TEACHER'S SKILLS AND PERCEPTIONS TOWARDS THE USE OF ICT IN MATHEMATICS TEACHING

A

THESIS

BY

ANITA MAINALI

FOR THE PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTERS OF EDUCATION

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Letter of Certificate

This is to certificate that Miss. **Anita Mainali**, a student of academic year 2074-2075 B.S. with thesis number **1704**, Exam Roll No. **7428244**, Campus Roll No**.119** and T.U. Regd. No. **9-2-21-4-2014** has completed her thesis under my supervision during the period prescribed by the rule and regulations of T.U. Nepal. The thesis entitled**"Teacher's Skills and Perceptions towards The Use of ICT in Mathematics Teaching"** embodies the result of his investigation conducted during the period of **2022** at the department of Mathematics Education, University Campus, TribhuvanUniversity, Kirtipur, Kathmandu. I hereby, recommended and forward that his thesis be submitted for the evaluation to award the Degree of Master of Education.

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Letter of Approval

This thesis entitled **"Teacher's Skills and Perceptions towards The Use of ICT in Mathematics Teaching"** submitted by **Ms. Anita Mainali**in partial fulfillment of the requirement for the Master's Degree in Education has been approved.

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Recommendation for Acceptance

This is to certify that **Ms. Anita Mainali** has prepared this thesis entitled **"Teacher's Skills and Perceptions towards The Use of ICT in Mathematics Teaching"** under my guidance and supervision. I recommend this thesis for acceptance.

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

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Anita Mainali

Dedication

This work is affectionately dedicated to my mother Mrs. Jeevan kumari Bhattarai, father Mr. Badri Mainali, Sister Sarita Mainali, SangitaMainali and brother Subash Mainali who even in a very difficult situation gave me a great span of their life for what I am now.

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…….

Anita Mainali

Abstract

This study is based on survey research design entitle "Teacher's skills and perception toward the use of ICT in teaching mathematics." The purpose of this research is to find out the perceived skills and perception of mathematics teachers towards the use of ICT in teaching mathematics. The sample of the study consisted from who teach Mathematics in community school of Kathmandu valley. The data were collected from questionnaire. For this study teachers were selected by simple random sampling method. The questionnaire was prepared on three parts which are teachers demographic, teacher's perceived skills on ICT and teacher's perception on ICT. The perceived skills of mathematics teachers measured in the four-point Likert scale. Similarly, the perception of mathematics teachers measured in the five-point Likert scale. The collected data was tabulated and analyzed by using SPSS software version 23.0 to get the value percentage, mean and standard deviation for first objectives, statistic chi-square value at 0.05 level of significance and percentage for second objectives.The study concludes that the use of ICT in mathematics teaching is increasing day by day and also, ICT provides great opportunity for school in developing and improving their teaching and learning processes. For the conceptual development of mathematics, one of the abstract subjects, the learning is more effective by the use of ICT. This study shows that 55% of respondents have been using ICT for 1 to 5 years and 26% of respondents have been using ICT for less than 1 years. So, using ICT in teaching mathematics was rarely used before COVID-19 pandemic. The physical classes were neglecting the use of ICT. After therapid spread of coronavirus, the school were start virtually. Then they started using ICT in teaching mathematics. The researcher found that teachers were skilled on word processor, spread sheet, presentation packages, Data base, search engines, communication,

GeoGebra, printer, projectors and scanners, but they were unskilled on Mathematica, Desmos and SPSS. Also, concluded that mathematics teachers has positive perception towards use of ICT in teaching mathematics. ICT helps to develop teachers and students skills, teaching materials, classroom management and students achievement.So, this situation made us all to realize that we cannot escape away from the use of technology. Similarly, we cannot ignore the increasing demand as well as necessity of ICT in teaching and learning.

List of Acronyms

2D	:	Two Dimensional
3D	:	Three Dimensional
B.Ed.	:	Bachelor of Education
COVID-19	:	Coronavirus Disease of 2019
DVD	:	Digital versatile disc
E-mail	:	Electronic mail
ICT	:	Information & Communication Technology
INGO	:	International Non-Govermental Organization
LCD	:	Liquid crystal display
M.Ed.	:	Master of Education
MOE	:	Ministry of Education
NCED	:	National Center of Educational Development
NGO	:	Non-Govermental Organization
SLC	:	School Leaving Certificate
SPSS	:	Statistical Packages for Social Scientists
SSDP	:	School Sector Development Plan
SSRP	:	School Sector Reform Plan
T. U.	:	Tribhuvan University
TSC	:	Teacher service Commission
UNESCO	:	United Nations Educational, Scientific and Cultural Organization
WHO	:	World Health Organization

Table of Contents

List of Tables

List of Figures

Chapter I

INTRODUCTION

Background of Study

My formal education started at the private school of the Sindhuli district. In that school, I studied class nursery to class one then shifted to the government school. As a student, I hardly remember a few things as rote memorization and drill of the multiplication table from 1 to 10 in class. The teacher used to give us lots of time for rote memorization. The teacher used to give the corporal punishment for not memorizing the table. In this case, I was lucky because I used to memorize the table. So, I did not get punishment whereas other friends got a lot of punishment for not doing that.

Teaching students through concrete things before moving to abstraction lead them gradually from actual objects through symbols. This technique had shown to be particularly effective with students who have difficulties in Mathematics (Jordan, L., Miller, M., and Mercer,C.D, 1998). Connecting mathematical concepts through the use of objects creates better retention and integration of concepts in the physical world. This approach is similar to the work of Jerome Bruner (1960) that teachers should start with the concrete components that include manipulative stools, or any other objects that students can be handle during the instruction and move to abstract components that include symbolic representations such as numbers or letters that students can write or interpret to demonstrate their understanding of a task. Through representations of abstract concepts by real objects, students can easily see the relevance of mathematics in their lives. Besides the rote learning of the multiplication table, its connection with the addition base could be more effective. But the teacher never connected. So, I thought mathematics was de-contextualized. Sometimes

teachers used to focus on different charts and paper for illustration. But such kinds of practices were not enough. Piaget's cognitive development theory(1936) emphasized the manipulation of the objects and craftwork to excel knowledge, teachers should explain the complex ideas with familiar examples and also can use a story for middle child age. I remembered the different stories that were still in my mind those the teachers told in the class. Stories remain a longer time for the middle child according to Piaget.

When I was studying at a lower secondary and secondary level new teacher taught us mathematics. But there was no fun and entertainment in the mathematics class because the teachers used to impose their ideas on students. Usually, in mathematics class, our teacher used to enter the classroom and just solve the problem. The teacher used to tell that, mathematics, the subject which could be studied only by talented students. Then, I had to work hard to learn mathematics to compete with the first student in the class. I used to solve many problems at home with the reference of the teacher's note and with the help of the examples done in the textbook. I memorized the formula and without linking mathematics to daily life, I would solve the problem using an algorithmic problem-solving method in which I would follow the series of procedures using formulae. So, my math teacher motivated me to do well in mathematics. I would directly memorize the formula $(a+b)^2= a^2+2ab+b^2$ instead of learning it by connecting it with the concept of area. This concept can also be visualized using paper cutting as well as using ICT. However, I never got any opportunities of using ICT during my school days.

While teaching the shapes such as cylinder, circle, prism, etc. in class, the teacher used to draw the image on the board. During my school days in the lower secondary and secondary levels, I thought mathematics was abstract because no

picture of the problem and solution was made in my mind. So it was difficult for the construction of knowledge. I felt sometimes mathematics was quite boring. Most of my friends had math anxiety also they never liked mathematics. They said that they would never open a mathematics book after the S.L.C examination. But, I was searching for how to make mathematics interesting for all. As I was interested in mathematics as well as the teaching profession, I choose education faculty for my further study. During my study at intermediated level, I was getting a few ideas about teaching but that was not even a drop in the ocean.

After joining Bachelors level in education, I got chance to be engaged with some good teachers and I got to know some ideas and techniques of teaching. In that time, I got a chance to participate in Montessori training. After the completion of training, I started teaching at the pre-primary level. During that time teaching was very interesting with lots of fun. I used different teaching methods to teach mathematics such as storytelling, singing rhymes, playing games, etc. but I was not satisfied with my strategies. So, I was searching for different appropriate methodologies for teaching mathematics. I didn't have any ideas about the use of ICT in mathematics classes. Today's students live in a globally connected society and they deserve teachers who practice and embrace the best technology that can aid theirlearning process. So, as a student when I finished my bachelor's level I was searching for a new way to teach and I wanted something new hence, I joined the Central Department of education for my master's degree in mathematics. I thought it was a great platform for me to learn with teachers who were updated with the use of ICT. I learned many things from there about different techniques and strategies about teaching and also the use of ICT in mathematics teaching like the use of GeoGebraand

Mathematica software in mathematics, use of PowerPoint slides while teaching math, and other mathematics software while teaching mathematics, and so on.

ICT includes all technical means that are used for handling information and facilitating communication, including computers, network hardware, communication lines, and all the necessary software. According to (Miles, S., and Singal,N., 2010) ICT stands for many different types of electronic systems which included LCD projectors, smart boards, fax machines, cyber school, printers, scanners, digital/video cameras, radio, television, DVD's, phones, calculators and various computer software, video conferencing, instant messaging, blogs and email. In another word, ICT means all types of processes and transfer of audio and video signals. In general, the integration of ICT in the classroom can involve computers, graphic calculators, cameras, a projector, and much more. (Chrysanthou, 2008)

There are several benefits of using ICT in teaching and learning mathematics. ICT has the potential to transform the nature of education improve teachers' design work, enhance the roles of students and teachers in the learning process, and help to create a collaborative learning environment. As a result, the integration of ICT in teaching and learning is high on the educational reform agenda of developed and developing countries. For developing countries, ICT can be seen as a way to merge and even leapfrog into a globalizing, technological world. However, developing countries are far from reaping these benefits because of certain challenges such as administrative support, teacher confidence, and competence. Positive attitudes towards computer use by school teachers are important for effective integration of technology in the school curriculum and also for pedagogical practices (Amusko, S., Miheso, M., and Ndethui, S., 2015). A teacher's belief can be a major barrier to ICT integration. Some teachers have a negative belief about the use of ICT in teaching

mathematics because of their own negative experiences such as anxiety and stress. The process of integrating ICT into mathematics teaching is directly affected by teacher's beliefs and attitudes towards using computers as a tool for teaching and learning mathematics. To change teacher's beliefs schools must develop strong leadership. Also, the school principal should not only be an official supervisor but be a personal advisor to assist individual teachers and staff.

ICT can improve the excellence of teaching, learning, and management in schools and teacher's professional development. ICT-assisted teaching is more effective in raising the arithmetical and logical skills in mathematics (Joshi, 2017). ICT supports mathematics for composing, revising, editing, publishing, calculating, making connections, visualizing data, finding importance synthesizing, and problem-solving varieties of notation, formula, symbols, figures, and graphs are available in mathematics which is difficult to demonstrate in blackboard/whiteboard like 2D and 3D figures, graphs and chart, a transformation of objects and other associative matters. By ICT-related applications tools and software, such matter can be taught expressively. ICT makes mathematics teaching healthier and helps to increase the achievement of students (Safder et al 2011; Gera and Verma, 2012 cited by Joshi Dirgha Raj, 2017). So every teacher has to use related technological tools, applications, and software for effective and meaningful teaching of mathematics.

