

**STUDENTS PERCEPTION IN LEARNING MATHEMATICS THROUGH  
THE INTEGRATION OF ICT**

**A  
THESIS  
BY  
NIRAJ DHAKAL**

**THE PARTIAL FULFILLMENT OF THE REQUIREMENT  
FOR THE DEGREE OF MASTER OF EDUCATION**

**SUBMITTED TO  
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NEPAL  
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त्रिभुवन विश्वविद्यालय  
शिक्षा शास्त्र केन्द्रीय विभाग  
**गणित शिक्षा विभाग**

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**Letter of Certification**

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**Prof. Dr. Bed Raj Acharya**

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**Letter of Approval**

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By

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**“Students Perceptions in Learning Mathematics Through the Integration of ICT”** has been approved in partial fulfillment of the requirements of the Degree of Master of Education.

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### Recommendation for Acceptance

This is to certify that Mr. **Niraj Dhakal** has completed his M. Ed. thesis entitled “**Students Perceptions in Learning Mathematics Through the Integration of ICT**” under my supervision during the period prescribed the rules and regulations of Tribhuvan University, Kirtipur, Kathmandu, Nepal. I recommend and forward his thesis to the Department of Mathematics Education to organize the final viva-voce.

.....  
**Asst. Prof. Krishna Prasad Adhikari**

(Supervisor)

Date:

## **Dedication**

This thesis is dedicated to my father **Mr. Dilli Raj Dhakal**,  
my mother **Mrs. Sita Dhakal**, and my brother **Mr. Nabal Dhakal**.

Whose love, support, and encouragement have enriched my soul and inspired me to  
purpose and completed this research.

## **Declaration**

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

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Niraj Dhakal

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.....

Mr. Niraj Dhakal

## Abstract

This study is based on survey research design entitled “Students Perceptions in Learning Mathematics Through the Integration of ICT”. The objectives of this study were to find out the perception of mathematics students towards the use of ICT in teaching mathematics and to compare the perception of Boys students’ and Girls students towards the use of ICT in teaching mathematics. The sample of the study consisted from who studied ICT in Mathematics Education at Central Department of Education 2077. The data were collected from questionnaire. For this study, 30 Boys students and 20 Girls students were selected by accidental sampling method. The questionnaire was prepared on the basis of six dimension (skill development, teaching materials, students' motivation, challenges, internet surfing). The perception of their views measured in the five-point Likert’s scale. The collected data was tabulated and analyzed by using SPSS software version 23.0 to get the value of statistics mean and percentage for first objective, mean, mean rank and Uvalue were computed by using Z-test at 0.05% level of significance for second objective.

The study found that, Boys and Girls mathematics students had positive perception towards use of ICT in teaching mathematics. ICT help to develop the student skills, effective teaching material, and time and classroom management. The researcher found that ICT help to increase the rate of student and attendance in mathematics and motivated the students to learn mathematics. Also, concluded that there is no significance difference between the perception of Boys and Girls mathematics students towards ICT in teaching mathematics.

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### **List of Abbreviations**

T. U	:	Tribhuvan University
MOE	:	Ministry of Education
CDC	:	Curriculum Development Center
ICT	:	Information and Communication Technology
ZPD	:	Zone Proximal Development
SSDP	:	School Sector Development Plan
SPSS	:	Statistical Package for the Social science
COVID19:		Coronavirus Disease of 2019
UNESCO:		United Nations Educational, Scientific and Cultural Organization

## **Chapter- I**

### **Introduction**

This chapter deals with the background of the study, statement of the problem, and significance of the study. Similarly, it also mentions the research objectives, research questions, and delimitations of the study. Furthermore, definitions of the key terms are also provided to capture the main components of the study.

#### **Background of the Study**

During the past decade, a great deal of literature has been produced on the use of information, communication, and technology (ICT) in schools. The ICT refers to the hardware, software, networks, and media for the collection, storage; processing, transmission, and presentation of information as well as related services describe the extent of the uses of ICTs in the following terms: information and communication technology are broadly defined as technologies used to convey, manipulate and store data by electronic means. This can include email text messaging, video chat, and online social media. It also includes all the different computing devices that carry out a wide range of communication and information functions. Information and communication technology (ICT) denote any communication device or application that has the potentiality of producing information, can store and communicate information. These may be electronic devices such as radio, television, computer, mobile, and other digital devices, as well as software applications associated with these devices such as digital learning programs, voice chat, and video conferencing. The technologies are designed as innovative devices that continually change. The field of education has been affected by ICTs, which have undoubtedly affected teaching, learning, and research. A great deal of research has proven the benefits to the quality of education. ICT has the potential to innovate, accelerate, enrich, and deepen skills, motivate and engage students, help relate school experience to work practices, create economic viability for tomorrow's workers, as well as strengthening teaching, and helping schools change.

