5	4	5	5	2	2
7	5	5	5	4	4	4	4	5	4	5	5	4	5	5	5	5	4	4	5	4	5	4	4	5	4	4	5	4	4	4	5	4	4	4
8	1	3	2	2	2	1	2	2	2	1	1	2	1	1	1	1	2	2	2	1	2	2	1	1	3	1	1	1	1	2	1	1	2	3
9	4	4	4	4	4	4	4	5	5	5	5	4	5	5	5	4	4	5	5	5	4	5	5	5	4	5	5	5	5	5	5	5	4	4
10	4	4	4	4	4	5	4	4	4	4	5	4	5	5	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	5	5	4	4	4
11	4	4	4	4	4	4	3	4	4	4	4	4	4	4	4	5	4	4	4	4	4	4	4	4	3	4	4	4	4	4	4	4	4	4
12	4	4	4	4	4	4	4	4	4	4	5	4	4	4	4	5	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
13	5	4	5	4	4	4	4	5	5	5	5	4	5	5	5	5	4	4	5	5	4	5	5	5	4	4	5	5	5	4	4	5	4	4

APENDIX- G

Participant schools' name

1. Sita secondary school, Charnge
2. Siktahan secondary school, Siktahan
3. Ramnares secondary school, Dhakdhai
4. Thutipipal secondary school, Thutipipal
5. Semari secondary school, mayadevi
6. Khudabagar secondary school, Khudabagar
7. Tenuhawa secondary school, Tenuhawa
8. Masina Baba Narendrapuri Mogalaha secondary school, Masina
9. Madhubani secondary school, Madhubani
10. Buddha aadarsha secondary school, Lumbini
11. Jogada secondary school, Jogada
12. Bishnupura secondary school, Bishnupura
13. Suryapura secondary school, Suryapura
14. Haraiya secondary school, Haraiya
15. Saraswati secondary school, Bargaduwa
16. Lumbini gyanniketan secondary school, Gargare
17. Pargati secondary school, Belbariya
18. Durga secondary school, Lausa
19. Kotiyadevi secondary school, Jhimjhime
20. Pasupati secondary school, Saljhandi
21. Ramapur secondary school, Ramapur

22. Parroha secondary school, Murgiya

23. Bangai secondary school, khadawa bangai

24. Bhagalapur secondary school, Manpakadi

25. Pharsatikar secondary school, Pharsatikar

26. Public secondary school, chhapiya

27. Gyanodaya secondary school, butwal

28. Kanti secondary school, Haatbajar

29. Sidyashori secondary school, Dipnagar

30. Kalika manavgyan secondary school, Kalikanagar

31. Naharpur secondary school, Naharpur

32. Durgadutta secondary school, Sankharnagar

33. Pashchim pahuni secondary school, Pashchim pahuni

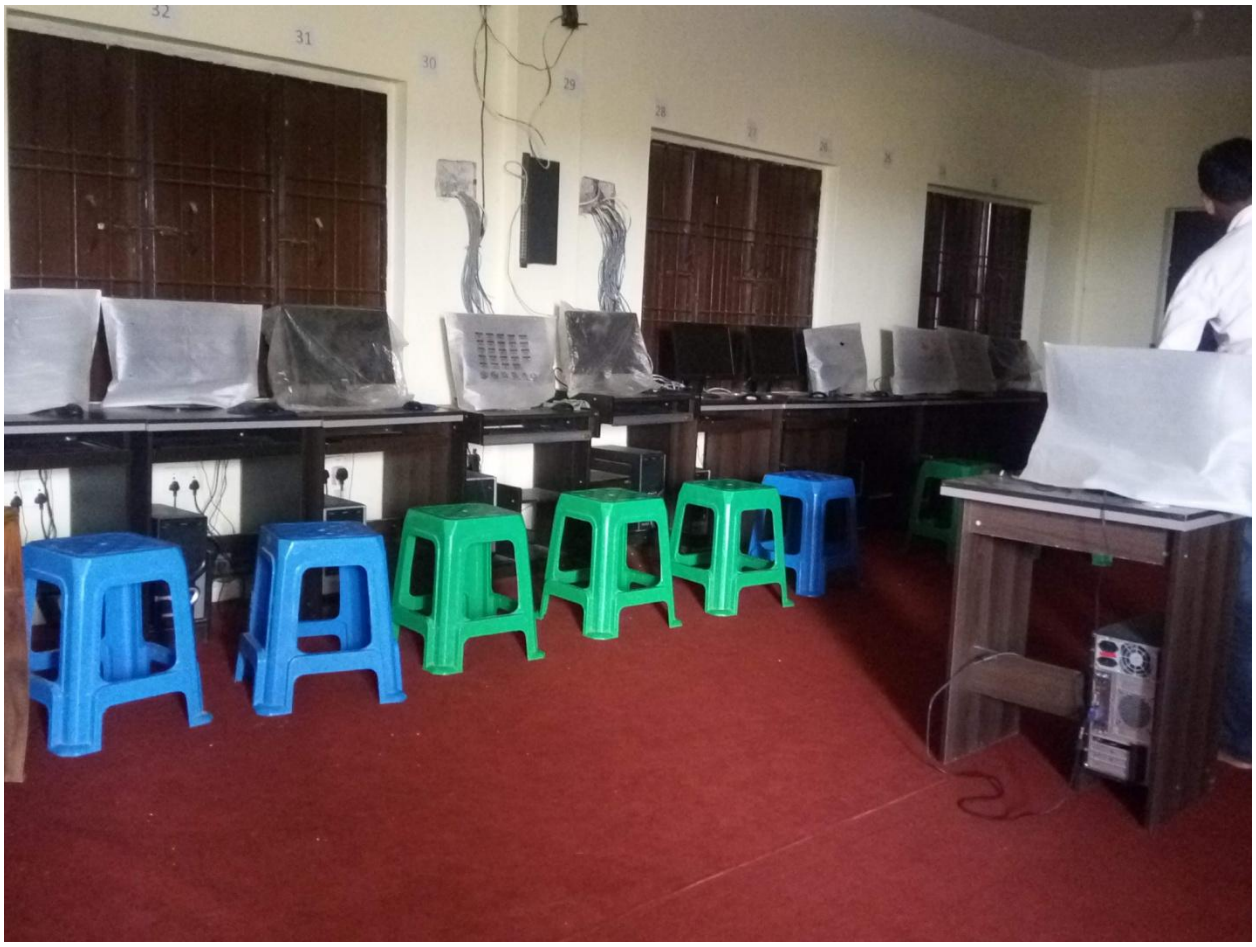
34. Shanti namuna secondary school, Manigram

APPENDIX- H

APPENDIX-I

APPENDIX-J

APPENDIX-K


32
31
30
29
28

APPENDIX-L