Some NGO's, INGO's, and various levels of government bodies have been contributing on this field, such as laptop and computer distribution for schools. One laptop per student program and other financial assistance for ICT instruments. Computer education is a distinct program (class 6 to 10). Various universities have incorporated ICT-related topics into their mathematics education B.ED and M.ED curricula (TU, 2010). It is part of the teacher licensing curriculum, the Teacher

Service Commission's (TSC) course for mathematics teachers (TSC, 2019) and in-service mathematics teacher training course (NCED, 2014). The National Center for Educational Development's (NCED) distance education and open learning section has been producing curriculum-related audio-visual documentaries. For a few years, Radio Nepal, NCED's virtual YouTube channel, and Nepal Television have provided support to the school's students and staff. So, this study will show theperceived skills of ICT and their perception towards the use of ICT.

Statement of the Problem

In the twenty-first century, knowledge is expanding day by day so teaching becoming one of the most challenging professions in our society. While learning mathematics, learners expected from facilitator to facilitate meaningful learning rather than just knowledge and skills. In this condition, the use of ICTs in teaching mathematics provides new possibilities in the teaching profession.

Knowledge of ICT is listed as a standard domain of teacher competency in the Teacher competency framework (2072). The School Sector Reform Plan(SSRP) 2009-2015 aimed to expand ICT infrastructures in schools to support ICT related teaching/ learning strategies (Ministry of Education, 2009); the three-year plan 2011-2013 focused on the use of ICT in school education(NPC, 2011); and the ICT in Education Master plan 2013-2017 aimed to expand equitable access to quality education, reduce the digital divide between the haves and have not and improve the educational service delivery system(Ministry of Education, 2013); National curriculum framework for school level in Nepal (2076) outlines some key guidelines for technology integration in education; and the current School Sector Development Plan 2016-23 (2016) consider ICT as a vital tool to optimize access to teaching/

learning materials, improve classroom delivery, and enhance the efficiency and effectiveness of educational management and governance.

The world health organization (WHO) was declared COVID-19 a global emergency on January 30th, 2020, and a global pandemic on March 11th, 2020. Nepal's government imposed strict social distancing measures as well as a lockdown policy on March 24th, 2020. The education sector has been severely impacted by this pandemic. According to Dawadi, Giri, and Simkhada(2020), Nepal has over nine million (8,796,624) pupils affected by school/university closures as a result of the pandemic. Pre-primary education accounts for 958,127 (11 percent), primary education for 2,466,570 (28 percent), secondary education for 3,463,763 (39 percent), and postsecondary education for 404,718 (5%). The examination for secondary education has been postponed. Nepal's government decided on June 15, 2020, to begin online programs at all levels, from elementary to university. I've often wondered if teachers have sufficient computer abilities. What was the impact of ICT in mathematics education, and how did they feel about it? As a result of these questions, I became interested in learning more about the subject.

Research Questions

The research question of this study are below:

1. What are mathematics teacher’s perceived skills of ICT?
2. What are teacher's perceptions of the application of ICT in teaching mathematics?

Objectives of the Study

The objectives of this study are below:

1. To find out mathematics teacher’s perceived skills of ICT.

2. To explore the perception of teachers towards the use of ICT in mathematics teaching.

Justification of the Study

This study seeks to investigate teacher's skills and perceptions towards the use of ICT in teaching mathematics. Worldwise research has shown that ICT can lead to improved student learning and better teaching methods. The use of ICT is helpful for teachers to teach mathematics effectively and dynamically as they are more visual, interactive become motivated while ICT instruments are used in teaching. The effectiveness of ICT in teaching mathematics also depends on the teacher's interest, ability, and knowledge about it. The significance of this research is as follows:

- It would help me to identify the level of knowledge on ICT in mathematics and improve it in further days.
- It would help the school management committee for making the school an ICT zone.
- It would help policymakers and curriculum developer.
- It would help master's levels mathematics students.
- This study provides for NGO & INGOs that handed for the educational programs.

Delimitations of the Study

Delimitations are in essence the limitations consciously set by the authors themselves. They are concerned with the definitions that the researchers decided to set as the boundaries or limits of their work so that the study's aims and objectives do not become impossible to achieve. The delimitations of my studies are as follows:

- This study was limited to the Kathmandu valley.
- This study was limited to the Government school.

- This study was based on quantitative research.
- This study waslimited to Basic and secondary level mathematics teachers.
- Only the tools like a computer as ICT tools.

Operational Definition of Related Terms

An operational definition is the key terms/ words which were frequently used in the research. The following are the key terms in this research;

ICT. Information and communication technology (ICT) mean applied hardware and software to produce and share learning materials for the students.

Teacher. The teachers who teach mathematics at the Basic level and secondary school levels.

Skills. Skills are the knowledge, experience, and ability of teachers in both hardware and software which eventually helps to do better in mathematics teaching.

Perception. Perception is the thought of teachers towards their skill, teaching materials, student achievement, and classroom management in teaching.

Chapter II

Literature Review

In this section, I describe the literature related to this topic which is classified as Thematic, Empirical, and Theoretical. Working with the literature is an essential part of the research process which generates the idea, helps in developing significant questions, and is regarded as instrumental in the process of research.

Empirical Review

The systematic summary of scientific research and real investigation, including their topics, the reason for the study, the method of the study, data collection tools, and method of confirming their validity and reliability, as well as major findings in the related field, is connected by the review of the empirical literature. It ensures that the researcher evaluates the scientific investigation and systematic study, as well as the methods and processes that must be followed.

The primary goal of this research was to determine mathematics teachers' abilities and attitudes regarding using ICT in the classroom. There are a plethora of articles, reports, and research projects linked to this topic. So, in order to understand the current problem of study, the researcher has analyzed the following studies:

According to Poudel(2015), research on the topic "Teacher's and Student's perceptions on the use of ICT in mathematics teaching." The goal of study was to explore the perception of students and teachers towards mathematics teaching with the use of ICT. The sample was taken from the students and teachers of mathematics in the lower secondary and secondary levels of the Bhaktapur district. This study used the qualitative research design. He used open-ended questions and in-depth interviews to explore the views of the participants to know their perception towards mathematics after using ICT in mathematics. This study concluded that teachers were interested in

teaching using ICT. With the use of ICT in mathematics classrooms, the students felt mathematics was another subject. Prior to the use of ICT, students' perceptions of mathematics were that it was a boring and difficult subject to learn, and that they couldn't concentrate well in class; however, after using ICT in the classroom, students' perceptions of mathematics were changed. ICT assisted in bringing positive perceptions of mathematics, and students began to study and learn by understanding their meaning and seeing mathematics as a normal subject like others. As a result, schools should begin to recognize the importance of education for students by providing accurate information, effective communication, and new technologies

Zhu (2015), also conducted research on "Pre-service Teacher's perception of ICT integration in teacher's education in Turkey." The goal of this study is to find out how pre-service teachers feel about ICT integration in teacher education and how that affects their teaching practices. The researchers used a stratified two-stage probability sampling approach. Firstly, three Turkish state Universities with the highest and lowest number of Pre-service teachers were chosen. Second, pre-service instructors were chosen from the disciplines of Turkish language, social sciences, elementary mathematics, and science. This research employed a qualitative approach. Data were collected from 728 Pre-service teachers from open-ended questions in a survey and interviews were conducted with 15 participants. Qualitative data were analyzed with thematic coding. The results identified the specific conditions of ICT integration in teacher education and Pre-service teachers' perception of ICT integration and the association with their teaching practices.

Likewise, Benning and Agyei(2015), conducted a journal on "Pre-service teacher use and perception of GeoGebra software as an instructional tool in teaching mathematics". This paper presents a case study of 85 pre-service mathematics

teachers from the university of Cape Coast, Ghana; who enrolled in an instructional technology mathematics course to develop competencies in teaching mathematics using GeoGebra software which was being introduced to them for the first time. The study focused on an in-depth investigation of the pre-service teacher's perception and use of GeoGebra in teaching mathematics. The questionnaire, interview, and lesson artifact developed by the teachers were the data sources of the study. Descriptive t-test and effect size statistics were used to analyze the quantitative data whereas the interview data and lesson artifacts were analyzed qualitatively. Statistical analysis confirmed that the use of the GeoGebra helped pre-service teachers expand their understanding of mathematical concepts as well as their knowledge of instructional strategies. This study also indicated that two perceived barriers, lack of awareness of the GeoGebra software and time constraint in designing GeoGebra lessons hinder pre-service teachers' use of the tool. That notwithstanding, the pre-service teacher's perceived developed attitudes and pedagogical views on the use of GeoGebra point to its potential as an instructional tool in developing their experiences in technology integration within an initial teacher education program in Ghana.

Also, Shrestha(2015) conducted a study on "status of ICT use in teaching/ learning mathematics" in order to find out the use of ICT in mathematics teaching and learning in heartland's children academy. Her research design was qualitative with case study. The data has collected from primary sources. Also, class 7, 8, 9 and 10 interview 4 teachers at heartland's children academy school in Kathmandu. She has found from the study that there was neither any plan on the use of educational technology tools in mathematics teaching and learning nor inadequate teachers training on the use of educational technology. In addition, there was a lack of relevant

educational technology tools for schools. There were the major reasons for the school not to use the educational technology tools in mathematics teaching and learning.

Furthermore, Timilsena (2017), conducted a research entitle "Attitude of teacher of ICT in teaching Mathematics" with the purpose to find out attitude of teachers towards ICT in teaching mathematics. The sample was 200 mathematics teacher out of 925 from Surkhet District of Nepal. The data collection tool were Questionnaire and interview guideline. The data analysis procedure is chi-square test at 0.05 level of significance. He found that most of the school of Surkhet district has ICT tools and some teacher are use ICT tools in teaching mathematics, but some teachers don't use ICT materials because lack of knowledge. Finally, he concluded that all mathematics teacher of Surkhet district have positive attitude towards ICT tools.

Likewise, Saud (2018), conducted a research on the topic "Attitude of students and teachers of using audio-video aids in learning on secondary level at Surkhet district." Objective of this study was to explore the attitude of students and teachers in using audio-visual aids in teaching learning. The researcher followed survey research design and total sample population of primary were 100 students and 15 teachers of Surkhet district. The stratified random sampling procedure was followed for the selection of sample population. Where closed ended questionnaire was using to collect data. There were used statistical aids mean, percentage and chi-square test at 0.05 level of significance. The researcher found from his research that students and teachers were using audio-video for their teaching and learning. The students and teachers had positive opinion in the use of audio-video for teaching and learning. He also concluded that students and teachers motivated to learn the subject materials the feel more comfortable, effective and sustainable teaching learning. All students and

teacher views were agreed that audio-video aids are very useful and higher achievements. In used the audio-video aids bring change the classroom environment as well as higher motivation support. In his opinion, audio-video aids are very important to change the education and it made effective and long-lasting learning.

In the same way, Dahal(2018) research out on "Attitude of teachers and students towards the use of social media in teaching and learning." The objective of this study was to find out the attitudes of teachers and students towards the use of social media in teaching and learning then compare their attitudes. This study was limited to 5 secondary schools of Sindhupalchowk district. This study used the qualitative research design through the survey and descriptive nature. The survey design collected required information opinion and attitude of respondents using questionnaires techniques and are students and teacher the use of social media in teaching and learning used chi-square distribution and t-test was use to find the significant difference between the mean score of student and teachers towards the use of social media in the teaching process at 0.05 level of significance. This study concluded that the attitudes of secondary level students and teachers had positive towards social media are slightly better attitudes than students attitudes.