The government of Nepal is promoting to use of ICT in the education sector for quality education. ICT in education master plan (2013-2017) introduces the ICT in education. Ministry of education is the ongoing implementation of its ICT master plan that is aimed at improving the speed of internal communication and staff access

to essential working documents and information, it focuses on four main components infrastructure, manpower, digital contents, and system enhancement. ICT in school directives (2069) has mentioned the use of ICT tools in decreasing the gap of education quality that exists between private and community schools urban and rural schools. According to (MOE, 2009) the national curriculum framework has argued to include ICT education in the school curriculum as a specific subject. It further highlights the use of ICT as a subject and tool/ medium in developing the curriculum for educational transformation (CDC, 2006). Its policy (2007) and three-year plan (2011-2013) of the government of Nepal have included some policies and strategies to develop and integrate ICT in education.

According to Daniels (2002), ICTs have become within a very short time, one of the basic building blocks of modern society. In the context of Nepal, the long-term goal of education in Nepal is to provide people with the appropriate knowledge, skills and attitude required to work actively in the development of the country and to integrate Nepal into the global community by ensuring the interest of students learning and quality of education for all, particularly focusing on basic education. School sector reform plan/SSRP (2009-2015) has identified some of the strategies to ensure equitable access to education. The government of Nepal, ministry of education has introduced various interventions to achieve the goal of education in Nepal. For that, the SSRP has envisioned implementing and expanding the ICT-assisted teaching and increase interest in students learning process in all schools. The use of ICT in education has been considered as one of the strategies to achieve the broader goals of education (Master plan 2013-2017). These descriptions point to the important position accorded to mathematics as the key factor in the development of any nation. The Nepalese educational system is rapidly developing due to the technological growth of the nation. Regarding this view, the new national policy of education stipulates that mathematics should be one of the core subjects taught at all levels of secondary and primary schools since the importance of mathematics cannot be over-emphasized in the area of science and technology. Thus, mathematics is a compulsory subject for all primary and secondary schools in many countries of the world.

### **Statement of the Problem**

As we know Nepal is a developing country and we are living in the 21<sup>st</sup> century. The world has turned into a global village and the use of mathematics has

become common to make life easier in every way. New technologies are becoming famous all over the world, new strategies, and skills new inventions. The use of mathematics has revolutionized the performance of research scholars which made it easy for them to obtain the related information which was traditionally extracted using library books in the university. The impact of ICT tools and technology has been shrinking the world as a global village. In this situation ICT tools and technology highly influencing the education system. It also impacts teaching and learning in school education. But teachers and student's unknown about ICT tools and technology because of lack of knowledge and lack of such advance social technology and tools. In this situation in Nepal, Tribhuvan University design and implement the curriculum of ICT in mathematics education for a master's degree course in mathematics education.

When I joined a master's degree in Tribhuvan University I had got a chance to study the elective subject as ICT in mathematics at fourth semester. I understood that ICT can play the role of scaffolding in teaching mathematics; also, I understood some features and advantages of ICT tools and got a chance for the use of ICT tools (GeoGebra) in the classroom. When I had got a chance to study mathematics by using ICT then I had realized, that ICT is more interesting while we are learning mathematics. Therefore, I had thought, what is the student's perception towards ICT in learning mathematics? So, this opportunity opens my eyes to learning mathematics from ICT tools and technology. That's why this area is my research study.

### **Objectives of the Study**

The objectives of the study were as follows;

1. To find out the student's perception towards the integration of ICT in learning mathematics.
2. To compare boys' and girls' students' perceptions towards the integration of ICT in teaching-learning mathematics.

### **Research Questions**

According to the above-mentioned objectives some research questions as follows. This study was focused on the answer to the following research questions:

1. What is the student's opinion about the integration of ICT for learning mathematics?
2. How boys and girls have taken the integration of ICT in mathematics education?

### **Hypothesis of the Study**

The research hypothesis of this study was formulated as follow;

1. Null Hypothesis ( $H_0$ ): There is no significance difference between the perception of boys and girls towards integrating of ICT in learning mathematics.
2. Alternative hypothesis ( $H_1$ ): There is significance difference between the perception of boy and girl towards integrating of ICT in learning mathematics.