Also, Adhikari(2019) carried out the research on the topic “Practice of ICT in teaching and learning mathematics”. The objective was to find out that the teachers and students practices of ICT tools in teaching and learning mathematics and to compare community and intuitional mathematics teachers and students practices of ICT tools in teaching and learning mathematics. The sample was taken from 46 secondary schools mathematics teachers and 146 students (from 15 community and 8 institutional secondary schools) of Dhankuta district by stratified random sampling method. The survey design was conducted to achieve the objective of study. The

practices of mathematics teachers and students was measured in five-point rating scale. The data was interpreted by using SPSS software version 21.0 to get the value of statistics chi-square test, percentage, mean, and standard deviation and t-test for objective first and second respectively.

By analyzing and interpretation of obtained data, the researcher found that secondary schools and mathematics teachers and students has minimum practices of ICT tools in teaching and learning mathematics. It is concluded that community and institutional secondary school's mathematics teachers has no significance difference in practice of ICT tools in teaching and learning mathematics. Likewise, community and institutional secondary school's students has significance difference practices of ICT tools in learning mathematics. This shows that community schools students in learning mathematics.

Moreover, Pahadi(2019) has conducted an unpublished thesis on "Perception of students towards digital technology and social media in learning mathematics." In this study, the sample was 100 students of the central department of mathematics. This study was related to quantitative research. The main objective of this study was to find out the perception of students towards digital technology. He concluded that there is no significant difference between the perception of boys and girls students. This study shows that there is a positive perception of digital technology in mathematics.

There were so many researches in topics ICT in mathematics. From above research teachers and students are more positive in teaching and learning mathematics using ICT. I am not getting the thesis about "Teacher's skills and perception toward use of ICT in mathematics teaching". ICT is new dimension for teaching, so I am interested to study about it.

Thematic Review

In a thematic review of the literature, the researcher identifies suitable theme in step with topic and briefly cites literature to document this theme(Creswell, 2012). According to my research purpose, I searched for existing literature from different sources which supported my research study. According to my research question, I went through different related materials for literature review on ICT, ICT in mathematics, ICT policy in school education, and teacher's perception towards the use of ICT in mathematics.

ICT. According to United Nations Educational, Scientific and Cultural Organization (UNESCO), the term information and communication technologies (ICT) refers varieties of technology that are used to transmit, process, store, create, display, share or exchange information by electronic means. This board definition of ICT includes such as technologies as radio, television, video, DVD, telephone (both fixed-line and mobile phones), satellite system and computer network hardware and software likewise because the equipment and services related to with these technologies like video conferencing, e-mail and blogs (Owusu-Ansah, S., 2013). This emphasizes that using ICT appropriately helps to expand access to education and helps to make teaching and learning effectively.

ICT in mathematics. Today's students live in a world where information and communication technology (ICT) is an integral part of their daily lives. ICT challenge the traditional conceptions and ensure new concepts within the mathematics teaching and learning. Different approaches are used in relation to new inventions and technology to make mathematics teaching and learning easy, effective, qualitative, advanced, and rewarding. Every technological advancement has aidedmathematics;

the impact of technology on education in mathematics is greater than any other discipline (Aydm, 2005).

The availability of ICT has changed the character of teaching and learning in mathematics. Calculators became more advanced, allowing users to perform increasingly complex functions. Multimedia software programs specialize in specific units of study, incorporating dynamic movement, sound, and visuals into the teaching and learning of students. The contribution that ICT can make to mathematics teaching in terms of problem-solving activities, number skills practice, and pattern and relation exploration.

ICT will be beneficial in various areas of mathematics, but the following areas will gain the mostfrom the opportunities it provides.

- Applying mathematics and solving problems.
- Position value, order, and rounding.
- Formulae, equations and identities.
- Graphs, functions and sequences.
- Lines, angles, and shapes are used in geometrical arguments.
- Transformations.
- Co-ordinate-geometric
- Loci and construction.
- Probability.
- Statistical applications etc.

ICT policy in school education. ICT has been given a place in our school's educational policy. ICT has been included as a subject and a tool for instruction in the National Curriculum Framework (2076). ICT (2010) and National Information and Communication Technology (2015)on the other hand, both included ICT in the school

curriculum to improve its quality. Infrastructure, comprising internet connectivity, human resources, content development and system enhancement, are four components of ICT in education covered in the Education Master Plan (2013). Digital skills were added in the Teacher Competency Framework by the Ministry of Education (MOE) of Nepal alongside the eight competencies of a qualified teacher (2016). It also de-cleared that a professionally competent teacher uses ICT for effective teaching and learning. The government of Nepal, MOE has included ICT as one of the curricula as a subject and tool for instruction in school education (ICT Master Plan, 2013-17). Only a few institutions have integrated this ICT policy and implemented it in classroom teaching and learning.

Teacher's perception toward the use of ICT in mathematics teaching. Boulton(1997) refers to an individual's attitudes, behaviors, self-beliefs, or views about anything. Teacher's perceptions describes their beliefs about the importance of integrating ICT into teaching and learning, as well as the perceived obstacles that are related to using ICT Education (Hutchison, A. and Reinking, D., 2011). Furthermore, teacher's perceptions of using ICT can reveal their beliefs, as well as their self-efficiency on ICT usage into teaching and learning. In a differentway the explained is how teachers regard understands and interpret the use of technology in teaching and learning.

Many nations in Europe and Asia have recognized the value of ICT and have integrated it into their educational systems; today, using ICT in teaching and integrating it into topic teaching becoming mandatory (Balcon, 2003 as cited inOsamah, 2008). ICT will improve the way of teaching and it provide a many new opportunities for both math teachers and students to explore, improve their knowledge and be creative. Depending upon the philosophical orientation behind the teaching

and learning activities, different teachers have different perceptions towards use of ICT. But moreover many teachers accept that by the utilization of ICT enables students to provide many examples and support their work. Teachers also believe that the usage of ICT tools and resources could support teaching and learning activities (Rauthven, K., and Hennessy, S., 2003). ICT based tools like computer, laptop, calculator, and others, allow students to use graphics, images and text together, to demonstrate their understanding of mathematical concepts.

Students envision the problem when they use ICT in math, which helps them grasp the topic and change their attitude toward mathematics.

The role of teachers in the success of technology-based learning. Teachers' job is to make sure that ICT is adequately integrated into their Math lessons in order to improve reading and writing. Teachers, on the other hand, must have the essential knowledge to do so successfully. They should be able to identify the appropriate equipment for a given work, as well as where and how to obtain information, among other things. According to Watson (1999), incorporating new technologies into educational contexts necessitates change, which will be handled differently by different teachers. According to him, it's critical to evaluate different teachers' shifts in attitude because what they believe influences what they do in the classroom. According toBecta(2003), one of the most important aspects of teachers' attitudes regarding the use of technology is their knowledge of how it will enhance their teaching and their students' learning.

Many teachers, according to Hennessy, Harrison &Wamakote(2010) are afraid of technology and want to stick to their tried-and-true teaching methods. They go on to say that many people are first concerned about the perceived loss of authority in the classroom since students, who are typically more competent at using technology, can

easily obtain material and dispute the teacher's status as a secondary source of knowledge. Teachers who participate in suitable professional development, however, learn how to manage their classrooms more efficiently and how to employ technology to create a more engaging learning environment, according to Olakulehin (2007, as cited in Hennessy, et al., 2010).

Theoretical Review

There are so many theories that can be used to understand the learning process. The theoretical discussion is needed for the interactive finding of the study. Some mathematical theories about learning are considered very necessary for the researcher of mathematics education. I use some theories as to my theoretical referents with the help of some theories as literature. I have tried to make my narrative clear. Those theories are discussed in brief below:

Constructivist learning theory. The constructivist learning theory explains how humans comprehend, know, and learn information. According to Burner (1966), learning is a continuous process in which students are given the opportunity to actively develop new ideas (knowledge) or concepts based on their prior or existing information. The theory can be summarized in three goals. The first goal is the students to learn the subject content through their interactions with their surroundings(Savery, J.R., and Duffy, T.M., 1995). To this study, it means that what students learn depends on how they learn it or merely on the ICT tools that they use in learning the content. If students are provided with all the tools, they need in searching for information, the information that they will be exposed to can't be the same as when they have a textbook as the only source of information. The second goal state that cognitive conflict is the stimulus for learning and regulates the organization and nature of what pupils learn (Savery and Duffy, 1995).

In the learning environment, for example, the classroom, there is some stimulus or goals for teaching and learning. In simplicity, as much as a teacher has a purpose for teaching, pupils also have a purpose for learning. Therefore, the goal is not only the stimulus for teaching and learning. Nonetheless, it is also the main factor in determining what the pupil attends to learning and how the teacher presents it. Also, the prior experiences pupil brings to learning bear many fruits in the construction of understanding the content. The understanding that pupils get is constructed based on the tools used in the process of learning. The third goal affirms that knowledge progresses through social concessions and the evaluation of the viability of pupils' understanding (Gaffney and Anderson, 1991). Teachers and pupils can use handheld games, interactive podcasts, interactive mobile TV, and text messages in a social environment for collaboration or interaction to develop a set of knowledge (Naismith, L., sharples, M., Vovoula, G., and Lonsdale, P., 2004).

According to Piaget, during the process of accommodation and assimilation, students develop new knowledge from their experiences. In the context of education, the theory of constructivism aims for pupils to discover knowledge on their own when they are provided with the necessary learning tools which can be ICT in this regard. By using ICT in mathematics classroom students will develop their knowledge by visualizing and here teacher role is just as a facilitator. Further, in this type of constructivist class students are motivated to share their ideas, expand their knowledge through ICT or by utilizing their experience. ICT improves higher-order thinking and better problem-solving skills in constructivist teaching, in which students use technology to explore and understand mathematical concepts. According to Roblyer, Edwards&Havriluk (1997, as cited in Madhukar, (2019), ICT addresses the following needs as identified by constructivism:

- Making skills more relevant to students' backgrounds and experiences by placing them in meaningful, authentic (e.g., real-life) situations.
- Using interactive activities that require students to take active rather than passive roles to address motivation issues.
- Using cooperative learning activities in groups, students will learn how to work together to solve issues.
- Prioritizing interesting, motivating activities that demand both higher-level and lower-level skills.

In my research, this constructivist theory supported me to understand the teacher's skills and the perception towards the use of ICT in teaching mathematics.

Connectivismtheory. Connectivism is still a relatively new learning theory that has been met with some criticism (Gracia, E., Brown, M., and Elbetagi, I., 2013). Siemens (2005) defines connectivist theory as "a learning theory for digital age". Connectivism learning theory was founded from belief that there is a need for a learning theory, which takes due cognizance of the ways in which societies has changed because of the new technologies or technologies advancement (Gracia, E., Brown, M., and Elbetagi, I., 2013). The theory was created with the goals of offering a paradigm for better understanding and management of teaching and learning, as well as the usage of ICT such as digital technology(Siemens, 2005). Behaviorism, cognitivism, and constructivism are three well-known learning theories that all contribute to the creation of online content in different ways when it occurs: Constructivist strategies use a shift toward real-life application, where the learner is given the opportunity to construct personal meanings from what is presented. Behaviorist strategies teach facts and what is needed for understanding concepts, cognitive strategies focus on how the process should be implemented for the most

successful learning, and constructivist strategies use a shift toward real-life application, where the learner is given the opportunity to construct personal meanings from what is presented. Connectivism is a useful instructional guide or theory for developing earlier learning theories for use in a globalized and networked environment, but it is not a stand-alone learning

Connectivism is defined by the principles, according to Siemens (2005).

- Learning and knowledge are based on a range of viewpoints.
- Learning is the act of linking specialized nodes or information sources.
- Non-human appliances may be capable of learning.
- Capacity to know more critical than what is currently know.
- Ability to see connections fields, ideas, and concepts is a core skill.
- Currency (accurate, up-to-date knowledge) is the intent of all Connectivist learning activities.
- Decision-making is in itself a learning process.

A Connectivismideasexplains how internet technologies have enable opportunities for the people to learn and to exchange information across the World Wide Web and among learner themselves. These technologies include Web browsers, email, wikis, online discussion forums, social networks, YouTube, and any other tool which enables the users to acquire and to share information with other people. In connectivist learning, a teacher will be taking a new role, which is guiding students to information and answering key question as needed, in order to support students learning theory does challenge the traditional learners. It transfers the power from teacher to the students during the process of learning.

Connectivism is a reflection of our fast changing society. Society is more complex, connected socially, global, and mediated by increasing advancements in

technology. Rather that a new learning theory, Connectivism offers and educator a model or mental representation the depict something that cannot be observed or experienced directly (Dorin, H., Demmin, P.E., and Gabel, D., 1990). While the debate over the status of George Siemens and Stephen Downe's theory of Connectivism will continue to be debated for many years, it is undoubtedly an important of thought directly applicable to the use of technology in the classroom today. There is no doubt that online learning cultures, methods, and inspirations. The combination of 3D interactive graphics and Web technologies (Web 3D) will permit instructors to create an interactive, realistic environment for the student in an online environment (Chittoro, L., and Ramon, R., 2007).

Comparing learning when using modern information communication technologies with traditional learning.

Traditional Learning	**Connective learning**
Memorize facts, dates, and details	Connecting to sources of data
Recognizing processes and phenomena	Using devices to collect information
Concepts should be taught	Looking for information
Putting skills into practice	Making and keeping connections
Solving a variety of subject-related challenges, both theoretical and practical	Perceiving connections between different locations, ideas, and concepts
Getting firsthand experience	the ability to think critically
Doing tests	Selecting learning things and making decisions on their own

Source:(Jolanta Szada-Borzyszkowska, Elżbieta Jaszczyszyn, 2014))

Conceptual Framework

A conceptual framework refers to the connection of the research variables in the study in compact form. The conceptual framework is developed based on the researcher's understanding of the research variable and research process using some

aspects of the theoretical framework. The conceptual framework was the plan or specific frame on which the whole study is established in the diagram. It provided the general picture of the whole study from where the reader can conceptualize the whole idea of the research. The following is the conceptual framework of my study:

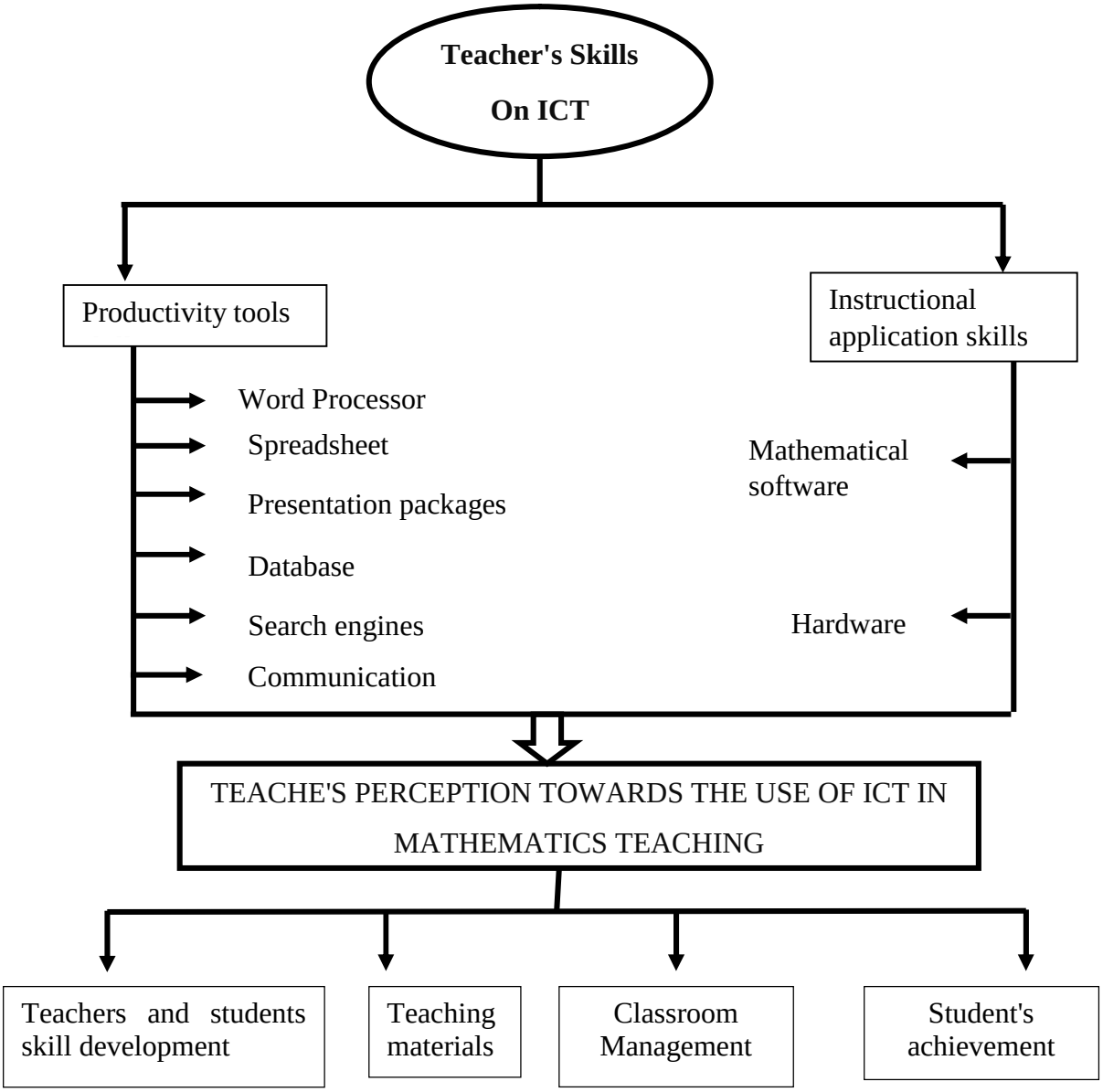

Figure2.1: **Conceptual Framework**

Productivity tools skills. Productivity tools makes more effective mathematics teaching. Some popular productivity tools are word processing, spreadsheet and database etc. These program enhance a teacher's lesson plan and allow the teacher to

take their students beyond textbooks and lectures. For example: Excel is a productivity tools that can be very helpful in teaching math. Excel possess the ability to change numerical data and put in the form of a graph in a matter of seconds. This technique allows the teacher to show the difference in the results of an experiment or survey using a graph or chart. This visual picture is just as important as the numerical data. Some children are visual learners and they may not be able to comprehend the difference of the data without seeing it in a chart or graph.

Instructional application skills. There are so many instructional software are develop. Instructional software are dependents on subject-wise or content wise. For example: A mathematics teacher enables their students to practice algebra problems with help of a drill and practice software. GeoGebra, Mathematica, Desmosetc are the most popular software in mathematics. Teachers must evaluate and use various types of specialized computer software to accomplish specific educational objectives.

The conceptual model of this study concerning the previously done national and international master's thesis and related literature review to this topic, then the researcher arrived at the above conclusion. In this research, the researcher has to come to point that the topic of teachers' skills and perception towards the use of ICT in teaching mathematics. The main purpose of the research is to find mathematics teacher's skills in ICT and perception towards ICT in teaching mathematics.

Chapter III

Methods and Procedures

This chapter deals with the research methodology. The methodology of the study guides the whole study along with its scope and it helps the researcher to easily collect and analyze the data. The following methods and procedures were adopted to conduct the research for the improvement of the study and fulfill the objective of this study. This chapter consists of design of the study, area of the study, selection of respondents, data collection tools and techniques, data collection procedures, data analysis procedures, and ethical consideration.

Design of the Study

The study was concerned with survey design. A survey is a research design that is widely used in social sciences and educational research. Primarily it is carried out in the search of attitudes, beliefs, and behavior of a large population. It is mostly useful to generalize the finding to a particular problem based on the data obtained from the large sample of the related universe. In terms of sample, instruments, and generalization of the results, it differs from other designs such as experimental, case study, and so on. Cohen, Manion, and Morrison (2010, p. 205),claim that "A survey collects information at a specific point in time with the goal of describing current conditions, identifying standards against which current conditions can be compared, or finding the correlations that exist between specific events".

Further say the survey can be exploratory, in which no assumptions or models are postulated but relationships and patterns are explored through correlation, regression, factor analysis; it can also be confirmatory, in which a model, cause relationship, or hypothesis is tested (p.207). We can conclude that survey research is a type of research that studies large and small populations by selecting a sample

population chosen from the study population. It is generally conducted to obtain a snapshot of conditions, attitudes, perceptions, or beliefs over something at a single point in time. It can also be a longitudinal process if the study is developmental research of survey. According to Cohen et al. (2010) any survey study must have three prerequisites: the study's goal, the population studied, and the resources available (pp. 207-09). To recap the concepts, a survey is research that is conducted on a large number of people in order to broaden the scope of the findings. It's regarded to be the most up-to-date study on educational and public-sector operations, professional practices, attitudes, and perceptions.

Because survey designs are quite flexible, they can take many different forms. However, they all have one thing in common: they collect data using standard questionnaires that are administered by phone or face to face, by postal pencil and paper questionnaires, or increasingly by web-based and e-mail forms (cited by Muijs, 2004). In this study, the questionnaire was conducted to obtain the objectives and collect the data via e-mail. Therefore, the survey research design was used to attain the objectives of this study.

Population and Sample of the Study

The skills and attitudes of teachers toward ICT in mathematics were examined in this study. The population of the study was all basic level and secondary level mathematics teachers who worked in Kathmandu valley community schools. Although it is considered, larger the population more reliable the study, researcher couldn't visit all the teachers due to time, pandemic of COVID-19, and economic constraints. However, the researcher opted to selected 100 teachers through a simple random sampling procedure.

Research Tools

As the study was survey research, the researcher used questionnaire as the research tool to gatherdata. The questionnaire was designed to examine the skills and perceptions toward the use of ICT in teaching mathematics.

Questionnaire. A questionnaire is a research tool comprising a number of questions soliciting specific responses from subjects concerning the given field of the study. Questionnaire is an important tool for data collection in this research. In this study, questionnaire developed had close-ended question. With the close-ended questions, Ross (2005) notes that with closed-ended questions, respondents are limited to a narrow set of responses that are simple to answer and code. Closed-ended questionnaires also allow for additional factors to be included in a research project. Because of the format, the respondent could answer more questions in a short time. The questionnaire was developed base on the conceptual framework of this study. On the first part of the questionnaires dealt with the participant's personal information, second part dealt with skills on ICT and third part dealt with their perception on ICT.

Reliability and Validity of Tools

For the validation of tools, researcher prepared the questionnaires based on conceptual framework. To ensure the validity of instruments, researcherconsulted with supervisor. Reliability is concerned to a degree to which a measuring instrument gives similar result over number of repeated trials. Here, in this survey, to ensure the reliability of questionnaire, researcher conducted the pilot test among fifteenmathematics teachers, which is not included in the study. For reliability, obtained data was calculated by using statistical package for social sciences (SPSS) programmer, version 23.0.