### **Justification of the Study**

Justification for a research study is the reason why the research is being conducted, taking into consideration the methods of the study. It explains the rationale for the study. In this study, I have selected the area of ICT in mathematics education and reviewed different types of literature in this area. I found that they have a more or less similar type of conclusion that ICT helps a lot for learning mathematics. By reading different journals and books I found that there are several issues about the research and evidence on the effective use of ICT in teaching in schools. Though these various research studies have been carried out in the field of ICT in mathematics, yet I felt a lot of gaps prevailing in these various researches carried out. Although I don't claim that my research will be completely different than these previous researches, still I can claim that my research will be quite different from those researches. My research will be also similar to them in the sense that all of these researches including mine are concerned with the ICT in mathematics which helps to change the student's perception towards mathematics. My research focuses also on the same matter. Even the methodologies applied in the researches can also more or less similar to them but still there lies the vast gap between my research and theirs. The rationale of this study is as follows;

- It is useful for students to know the role of ICT tools in learning mathematics.
- It is useful for subject expert and curriculum makers to develop ICT-related

mathematics courses of graduate-level mathematics.

- It helps students for attractive mathematics learning.
- It is useful for master's level mathematics students.

### **Delimitation of the Study**

This study was delimited on the following areas;

- This study was limited to the Kathmandu district.
- The sample of the study was selected only 100 students from the master's program studying in the 2<sup>nd</sup> and 3<sup>rd</sup> semesters of mathematics education.
- This study was based on a quantitative research design only.

### **Operational Definition of Related Terms**

The definition of key terms consists of such a definition of words/terms which will be used in this research. The keywords and their definitions used in this study are as follows

**ICT.** In this study information communication and technology (ICT) refers that some mathematics software which makes mathematics teaching/learning enjoyable and effective like as GeoGebra, Maple, Latex, Mathematica and etc.

**Students.** In this study, the term students refers to those students who are studying mathematics at Central Department of Education TU Kirtipur and Mahendra Ratna Campus Tahachal in the academic year 2021 AD

**Perception.** Perception is the thought/mental image/behavior or thinking of teachers towards their skill, teaching method, materials, student motivation, classroom management, time management as well as student's achievement in teaching.

**Integration.** Integrating ICT into teaching and learning refers to the process of determining which products and processes of ICT should be appropriate for giving class-room situations and problems.

## **Chapter II**

### **Review of Related Literatures**

A review of related literature is the source of further study of the research task. It helps to give a better idea of investigating the research and find the gap in the research field, thus the review of related literature is important and essential for guideline of re- search planning. Here I have reviewed some literature, which has related to my research topic.

#### **Review of Empirical Literature**

The review of the empirical literature connects the systematic summary of scientific researches and real investigations including their topics, the reasons why this study is conducted, methods of the study, data collection tools, and method of confirming their validity and reliability and major findings in the related field. It guarantees that the re- searcher appraises the scientific investigation and systematic study, its ways, and required procedures for it. The major purpose of the present study finds the perception of mathematics students towards the integration of ICT in teaching mathematics and compares the perception of boys and girls' mathematics students towards the integration of ICT in teaching mathematics. There are so many journals, reports, and related research studies. So, the researcher has reviewed these studies to explain the present problem of the study. They are as follows.

Danai, (2017) conducted a study on the "effectiveness of information communication and technology (ICT) in teaching Geometry". The purpose of the study was to find out the effectiveness of ICT in teaching Geometry at the secondary level and compare the achievement of students taught by using tools of ICT and without ICT. The population was taken from Kathmandu district private school students of grade IX academic year 2073. The research was experimental, so the researcher takes two equivalent groups. One controls (taught by traditional method) group and another is experimental (taught by the use of ICT tools) group he was taught 30 days in both schools. After that researcher take the exam on both groups and the hypothesis was tested by using a t-test at a 0.05% level of significance. Also, he shows that the given data from the pie-chart and graph. The re- searcher found that from his study. The mean of the pretest was less than the posttest and the standard deviation of the experimental group was less than the control group. The students

were more motivated, interested regularly, and more concentrated on ICT class. The achievement of the class nine students who were taught without using the tools of ICT achieves better achievement than the student who was taught without using the tools of ICT. Finally, he concluded that using the tools of ICT is more effective in teaching Geometry.