Sources of Data

Data are the units of information from which further measurement or analysis can be drawn up. It can be a number, opinion, image, figure, fact, idea and other relevant materials, past and present information. It helps the researcher to justify, analyze and draw appropriate findings. Normally, there are two sources of data: primary source and secondary source where the primary source of data are the first handed data that are collected from the real source such as data obtained from relative respondents; on the other hand, secondary data are second-hand data that are obtained from mostly documents such as government publication, earlier researches, books, articles, journals and so on.

Regarding this study, researcherconsulted with both the primary source of data (Mathematics teachers teaching in Kathmandu valley) and the secondary data (related book, report, article, journal).

Data Collection Procedure

Data is the foundation of any research. Data collection refers to gathering information from vivid sources through the application of multiple data gathering methods to attain the objectives of the research. Therefore, researcher used primary sources and secondary sources for the data collection procedure. The primary information was collected from the responses sent by participants. After collecting the data, researcher interpreted and analyzed the data then the finding and the conclusion were drawn.

For this study, researcher made a questionnaires using Google form. Then, researcher made a list of teacher who currently teaching in Kathmandu valley. After that, researcher collected their Gmail ID. Further, researcher selected the sample teacher by random sampling method. Then, researcher provided the link of

questionnaire through e-mail or messenger and requested to fill up the form. Finally, researcher thanked the respondents for their help and co-orperation.

Scoring Procedure

For this study, the researcher collected data from a sample of teacher and then data was tabulated by using following four-point Likert scale and five-point Likert scale. The scoring procedure of each items of the instrument were as follows:

Table 3.1: ***Likert's Four Point Scale***

Meaning of Rating	**Rating**
High	4
Moderate	3
Low	2
Cannot use	1

Table 3.2: ***Likert's Five Point Scale***

Meaning of Rating	**Rating**
Strongly Agree	5
Agree	4
Neutral	3
Disagree	2
Strongly Disagree	1

Weightage 1, 2, 3, 4 and 5 were assigned to the positive statement if the response was'Strongly Disagree', 'Disagree', 'Neutral', 'Agree' and 'Strongly Agree' respectively.

Data Analysis and Interpretation Procedure

Data analysis is considering to be important step and heart of the research work. After collection of data with the help of relevant tools and technique, the next

logical step is to analyze and interpret data with a view to arriving empirical solution of problem.

After the completion of data collection, the researcher analyzed the data by using statistical package for social science (SPSS) software version 23.0. For the first objective, the data was collected through a four-point Likertscale; cannot use, low, moderate and high, analyzed by using Mean, Percentage and Standard Deviation. The score was four points for High, three points for moderate, two points for low and one point for cannot use. For second objective, the data was collected through the five points Likert response mode; strongly agree, agree, natural, disagree and strongly disagree. Response for each statement was ranked as through strongly agree, agree, neutral, disagree, strongly disagree. Each positive statement scored five points for strongly agree, four for agree, three for neutral, two for disagree, and one for strongly disagree. For negative statement, one point for strongly agree, two for agree, three for neutral, four for disagree, and five for strongly disagree. Then data wasanalyzed by using percentage and the Chi-square test 0.05 level of significance.

Ethical Considerations

Ethical considerations can be specified as one of the most important parts of research. A research ethics describes the various actions carried out by the researcher in a study. Ethical rules in a study according to (Creswell, 2014) contain two main areas such as; research requirements and individual protection requirements. Individual participants and the society as a whole have a right to demand that the research conducted is of high quality and ensure that phenomenon studied is properly verified. Also, participant protection which consists of confidentiality, consent,information and utilization requirements are vital throughout the study. The ethical considerations of thisresearch are:

- The data was taken by the permission of principal or teachers and the guidance of my supervisor.
- The identity of the participants was secured for privacy concerns.
- Data was taken by consent without any harm.
- All the information was managed with strict confidentiality.
- The researcher neither fabricated the data nor did falsify in the reporting.
- Researcher respected the autonomy of participants for answering the question.
- Researcher did not use taboo or any offensive words in the questionnaire.

Chapter IV

Analysis and Interpretation of Data

This chapter deals with statistical analysis and interpretation of collected data related to teacher's skills and perception toward the use of ICT in mathematics teaching. For this 100 mathematics teachers who teach in Kathmandu valley were selected by the method of random sampling. The questionnaire was the main tool for the collection of data in this research. The questionnaire was developed in three sections. The first section questions are related to personal information (gender, age, teaching level, teaching experience, teaching using ICT, and ICT training). In the second section, questions are related to ICT skills (productivity tools skills and instructional application skills), and the third section questions are related to perception toward the use of ICT in mathematics teaching (teachers and studentsskills development, teaching materials, classroom management, and student's achievement).

The collected data were tabulated and analyzed by using the statistical package for social science (SPSS) software version 23.0 for analyzing the data. Mean, percentage, and chi-square tests were calculated. The collected data were analyzed under the following heading correspondence to the objectives of the study:

- Participant's demography
- Teacher's skills on ICT
- Teacher's perception toward the use of ICT in mathematics teaching

Participant's Demography

The participant's demography, in this study, is focused on the gender, age, teaching level, teaching experience, teaching year with using ICT and ICT pedagogical training.

Age and gender. As indicated in figure 4.1, 80% of the respondents were male while the remaining 20% were female. In the figure, the least age group that responded to the questionnaires falls above 50 years of age which represents 4% of the respondents and they were all males. Of the total number of participants, 24% were between the age of 20 to 29 years. With this number, 18% were male while 6% female participants. From the age of 40 to 49 year, 30% of the participants were represented. Of this number, 25% were male and the remaining 5% were female. The highest number of the participants that participants in the study fell within the age group of 30 to 39, which denotes 42% of the total respondents. With this number, the number of male participants was 33% while the female participants were 9%.

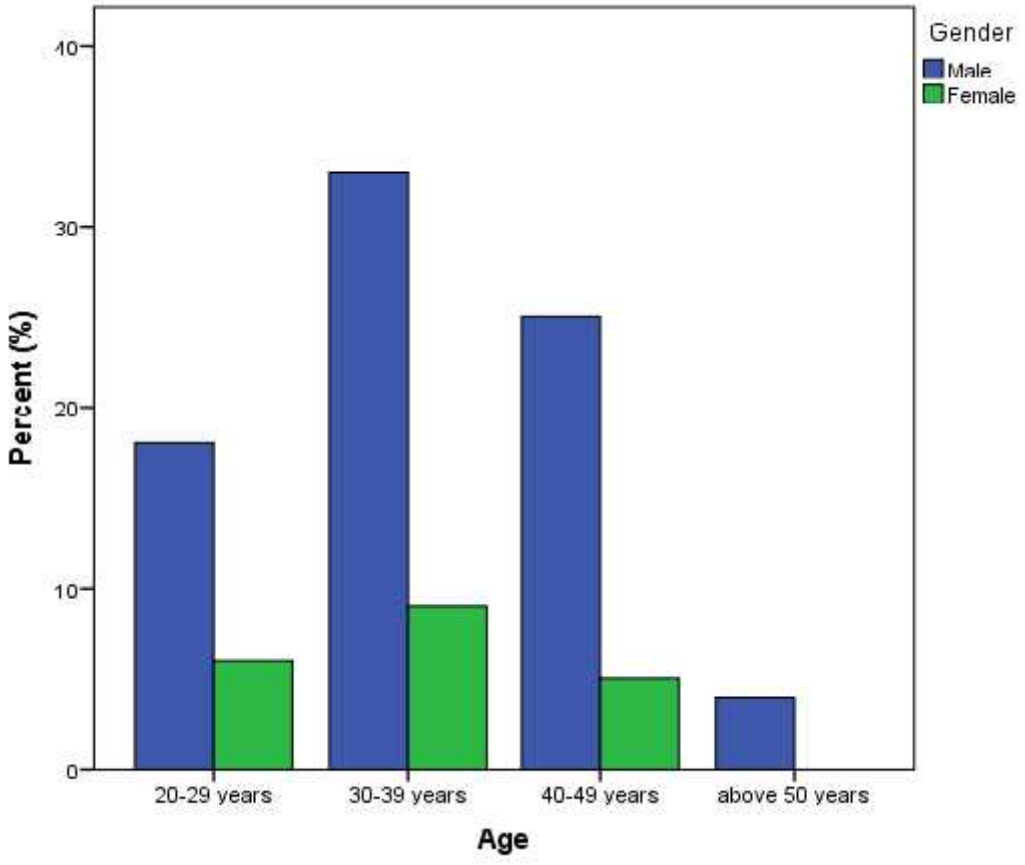

***Figure 4.1*: Gender and Age Representation**

Teaching level and teaching experience. From figure 4.2, 71% of respondents were teaching at the secondary level. With this number, 18% had 11 to 15 years, 16% had 6 to 10 years, 15% had above 20 years, 14% had 16 to 20 years and 8% had less than 5 years teaching experience. The remaining 29% of respondents were teaching at the basic level. Where 10% had 6 to 10 years, 7% had less than 5 years, 6% had 11 to 15 years, 4% had 16 to 20 years and 2% had above 20 years teaching experience.

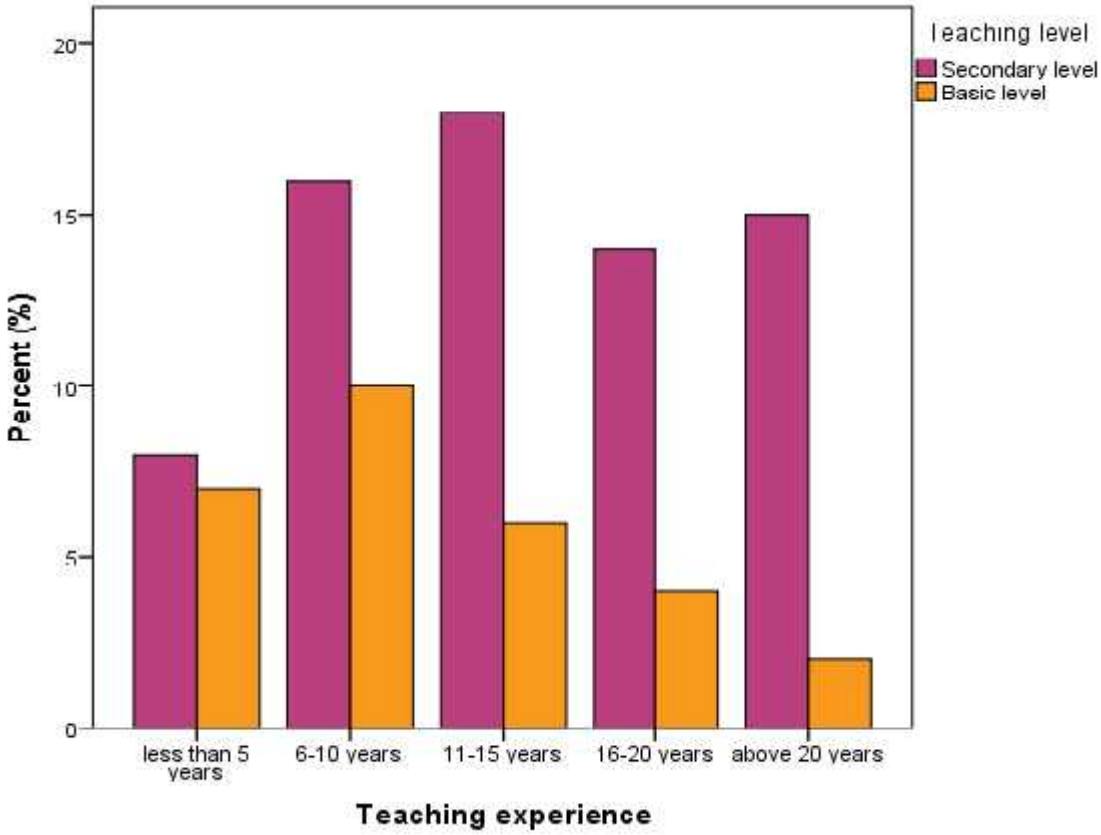

Figure 4.2: **Teaching Level and Teaching Experience Representation**

Years of teaching with ICT. Participants were also asked to indicate the period to which they have used ICT in teaching. The finding is presented in figure 4.3. In the figure, 13% of the respondents have been teaching without using ICT, 55% reported to have been using ICT for 1 to 5 years and 26% have been using ICT for less than 1 year and only 6% have been using ICT for above 10 years of teaching.

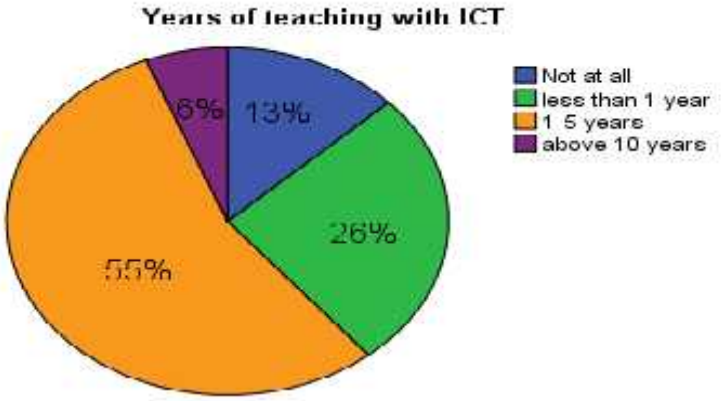

***Figure 4.3*: Years of Teaching with ICT integration**

ICT pedagogical training received. In figure 4.4, the variations in pedagogical training received by the participants are presented. In the figure, 32% of the respondents did not receive any pedagogical training in ICT, 34% received less than one year of training in ICT, 30% received between 1 to 2 years of ICT training, 1% of the respondents received 3 to 4 years of ICT training and 3%of the respondents received a pedagogical training in ICT over more than 4 years.

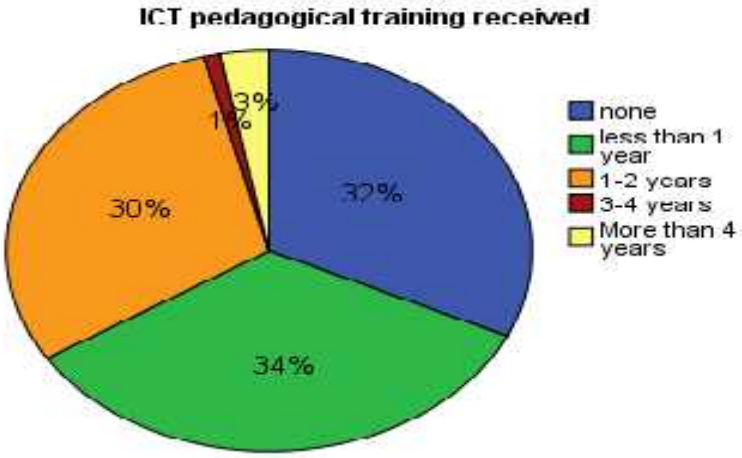

***Figure 4.4*: ICT Pedagogical Training Received**

Teacher's Skills on ICT

In this section, the researcher presents the skills on ICT. Teachers were asked to rate their ICT skills on a four-point Likert scale (1- cannot use, 2- low, 3-moderate, and 4- high). The teacher's skills on ICT were collected on two different subheading

productivity tools skills and instructional application skills. They are analyzed and interpreted as follows;

Table 4.1: ***Teacher's Responses on the Productivity Tools Skills***

Skills	**High (%)**	**Moderate (%)**	**Low (%)**	**Cannot use (%)**	**Mean**	**Std. Dev**
Word processor (e.g. Microsoft word)	35	54	9	2	3.22	0.690
Spreadsheet (e.g. Microsoft excel)	17	65	16	2	2.97	0.643
Presentation packages (e.g. Microsoft Powerpoint)	33	58	6	3	3.21	0.686
Database (e.g. Microsoft access)	5	50	32	13	2.47	0.784
Search Engines (e.g. Google, Bing etc)	49	38	10	3	3.33	0.779
Communication (e.g. email)	52	38	8	2	3.40	0.725

According to table 4.1, the entire disclosures showed a moderate level. For word processor (M= 3.22, SD= 0.690), 35% respondents high, 54% respondents moderate, 9% respondents low and 2% respondents cannot use. This means that teachers were skilled in aword processors. On the spreadsheet (M=2.97, SD=0.643), 17% respondents high, 65% respondents moderate, 16% respondents low and 2% respondents cannot use. This value represents that teachers were skilled on spreadsheet. In the presentation packages (M=3.21, SD=0.686), 33% respondents high, 58% respondents moderate, 6% respondents low and 3% respondents cannot use. This value indicates that teachers were skilled on presentation packages. For database (M= 2.47, SD= 0.784), 5% respondents high, 50% respondents moderate, 32% respondents low and 13% respondents cannot use. This means that teachers were skilled in database. On the search engines (M= 3.33, SD=0.779), 49% respondents high, 38% respondents moderate, 10% respondents low and 3% respondents cannot use. This value represents that teachers were skilled in search engines. On the

communication (M=3.40, SD=0.725), 52% respondents high, 38% respondents moderate, 8% respondents low and 2% respondents cannot use. This value indicates that teachers were skilled in presentation packages.

From the above discussion, the result revealed that basic level and secondary levels mathematics teachers who teach in Kathmandu valley were skilled in a word processors, spreadsheets, presentation packages, database, search engines, and communication of the average mean value of 3.1. This result shows that teachers to be more proficient in communication (e.g. email), search engines (e.g. Google), and a word processors (e.g. Microsoft word) respectively.

Table 4.2:*Teacher's Responses on the Instructional Application Skills*

Skills	**High (%)**	**Moderate (%)**	**Low (%)**	**Cannot use (%)**	**Mean**	**Std. Dev**
Instructional Mathematical software						
GeoGebra	17	52	22	9	2.77	0.839
Mathematica	5	40	35	20	2.30	0.847
Desmos	6	25	34	35	2.02	0.921
SPSS	6	28	36	30	2.10	0.905
Hardwares						
Printer	32	41	15	12	2.93	0.977
Projectors	32	42	15	11	2.95	0.957
Scanners	27	42	22	9	2.87	0.917

According to table 4.2, on GeoGebra (M= 2.77, SD= 0.839), 17% respondents high, 52% respondents moderate, 22% respondents low and 9% respondents cannot use. This means that teachers were skilled in GeoGebra. On the Mathematica (M=2.30, SD=0.847), 5% respondents high, 40% respondents moderate, 35% respondents low and 20% respondents cannot use. This value represents that teachers were unskilled in Mathematica. On the Desmos (M=2.02, SD=0.921), 6% respondents high, 25% respondents moderate, 34% respondents low and 35% respondents cannot use. This value indicates that teachers were unskilled inDesmos.

For SPSS (M= 2.10, SD= 0.905), 32% respondents high, 42% respondents moderate, 36% respondents low and 30% respondents cannot use. This means that teachers were unskilled in SPSS. On the printer (M= 2.03, SD=0.977), 32% respondents high, 41% respondents moderate, 15% respondents low and 12% respondents cannot use. This value represents that teachers were skilled in a printer. On the projectors (M=2.95, SD=0.957), 32% respondents high, 42% respondents moderate, 15% respondents low and 11% respondents cannot use. This value indicates that teachers were skilled in Projectors. On the scanner (M=2.87, SD=0.917), 27% respondents high, 42% respondents moderate, 22% respondents low and 9% respondents cannot use. This value indicates that teachers were skilled in scanners.

From the above discussion, the result revealed that basic level and secondary levels mathematics teachers who teach in Kathmandu valley were skilled in GeoGebra, printer, projectors, and scanners of the average mean value of 2.56, but the lowest means scores were 2.30, 2.02, and 2.10 for Mathematica, Desmos, and SPSS respectively which means that they are unskilled in this aspect of ICT. The reason for the low use of these instructional application tools could be attributed to lack of access to equipment in the classroom, lack of teacher training skills in the use of the equipment.

Teacher's Perception toward the Use of ICT in Mathematics Teaching

In this section, researchers present the teacher's perception toward the use of ICT in mathematics teaching. Teachers were asked to respond to 27 statements related to the perception of teachers. The statements are designed under teachers and student's skill development, teaching materials, classroom management, and student achievement. Perception of mathematics teacher was represented by ¡² - value on five-point Likert scale for positive statements, where five-point was given for strongly

agree represents the maximum score of scale and one point was given for strongly disagree represents the minimum score and the same thing is done in negative statements. The analysis and interpretation of the data obtained through the questionnaire were presented as follows.

Teachers and students skill development. There were eight statements (1-8) for teachers related to teachers and student's skill development. The following table consists of the teacher's perception and its corresponding ¡ ^{2} value of the questionnaire.

Table 4.3: ***Teacher's Responses onthe Skill Development***

Statement	**SA %**	**A %**	**N %**	**D %**	**SD %**	¡ ^{2}	**Decision**
1. ICT makes teaching more interesting.	60	38	2	0	0	51.44	S
2. ICT helps to increase teacher confidence.	54	43	3	0	0	43.22	S
3. The high level of ICT skills makes the mathematics teaching easier.	52	43	4	0	1	82.80	S
4. Using ICT promote innovation and problem-solving skills of my learners.	39	44	17	0	0	12.38	S
5. Internet can offer opportunities to teachers for obtaining educational resources to improve on course content.	57	39	4	0	0	43.58	S
6. ICT enhance student's critical thinking skills.	36	48	15	1	0	53.04	S
7. Lack of ICT makes it difficulties for teacher to keep up with the current trends in education.	40	43	16	0	1	48.24	S
8. School need to prioritize the ICT pedagogical training in their professional development.	55	39	6	0	0	37.46	S

Critical region ¡ $^2_{(\sim,\neg)}$ = ¡ $^2_{(\mathbb{C}.\mathbb{U}\ ,4)}$ ™9.49 (Non-significant)

From the above table 4.3 the statement "ICT makes teaching more interesting" with the ¡² - value 51.44 at 0.05 level of significance. A total of 60% teachers strongly agree, 38% agree, and 2% are neutral about this statement. This state that most mathematics teachers are positive about this statement. Also, the statement "ICT helps increase teacher confidence" with the ¡²-value 43.22 at 0.05 level of significance. A total of 54% of teachers strongly agree, 43% agree, and 3% are neutral about this statement. This shows that most of the mathematics teachers are positive about this statement.

On the statement "The high level of ICT makes the mathematics teaching easier"is highly significant with the ¡² - value 82.80 at 0.05 level of significance. A total of 52% of teachers strongly agree, 43% agree, 4% neutral and 1% strongly disagree. This states that most of the mathematics teachers are positive about this statement. Also, the statement "Using ICT promote innovation and problem-solving skills of my learners" about 39% strongly agree, 44% agree, and 17% neutral. This statement is significant with ¡²-value 12.38 at 0.05 level of significance. This shows that most of the mathematics teachers are positive about this statement.