Also, Timilsena (2017), conducted research entitled "Attitude of the teacher of ICT in teaching Mathematics". To find out about the attitude of teachers of ICT in teaching mathematics, he follows Vygotsky's constructivist theory of learning depends on prior knowledge linkage with ZPD. The sample was taking 200 mathematics teachers out of 925 from the Surkhet District of Nepal. The data collection tools are questionnaires and interview guidelines. The data analysis procedure is the chi-square test at a 0.05% level of significance. He found that most of the school of Surkhet district has ICT tools and some teachers are use ICT tools in teaching mathematics, but some teachers are don't use ICT materials because of lack of knowledge. Finally, he concluded that all mathematics teachers of the Surkhet district have a positive attitude towards ICT tools.

Likewise, Moila (2009) researched, "the use of education technology in mathematics teaching and learning." an investigation of South African rural secondary school. "The investigation followed a mixed-method approach that was more evaluative and was a case study. The study consisted of 25 students and 5 mathematics teachers from Phusela secondary school. The finding concluded that computer technology did not use in mathematics teaching and learning, there are no plans on the use of educational technology tools in mathematics teaching and learning, inadequate educators training on the use of educational technologies in teaching and mathematics, and lack of relevant educational technology tools for rural schools.

Also, Dahal (2019) did research entitle "Attitude of teachers and students towards the use of social media in teaching and learning". The purpose of this study was to find the attitude of teacher and student towards the use of social media in teaching-learning and compare their attitude of teacher and student. He took the 200 students and 100 teachers out of 2000 students and 150 teachers of community school of secondary level in the Sindhupalchok district of Nepal. The data collection tools

were questionnaires. Chi- square distribution was used to find out the attitude of students and teachers towards the use of social media and a t-test was used to find out the significant difference between the mean score of students and teachers towards the use of social media in the teaching and learning process at 0.05% level of significance. He concluded that secondary level students and teachers have positive attitudes towards the use of social media in teaching and learning. Also, he concluded that the attitude of teachers towards social media is a slightly better attitude than student attitude. There is no significant difference between teachers' and student's attitudes.

Similarly, Paudel (2015) did research on the topic "Teachers and students' perceptions on the use of ICT in mathematics". The study has investigated the perception of the teachers and students who use ICT in the mathematics classroom. The purpose of this study was to know the perceptions towards mathematics after using ICT in the mathematics classroom of students as well as teachers. How did students and teachers think or perceived mathematics as a subject? The researcher granted two questions to identify the perception of students and teachers towards the use of ICT in mathematics. He used interpretive as his research paradigm. He also used open-ended questions in-depth interviews to explore the views from the participants to know their perception towards mathematics after using ICT in mathematics. The major findings of the study are by the use of ICT in mathematics classrooms the student felt mathematics as other subjects. Before using ICT perception towards mathematics was a boring and harder subject and the student could not concentrate well in the class but after using ICT, the perception towards mathematics is changed. ICT helped to bring the positive perception towards mathematics and students started to study and learn by understanding their meaning and felt mathematics as a normal subject like others thus, the schools should start to realize the need for student through the help of perfect information, proper communication and modern technologies.

In the same way, Adhikari (2019) has researched the topic "Practices of ICT in teaching and learning mathematics". This study of purpose was to identify teachers' and students' practice of ICT tools in teaching and learning mathematics and to compare community and institutional mathematics teachers' and students' practice of ICT tools in teaching and learning mathematics. The researcher took this sample of

the population of this study was limited to 15 community and 8 institutional secondary schools of the Dhankuta district. It takes 30 mathematics teachers from community schools and 16 mathematics teachers from institutional schools. Likewise, it takes 90 students from community schools and 56 students from institutional schools. The data was collected by questionnaire (based on the five-point rating scale) and collected data were analyzed 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 the objective. The research was based on the survey method. He concluded that in this research, researchers found that secondary school mathematics teachers and students have minimum practices of ICT tools in teaching and learning mathematics. He found that community and institutional secondary school mathematics teachers have no significant difference in practices of ICT tools in teaching and learning mathematics.

Furthermore, Bhandari (2015) conducted a study entitled "effectiveness of GeoGebra assisted instruction in mathematics at the secondary level." The data were collected from 48 students from two public schools in Kathmandu using a quasi-experiment design by the way of test items and questionnaires. The reliability of these tools was ensured through the split-half method. The result shows that GeoGebra assisted instruction to improve the student's achievements in mathematics in the comparison of subsisting pedagogy.

Likewise, Dhakal, (2014) conducted research entitled "ICT in mathematics: access and quality in higher education". In this research, questionnaire students were asked to indicate whether the application of computer and ICT-related facilities in their subjects enhances the quality of their learning. The twenty-two questions on this category were collected together defined according to "if the score falls below 22, the belief is low, if the score falls in between of 22 and 44 there is moderate belief and if the score falls above 44, there is high belief.