On the statement "Internet can offer opportunities to teachers for obtaining educational resources to improve on course content"with the ¡² - value 42.58 at 0.05 level of significance. A total of 57% of teachers strongly agree, 39% agree, and 4% neutral. This states that most of the mathematics teachers are positive about this statement. Also, the statement"ICT enhances students' critical thinking skills." about 36% strongly agree, 48% agree, 15% neutral, and 1% disagree. This statement is significant with ¡²-value 53.04at 0.05 level of significance. This shows that most of the mathematics teachers are positive about this statement.

On the statement "Lack of ICT makes it difficulties for a teacher to keep up with the current trends in education" with the ¡² - value 48.24 at 0.05 level of significance. A total of 40% teachers strongly agree, 43% agree, 16% neutral, and 1% strongly disagree. This state that most of the mathematics teachers are positive about this statement. Also, the statement "School needs to prioritize the ICT pedagogical training in their professional development" about 55% strongly agree, 39% agree,and 6% neutral. This statement is significant with ¡²-value 53.04 at 0.05 level of significance. This shows that most of the mathematics teachers are positive about this statement.

From the above data analysis statement (1-8), the majority of the mathematics teachers havea positive perceptions. The statement "The high level of ICT skills makes the mathematics teaching easier" is highly significant and the statement "Using ICT promotes innovation and problem-solving skills of my learners" is a low significant other teacher and student skill development-related statement. The use of ICT in the classroom is based upon the assumption of constructivism where teachers should play the role of the instructor and students are actively participate in the classroom. The result of this finding was interlinked with constructivism theory. So, it is concluded that mathematics teachers towards the use of ICT in teaching mathematics for teacher and student skill development have a positive perception.

Teaching materials. There were six statements (9-14) for teachers related to teaching materials. The following table consists of the teacher's perception and its corresponding ¡² value of the questionnaire.

Table 4.4:*Teacher's Responses on the Teaching Materials*

Statement	**SA %**	**A %**	**N %**	**D %**	**SD %**	**¡²**	**Decision**
9. ICT helps to easy to calculate hard problem.	37	55	7	1	0	77.76	S
10. ICT helps me to organize my work.	32	57	11	0	0	31.82	S
11. Using ICT helps to clear the concepts of 2D and 3D figures, graphs and Charts.	58	38	4	0	0	44.72	S
12. ICT makes my lesson easy.	44	44	12	0	0	20.48	S
13. ICT improves to develop presentation materials for my lesson.	48	45	7	0	0	31.34	S
14. ICT consuming time to make teaching materials.	0	3	10	49	38	58.16	NS

Critical region $¡^{2}_{(\sim,\neg)}$= $¡^{2}_{(0.0\ ,4)}$ 9.49 (Non-significant)

From the above table 4.4 the statement "ICT helps to easy to calculate hard problem" is highly significant with the ¡²- value 77.76at 0.05 level of significance. A total of 37% teachers strongly agree, 55% agree, 7% neutral, and 1% disagree about this statement. This state that most mathematics teachers are positive about this statement. Also, the statement "ICT helps me to organize my work." with the ¡²-value 31.82 at 0.05 level of significance. A total of 32% of teachers strongly agree, 57% agree and 11% neutral about this statement. This shows that most of the mathematics teachers are positive about this statement.

On the statement "Using ICT helps to clear the concepts of 2D and 3D figures, graphs and Charts" with the ¡²- value 44.72 at 0.05 level of significance. A total of 58% teachers strongly agree, 38% agree, and 4% neutral. This states that most of the mathematics teachers are positive about this statement. Also, the statement "ICT makes my lesson easy" about 44% strongly agree, 44% agree and 12% neutral. This

statement is significant with ¡²-value 20.48 at 0.05 level of significance. This shows that most of the mathematics teachers are positive about this statement.

On the statement "ICT improves to develop presentation materials for my lesson" with the ¡²- value 31.34 at 0.05 level of significance. A total of 48% of teachers strongly agree, 45% agree, and 7% neutral. This states that most of the mathematics teachers are positive about this statement. Also, the statement "ICT consuming time to make teaching materials" about 38% strongly disagree, 49% disagree, 10% neutral and 3% agree. This statement is significant with ¡²-value 20.48 at 0.05 level of significance. This shows that most of the mathematics teachers are negative about this statement.

From the above data analysis statement (9-14), the majority of the mathematics teachers have a positive perceptions. The statement "ICT helps to easy to calculate hard problem" is highly significant and the statement "ICT makes my lesson easy" is low significant other teaching materials related statement. The use of ICT in the classroom is based upon the assumption of connectivism where searching and gathering knowledge in a device.Then perceivingthe relationship between areas, ideas, and concepts.The result of this finding was interlinked with connectivism theory. So, it is concluded that mathematics teachers towards the use of ICT as teaching materials have a positive perception.

Classroom management. There were four statements (15-18) for teachers related to classroom management. The following table consists of the teacher's perception and its corresponding ¡² value of the questionnaire.

Table 4.5:*Teacher's Responses on the Classroom Management*

Statement	**SA %**	**A %**	**N %**	**D %**	**SA %**	**¡²**	**Decision**
15. ICT makes easy to control the classes.	31	49	17	3	0	46.40	S
16. ICT can enhance teacher and students interaction.	24	63	11	2	0	86.80	S
17. ICT can enhance collaboration among students.	24	59	13	3	1	111.80	S
18. When using ICT, my role will be a facilitator of individual students learning.	35	54	11	0	0	27.86	S

Critical region $¡^2_{(\sim,\neg)}$= $¡^2_{(0.0,4)}$ 9.49 (Non-significant)

From the above table 4.4 the statement "ICT can enhance collaboration among students" is highly significant with the ¡²- value 111.80at 0.05 level of significance. A total of 24% of teacher strongly agree, 59% agree, 13% neutral, 3% disagree and 1% strongly disagree about this statement. This states that most mathematics teacher are positive about this statement. Also, the statement "ICT makes easy to control the classes" with the ¡²-value 27.86 at 0.05 level of significance. A total of 31% teachers strongly agree, 49% agree, 17% neutral,and 3% disagree about this statement. This shows that most of the mathematics teachers are positive with this statement.

On the statement "ICT can enhance teacher and students interaction" with the ¡²- value 86.80 at 0.05 level of significance. A total of 24% teachers strongly agree, 63% agree, 11% neutral, and 2% disagree. This states that most of the mathematics teachers are positive about this statement. Also, the statement "When using ICT, my role will be a facilitator of individual students learning" about 35% strongly agree, 54% agree, and 11% neutral. This statement is significant with ¡²-value 27.86at 0.05 level of significance. This shows that most of the mathematics teachers are positive about this statement.

Hence, from the analysis of the data, the majority of the teachers hada positive perceptions of the statements. So, it is concluded that the majority of teachers had a positive perceptions and ¡²-value of each statement is significant. So, the researcher claimed that using ICT in the classroom is best for better classroom management.

Student's achievement. There were nine statements (19-27) for teachers related to Students' achievement. The following table consists of the teacher's perception and its corresponding ¡² value of the questionnaire.

Table 4.6:*Teacher's Responses on the Student's Achievement*

Statement	**SA %**	**A %**	**N %**	**D %**	**SD %**	**¡²**	**Decision**
19. ICT helps increases students motivation.	33	57	10	0	0	33.14	S
20. ICT helps to decrease the class repetition rate of students.	18	47	32	3	0	42.64	S
21. ICT helps to increase the attendance and enrolment rate of students.	25	43	27	5	0	29.12	S
22. ICT helps to decrease dropout and leave rate of students.	21	34	35	8	2	44.50	S
23. Using ICT help to ensure quality education.	30	58	11	1	0	75.44	S
24. ICT use promote student's ability with learning task (e.g. writing, analyzing data and solving problems etc)	27	60	10	2	1	121.70	S
25. The use of ICT encouraged my students to explore new information.	30	64	6	0	0	50.96	S
26. I find the use of ICT in teaching and learning take a long time.	17	48	25	8	2	64.30	S
27. I believe by integrating ICT in teaching, I am helping students to acquire the basic computer education needed for their future careers.	28	62	9	1	0	88.40	S

Critical region ¡²(~,¬)= ¡²(0.0 ,4)™9.49 (Non-significant)

From the above table 4.6, the statement "ICT helps increases students motivation" with the ¡²- value 33.14 at 0.05 level of significance. A total of 33%

teachers strongly agree, 57% agree, and 10% neutral about this statement. This states that most of the mathematics teachers are positive about this statement. Also, the statement "ICT helps to decrease the class repetition rate of students" with the ¡²- value 42.64 at 0.05 level of significance. A total of 18% teachers strongly agree, 47% agree, 32% neutral and 3% disagree about this statement. This shows that most of the mathematics teachers are positive about this statement.

On the statement "ICT helps to increase the attendance and enrolment rate of students." is highly significant with the ¡²- value 29.12at 0.05 level of significance. A total of 25% teachers strongly agree, 43% agree, 27% neutral, and 5% disagree. This states that most of the mathematics teachers are positive about this statement. Also, the statement "ICT helps to decrease dropout and leave rate of students" about 21% strongly agree, 34% agree, 35% neutral, 8% disagree and 2% strongly disagree. This statement is significant with ¡²-value 44.50at 0.05 level of significance. This shows that most of the mathematics teachers are positive about this statement.

On the statement "Using ICT help to ensure quality education" with the ¡²- value 75.44 at 0.05 level of significance. A total of 30% teachers strongly agree, 58% agree, 11% neutral, and 1% disagree. This states that most of the mathematics teachers are positive about this statement. Also, the statement "ICT use promotes student's ability with learning task (e.g. writing, analyzing data and solving problems,etc)" about 27% strongly agree, 60% agree, 10% neutral, 2% disagree and 1% strongly disagree. This statement is significant with ¡²-value 121.70at 0.05 level of significance. This shows that most of the mathematics teachers are positive about this statement.

On the statement "The use of ICT encouraged my students to explore new information." with the ¡²- value 50.96 at 0.05 level of significance. A total of 30%

teachers strongly agree, 64% agree, and 6% neutral. This states that most of the mathematics teachers are positive about this statement. Also, the statement "I find the use of ICT in teaching and learning take a long time" about 17% strongly agree, 48% agree, 25% neutral, 8% disagree and 2% strongly disagree. This statement is significant with ¡²-value 64.30at 0.05 level of significance. This shows that most of the mathematics teachers are positive about this statement.

On the statement "I believe by integrating ICT in teaching, I am helping students to acquire the basic computer education needed for their future careers" with the ¡²- value 88.40 at 0.05 level of significance. A total of 28% teachers strongly agree, 68% agree, 9% neutral, and 1% disagree. This states that most of the mathematics teachers are positive about this statement.

From the above data analysis statement (19-27), the majority of the mathematics teachers have a positive perception. The statement "ICT use promote student's ability with learning task (e.g. writing, analyzing data and solving problems,etc)" is highly significant and statement "ICT helps to increase the attendance and enrolment rate of students" is low significant other student's achievement-related statement. So, it is concluded that the majority of teachers had a positive perception and ¡²-value of each statement is significant. So, the researcher claimed that using ICT in the classroom is best for improving students' achievement.

Chapter V

Findings, Conclusion and Implications

This chapter deals with major finding drawn from the study after the analysis of collected data. The area of recommendation is also included for the further study.