Also, Fuglested, (2003) did a research study entitled "ICT and mathematics learning". It shows that professionals reflect critically on and inquire into aspects of this professional life, issues are revealed, questions refined and socially significant action cannot be taken in clearly directed and knowledgeable. This project will be a large-scale inquiry involving professional teachers, dedicated and researchers in

inquiry at some level. At any level, those involved will engage in inquiry to their own particular roles, aims, and expertise. This project involves researching aspects of students learning with ICT and the use of ICT as support for teaching. In close cooperation with researchers in other areas of faculty, they will also study the very nature of inquiry as a means of sustained effective education development in mathematics. He focuses the developmental research involving personal technology may form a basis for further planning of teaching environment and material also ICT helps to develop the communication for learning with technology.

Moreover, Rodolfo, (2015) completed a study entitled "students' perception and attitude on ICT integration in mathematics classroom". The purpose of this study was to investigate how mobile gadgets were utilized inside a mathematics classroom during the teaching-learning process. A sample of 93 students has used a survey design. Findings indicate that students who have a positive attitude towards mathematics agreed if ICT will be integrated into the teaching-learning inside the classroom, still agreed after the ICT integration and evaluated the ICT integration as effective. Moreover, there is an increased level of agreement of the students and a significant relationship between the students' attitudes towards Mathematics and the students' perception of ICT integration inside the classroom.

Similarly, the above literature also focused on the attitude of students and their relationships towards ICT in different subjects including mathematics. The result indicated that ICT and its tool are more beneficial for teaching and learning activities and there was no difference between the mean scores of the students towards ICT. So, these reviews are completely related to this study and give a guideline and evidence for the present research.

In the same way, Sapkota, (2015) did research on the "effectiveness of ICT integrated pedagogy at the secondary level." This study aimed to find the effectiveness of ICT integrated pedagogy in the existing educational system among students in the experimental and control group of grades 9. 46 students of two public secondary schools of Kathmandu district were selected for the study. She conducted that this research brings an effective result in terms of the achievement of mathematics in comparison to the existing pedagogy as well as students taught by integrating ICT is more motivated towards mathematics instruction.

Also, Saud, (2018) has studied the research topic "Attitude of students and teachers of using audio-video aids in learning on the secondary level at Surkhet district. "The purpose of this study was to explore the attitude of students and teachers in using audio-visual aids for teaching learning and to find out the challenges of using audio- visual aids in teaching-learning. The researcher followed the survey research design and the total sample population of the primary was 100 students and 15 teachers of Surkhet district. The stratified random sampling procedure was followed for the selection of the sample population where the closed-ended questionnaire was used to collect data. There were used statistical aids mean, percentage, and chi-square test at 0.05% level of significance. The researcher found that from his research that students and teachers were using audio-video for their teaching and learning. He also concluded that students and teachers motivate to learn the subject materials they 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. I used the audio-video aids to bring change to the classroom environment as well as higher motivation support. In his opinion, audio-video aids are very important to change education and they made effective and long-lasting learning.

These above literatures have described about effectiveness of GeoGebra, attitude of students towards ICT in mathematics and perception of teachers and students towards ICT in mathematics at undergraduate level. These various research studies have been carried out in the field of ICT in mathematics however no information was found about perception of Master level students towards ICT in learning mathematics. The previous re- searches mainly deal with effectiveness of GeoGebra, attitude of students and perception of teachers and students at undergraduate level but my research deals with perception of students towards ICT in learning mathematics at Master level. Therefore, my research is different than the previous researches.

### **Theoretical Framework**

Researches and theories are interrelated and inseparable. "A theory provides a conceptual framework for research. Research, in turn, contributes to the development of theory" (Pant, 2009). A theory plans and directs the research studies. Any

philosophies must be supported by any theory for its pedagogical implementation. Likewise, the Use of ICT is supported by many theories. Here I have discussed in brief these theories.

**Constructivism.** Constructivism is one of the major influences in today's day science and mathematics education. Constructivism took on an ethical and moral dimension and presents itself as a morally superior theory. "It offers teachers' moral imperative for deconstructing traditional objectivist conceptions of the nature of science, mathematics, and knowledge, and for reconstructing their epistemologies, teaching practices and educative relationships with students' (Hardy & Taylor 1997). According to Acharya, (2017) there are three major forms of constructivism; educational constructivism, philosophical constructivism, and sociological constructivism and also educational constructivism divides itself into radical constructivism and social constructivism. My discussion has focused on social constructivism because it appears to be the firm that has the greatest influence on science and mathematics education. Constructivist perspective may emphasize an active learning environment that may incorporate learners centered and problem-based learning in which students are actively engaged in critical thinking activities so use of ICT in the classroom is based upon the assumptions of constructivism where teachers should play the role of instructor and students are actively participate in the classroom. In a constructivist classroom, the student tries to find the solution to the problems by learning in a group where students are motivated to do their work themselves and find the solution and teacher work is just to facilitate the student. By using ICT in math's classroom students will develop their knowledge by visualizing and here teacher's 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 (Tyler, 2002). All in all, ICT supports constructivist pedagogy where students use technology to explore and reach an understanding of mathematical concepts where it promotes higher-order thinking and better problem-solving strategies (Keong, et.al 2005).

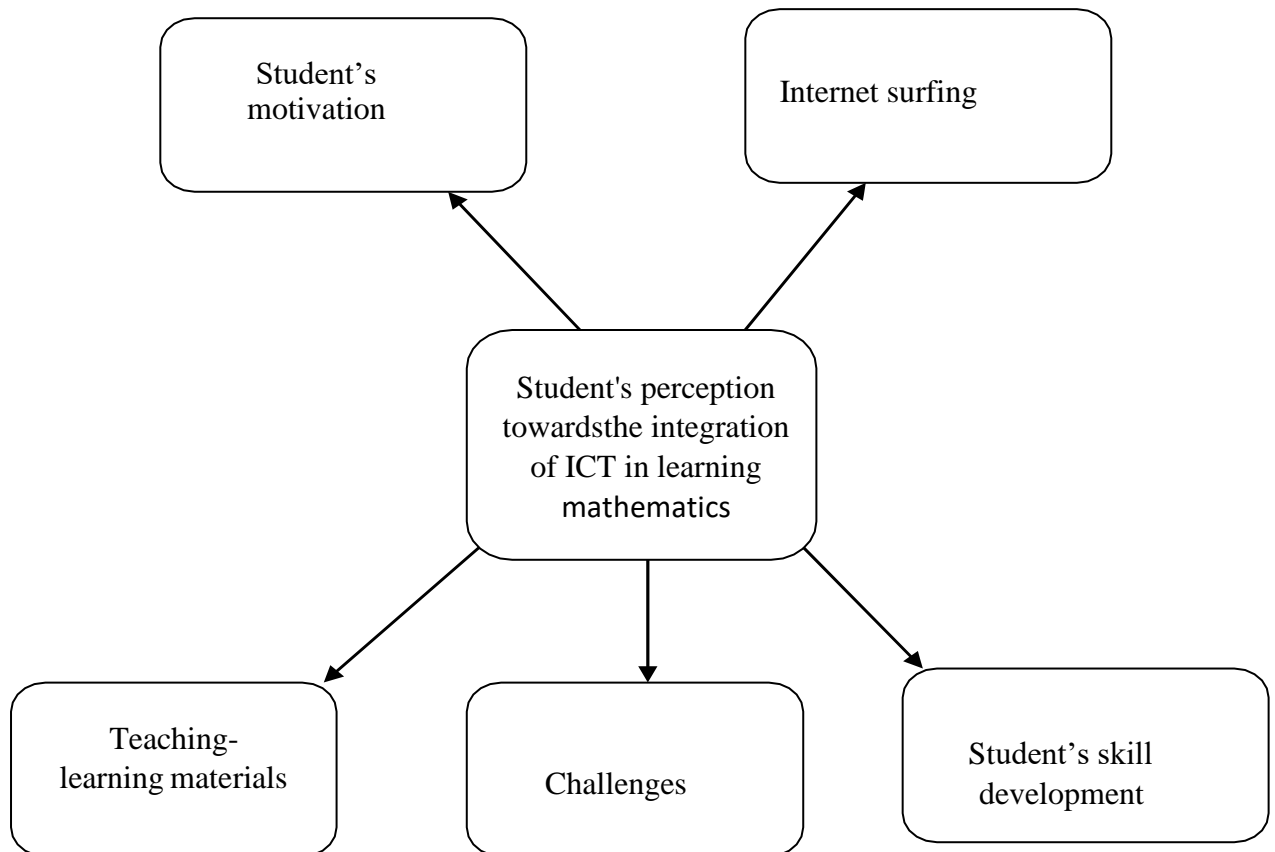
**Social Constructivism.** Social constructivism builds on the principles of radical constructivism and adds the assumption of the existence of both the physical and social world (Ernest, n.d.). Social constructivists believe that both reality and knowledge are socially constructed.