Summary of this Study

The use of mathematics has been used for human civilization. It has its own developmental stages of mathematics. It has been covering a particular important place in the curriculum of the school level and university level. Mathematics subject has been developed as difficult and abstract by the psychological aspect of school level students as well. In this situation, the development of ICT tools and technology highly influence the life of people and the education system. The use of ICT seems quite useful and famous in the present context of world-wise. In the section of education, ICT learning has played an important role than the traditional way of learning. Therefore, the method with ICT challenges the negative impression of students towards mathematics education. So as a researcher, I have tried to study with the main purpose of identifying teacher's skills and perceptions towards the use of ICT in teaching mathematics.

The main purpose of my research was to identify teachers' perceived skills on ICT tools and what are their perception. The researcher implied the survey design. While researching, researchers have taken 100 teachers of Kathmandu valley. The researcher adopted constructivism and the connectivism approaches. The use of ICT in the classroom is based upon the assumption of connectivism, it transfers the power from the teacher to the students during the process of learning. Moreover, constructivist class students are motivated in any classroom to share their ideas, experience and expand their knowledge through ICT tools. The questionnaire was

used as the major tool for this study, which was developed based on the conceptual framework. The questionnaire was in three sections. In first section, the question was related to teacher demographics. In the second section, the question was related to teacher perceived skill on ICT tools.The four-point Likert scale opinionnaire made of cannot use, low, moderate, and high was adopted to indicate their options with the tick mark. In the third section, a question was related to teacher perception toward the use of ICT on teaching mathematics. The questionnaire from included 27 statements in the based on four dimension: teachers' and students' skill development, teaching materials, classroom management, and student's achievement. The five-point Likert scale opinionnaire made of strongly agree, agree, neutral, disagree, and strongly disagree was adopted to collect data and respondent were asked to indicate their options with a tick marks. The collected data were analyzed by using chi-square test at 0.05 level of significance.

Findings of the Study

Based on analysis and interpretation of the data, the major finding of this study are presented below:

- In this study 80% of respondents were male and 20% of respondents were female where 42% of total respondents were 30 to 39 years and 4% of total respondents were above 50 years.
- In this study, 71% of respondents were teaching at the secondary level where 18% had 11 to 15 years of teaching experience and 8% had less than or equal to 5 years teaching experience. 29% of total respondents were teaching at the basic level where 10% had 6 to 10 years teaching experience and 2% had above 20 years teaching experience.

- In this study, 55% of teachers have been using ICT for 1 to 5 years while 26% have been using ICT for less than 1 year and 34% of teachers received less than 1 year of training in ICT. It shows that COVID-19 is the gateway for a maximum teachers to use ICT in teaching mathematics.
- Above 90% of mathematics teachers have high and moderate skills in communication (e.g. email). It concluded that most of the mathematics teachers have maximum practice in communication (e.g. email).
- This study found that teachers had skills in the following ICT tools:
    a. Word processor (e.g. Microsoft Word)
    b. Spreadsheet (e.g. Microsoft Excel)
    c. Presentation packages (e.g. Microsoft PowerPoint)
    d. Database (e.g. Microsoft Access)
    e. Search engines (e.g. Google, Bing,etc)
    f. Communication(e.g. email)
    g. GeoGebra
    h. Printer
    i. Projectors
    j. Scanners
- This study found that teachers are unskilled in Mathematical software for example Mathematica, Desmos, and SPSS. It is concluded that mathematics teachers need training on mathematical software.
- This study found that teacher 38% strongly disagree, 49% disagree, 3% of teachers agreed and 10% were neutral with the statement "ICT consuming time to make teaching materials." It concluded that teachers do have no positive perception of this statement.

- This study found that teachers had a positive perceptions toward the use of ICT based on four dimensions: teachers and student's skill development, teaching materials, classroom management, and student's achievement.

Conclusion of the Study

The review of the constructivist perspective emphasizes an active learning environment that may incorporate learners-centered and problem-based learning in which students are actively engaged in critical thinking activities. So the use of ICT in the classroom is based upon the assumptions of constructivism where teachers should play the role of the instructor and students are actively participating in the classroom. The review of the theory and findings of the research also focused that teacher's skills on productivity and instructional tools and teacher's perception on skill development, teaching materials, classroom management, and student's achievement.

Based on research, this study was a survey design. The researcher herself developed a questionnaire under the guidance of a supervisor. The questionnaire wasthe main tools of this study. The responses were collected from mathematics teachers from Kathmandu valley, selected by a simple random sampling method. Moreover, the major finding of the study shows that the use of ICT in mathematics teaching is increasing day by day. Mostly, mathematics teachers use ICT tools in mathematics teaching. There is a growing concern in teachers of mathematics about teaching mathematics by using technology.

From the research finding, the researcher concluded that most of the teachers have been using ICT tools in mathematics teaching for one to five years. Furthermore, there is a maximum number of teachers are skilled on a word processors, Spreadsheets, Presentation packages, Database, search engines, GeoGebra, Printers, projectors, and scanners but maximum number of teacher's are unskilled on

mathematical software (Mathematica, Desmos, and SPSS). Similarly, the researcher concluded that teachers responded to positive perceptions towards using ICT in teaching mathematics at the Basic and secondary levels. Moreover, most of the teachers have highly positive perceptions towards the statement "ICT makes teaching more interesting". In conclusion practice of ICT in mathematics education isincreasing day by day. The use of technology in teaching and learning has so many challenges as well as opportunities. Getting access to flexible tools, portable sources of information, multiple concepts carried by a single figure, and representation of abstract concepts by ICT tools help for lifelong learning skills. All the students and teachers of mathematics know about the effectiveness of digital technology. But this research shows that most of the mathematics teachers are not literate in mathematical software. Thus, the government of Nepal should develop ICT-related school mathematics courses and provide proper training onICT use in mathematics teaching and learning. Should provide ICT access in all schools as well as should develop ICT mathematics lab in all schools.

Recommendations for Educational Implication

The conclusion of the study cannot generalize to all areas due to the limitation contained in this study. After analyzing the conclusion, the researcher has prepared the following recommendation for education implications;

- The government of Nepal should develop ICT-related mathematics courses and provide training for all community school's mathematics teachers.
- The local-level should establish the lab, training center, equipment, and infrastructures for ICT-related mathematics courses and provide training for all mathematics teachers.
- Community school administration should develop an ICT lab in school.

- There should be a uniform training program on integration of ICT in all teaching subject teacher trainees at school and colleges level. The program should be able to prepare teacher trainees be able to integrate ICT in their teaching at school level.
- Government and non-government sectors should be able to take necessary initiatives to develop schools and universities as free Wi-Fi sectors.
- Practical aspects with ICT integration must be included in mathematics examination not only theoretical aspects.
- Community schools, parents, and teachers should provide an opportunity to use ICT tools for their children.

Recommendations for the Further Study

The researcher believes that further research can be carried out in the following areas;

- A similar studies can be carried out with a large sample size and various schools of different parts of Nepal.
- This research studied the teachers only. Further study is needed in this topic considering the response of school administration and students' parents also.
- Experimental research can also be done to investigate the effectiveness of ICT tools in teaching and learning mathematics.
- Further study can be done on the use of ICT tools in their real classroom situation.

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Appendix

Questionnaire

I am Master Degree students form central department of mathematics education, T.U. researching on teachers' skills and perception towards the use of ICT in mathematics teaching. This study is part of our Master degree thesis. Answering this questionnaire should require about 20-25 mintues of your time. All responses are anonymous and are treated with strict confidentiality. Thank you very much for your collaboration, your input is really important for my study.

PART I: PERSONAL INFORMATION

Kindly answer the all questions by ticking in the boxes.

1. What is your Name?

2. What is your school Name?

3. Your Gender : [ ] Male [ ] Female [ ] Other

4. What is your Age?

   [ ] less than 20 years [ ] 20-29 years [ ] 30-39 years

   [ ] 40- 49 years [ ] above 50 years

5. How long have you served a Teacher?

   [ ] less than 5 [ ] 6-10 years [ ] 11-15 years

   [ ] 16-20 years [ ] above 20

6. Teaching level

[ ] basic level (1-3) [ ] basic level (4-5) [ ] basic level (6-8) [ ] secondary level (9-10)

7. How long have been using computers in teaching Mathematics?

[ ] Not at all [ ] less than 1 [ ] 1-5 years

[ ] 6-10 years [ ] above 10

8. ICT pedagogical training received

[ ] none [ ] less than 1 [ ] 1- 2 years

[ ] 3-4 years [ ] More than 4 years

PART II: TEACHE'S SKILLS ON ICT

Please tick the numeric value corresponding to your personal opinion for each:

A. PRODUCTIVITY TOOLS SKILLS:

Rate your skill level for following tools:	High	Moderate	Low	Cannot use
Word processor (e.g. Microsoft word)				
Spread sheet (e.g. Microsoft excel)				
Presentation packages (e.g. Microsoft Powerpoint)				
Data Base (e.g. Microsoft access)				
Search Engines (e.g. Google, Bing etc)				
Communication (e.g. email)				

B. INSTRUCTIONAL APPLICATION SKILLS

Rate your skill level for following software/ hardware:	High	Moderate	Low	Cannot use
Instructional Mathematical software				
⁾ GeoGebra				
⁾ Mathematica				
⁾ Desmos				
⁾ SPSS				
Hardwares				
a. Printer				
b. Projectors				
c. Scanners				

PART III: TEACHER PERCEPTION TOWARDS USE OF ICT IN MATHEMATICS TEACHING

This section contains a Likert scale where 5 – Strongly agree, 4 – agree, 3 – Neutral, 2 – disagree and 1 – strongly disagree. Tick as appropriate.

A. Perception towards Teachers and students skills development

Statement	**SA**	**A**	**N**	**D**	**SD**
1. ICT makes teaching more interesting.					
2. ICT helps to increase teacher confidence.					
3. The high level of ICT skills makes the mathematics teaching easier.					
4. Using ICT promote innovation and problem-solving skills of my learners.					
5. Internet can offer opportunities to teachers for obtaining educational resources to improve on course content.					
6. ICT enhance student's critical thinking skills.					
7. Lack of ICT makes it difficulties for teacher to keep up with the current trends in education.					
8. School need to prioritize the ICT pedagogical training in their professional development.					

B. Perception towards teaching materials

Statement	SA	A	N	D	SD
9. ICT helps to easy to calculate hard problem.					
10. ICT helps me to organize my work.					
11. Using ICT helps to clear the concepts of 2D and 3D figures, graphs and Charts.					
12. ICT makes my lesson easy.					
13. ICT improves to develop presentation materials for my lesson.					
14. ICT consuming time to make teaching materials.					

C. Perception towards classroom management

Statement	SA	A	N	D	SD
15. ICT makes easy to control the classes.					
16. ICT can enhance teacher and students interaction.					
17. ICT can enhance collaboration among students.					
18. When using ICT, my role will be a facilitator of individual students learning.					

D. Perception towards Students Achievement

Statement	SA	A	N	D	SD
19. ICT helps increases students motivation.					
20. ICT helps to decrease the class repetition rate of students.					
21. ICT helps to increase the attendance and enrolment rate of students.					
22. ICT helps to decrease dropout and leave rate of students.					
23. Using ICT help to ensure quality education.					
24. ICT use promote student's ability with learning task (e.g. writing, analyzing data and solving problems etc)					
25. The use of ICT encouraged my students to explore new information.					
26. I find the use of ICT in teaching and learning take a long time.					
27. I believe by integrating ICT in teaching, I am helping students to acquire the basic computer education needed for their future career.					