Whereas in radical constructivism, knowledge is defined in terms of individual mental representation, in social constructivism, knowledge is defined in terms of consensus (Rowlands and Carson, 2001). “To social constructivists, knowledge is a human product, and is socially and culturally constructed. Individuals create meaning through their interactions with each other and with the environment they live in” (Kim, 2001).

The social constructivist approach can be achieved through integration and use of ICTs in the classroom, which supports creating a social constructivist learning environment through the provision of access to interactive and collaborative tools (such as interactive whiteboards, wikis, blogs, mobile devices, and social networking sites). All of these tools provided students different ways to create and build upon content effectively. Social constructivism teaches that all knowledge develops as a result of social interaction and language use, and is therefore a shared, rather than an individual, experience. Knowledge is additionally not a result of observing the world; it results from many social processes and interactions. We, therefore, find that constructivist learning attaches as much meaning to the process of learning as it does to the acquisition of new knowledge. Math educators know that unless students are challenged by and actively engaged in the course material, students will quickly lose attention. If the challenge is too great, students might simply give up. By understanding the concept of a zone proximal development and how to connect with learners at different developmental points, teachers can plan a more strategic approach to group and individual instruction. The concept of ZPD involves connecting unlearned material to what is familiar; teachers play a pivotal role in the application of ZPD in the classroom (Pandey, 2012). They provide appropriate scaffolding – strategic social interactions, learning experiences, and instruction based on student's past performance, intuition, and current thinking- that guide effective learning and development. Scaffolds facilitate a student's ability to make sense of new situations, build on prior knowledge, and transfer learning. In the math educational setting, scaffolds may include manipulative, games, models, cues, prompts, hints, partial solutions, think-aloud modeling, or using contextual problems based on a student's interests.

## Conceptual Framework

The conceptual framework is the pictorial description that is based on theoretical concepts and shows the interrelationships between the concepts and the variables related to the research (Khanal, 2019). My research was based on the following conceptual framework;



*Figure 2.1:* Conceptual framework

In the above conceptual framework, students' perception towards the integration of ICT in learning mathematics are divided into five categories like as students' skill development, challenges, teaching/learning materials, students' motivations and internet surfing. The review of empirical literature was helped me for developing/making the conceptual framework and also for selection of its five categories. The conceptual framework tries to clarify the study of the variables (dependent and independent) drawn from the research-based literature and theory-based knowledge to fulfill the objectives. Social constructivism is closely related to the learning environment and emphasizes the theme that social interaction and the

cultural environment contribute to the cognitive development of the child. The above discussed literature helped me for find out some student's perception towards ICT in teaching mathematics and also some factors which are affecting in students' learning mathematics. Also, the above discussed theories helped me for find out the effective teaching strategies in teaching mathematics by using ICT related materials. Thus, in this study the implication of constructivism learning theory is, the collected data has been explained related to how the mathematical contents can be taught effectively by connecting to our culture, our social activities, and our daily life problems.

## **Chapter III**

### **Method and Procedures**

The research methodology is useful to solve the research problem systematically. The following methods and procedures will conclude the details of the design of the study, the population of the study, the sample of the study, tools of data collection, reliability and validity of the tool, data collection procedure, and data analysis and interpretation procedure are consisting in detail.

#### **Research Design**

Research design constitutes the blueprint for the collection, measurement and analysis of data (Huia, 2004). According to Peter & Karol (2001) quantitative research is a research strategy that focuses on quantifying the collection and analysis of data. It is formed from a deductive approach where emphasis is placed on the testing of theory, shaped by empiricist and positivist philosophies.

Survey research is defined as "the collection of information from a sample of individuals through their responses to questions" (Check & Schutt, 2007, p. 160). According to Creswell (2012) survey research designs are procedures in quantitative research in which investigators administer a survey to a sample or to the entire population of people to describe the attitudes, opinions, behaviors, or characteristics of the population. The study was adopted the descriptive survey approach under quantitative research method. Descriptive survey design was selected because the study entailed asking a large number of people question (in form of the questionnaires) about their opinion and idea and even describe what the people say. Thus, according to my research objective I thought that only the survey research would be fruitful for achieving this objective. Therefore, I used this survey research approach under quantitative research method.

#### **The Population of the Study**

The population of this study was taken all M.Ed. level students of mathematics education in Tribhuvan University and situated in Kathmandu district.

#### **Sample of the Study**

Sampling is the process of selecting a few (a sample) from a bigger group (the sampling population) to become a basis for estimating or predicting a fact, situation

or outcome regarding the bigger group (Kumar, 2014). A sample is a subgroup of the target population that the researcher plans to study for generalizing about the target population (Khanal, 2017). So, first of all, I had listed of total University of Kathmandu district. From the list I selected only Central Department of Education TU Kirtipur, Mahendra Ratna Campus Tahachal by using the method of random sampling. In this selected college, there I had selected 100 mathematics students for questionnaire and also 2 mathematics teachers as interview. Among in this colleges I had selected total 100 students which are studying mathematics as the sample of this study. For sampling, I divided into two parts; 50 students were selected from first and second semester and also another 50 students were selected from third and fourth semester in M.Ed. Mathematics Education. In these 50 students, I selected 30 boys' students and 20 girls' students from selected campus from Kathmandu district.

### **Tools of Data Collection**

It is an important part of the study. To fulfill the objective, some necessary data are needed; there are many data collection tools. In this research, the researcher has used questionnaires and interviews as data collection tools which were described as follows.

**Questionnaires.** One set of the questionnaire was used for this study, the questionnaire is an extremely important tool for data collection in this research (Khanal, 2019). I had prepared a set of questionnaires based on a conceptual framework with five dimensions (students' Skill Development, Teaching Materials, Students Motivation, Students' Achievement, and Time Management). The questionnaire has been developing based on the Likert five- point Scale strongly agrees, agree, neutral, disagree, and strongly disagree respectively. Rank response for each statement through each aspect were, strongly agree, agree, neutral, disagree, and strongly disagree. Each positive statement has received a score based on five-point for strongly agree, four for agree, three for neutral, two for disagree, one forstrongly disagree, for negative statements one point for strongly agree, two for agree, three for neutral, four for disagree, five for strongly disagree.

**In-depth interview.** The interview is the formal or informal communication between the interviewee and interviewer (Pokhrel, 2016). It is also one of the major data collection tools which provide basic and personal information towards anything.

In this research, the researcher was selected 3 boys and 3 girls' students for interview purposes. The interview supports the quantitative data to make valid conclusions. I had developed the different interview schedule forms for mathematics students and mathematics teachers. The in-depth interview was conducted with the mathematics teacher, students, and their parents using open-ended or semi-structured questions. The in-depth interview helped me for face-to-face communication with the students and also to get information about the personal gestures, habits, attitudes of the students towards mathematics.

**Document review.** Both primary data and secondary sources of data have been used to meet the objectives of the study. The primary sources of data for this study were taken from open end and close end questionnaire through interview, multiple choice achievement test paper and direct field observation. The secondary source of data will be taken from various books, articles, reports and research studies, journals, related to the study.

### **Reliability and Validity of Tools**

According to Kvale (1996) reliability is connected with the persistently of the research finding. According to Ying (1994:37) the aim of reliability is to minimize errors and biases. According to Kvale (1996) validity refers to the truthfulness and trustworthiness of findings. For the reliability of questionnaires the I had carried out pilot test on 20 students of Central Department of Education TU at Kathmandu district. Before administering questionnaires, I had instructed the students how to respond the paper. To determine the internal consistency of the achievement test i.e. to find the reliability of the mathematics achievement test, correlation coefficient had tested. To test the correlation coefficient and split half method was applied for to test the questionnaires of reliability and validity. Thus at last, in this study, I had calculated the reliability and validity score by using split-half method. The split half reliability of the test had found 0.96. It indicates that test was reliable.

### **Data Collection Procedure**

First of all, I visited to selected university and I had met Department Head as well as subject teacher and I had taken the permission to collect the data in the classroom. I had used three types of instrument or tools in this study they are; interview with related students, document analysis and questionnaires form. The tools

for the study was administered on a sample of 100 students from the campus including in the sample. Before administering the test, I had explained the answering procedure to test. After the time duration of examination, the answer sheets were collected and were scored by the researcher. I had prepared the required instrument for data collection. M.Ed. level mathematics education students have selected by the researcher using an random sampling technique. Then I gave a questionnaire to students and I had collected their responses based on the five-point rating scale.

**Scoring procedure.** I had collected the data from the sample and then data was tabulated by using the following 5-point rating scale.

Meaning Scales	Scores
Always (at least one time in a day)	5
Frequently (at least two or three times in a week)	4
Sometime (at least one times in a week)	3
Rarely (at least two times in a month)	2
Never (at least one time in six month)	1

Weightage of 5, 4,3,2 & 1 to a statement if the response is “Always”, “Frequently”, “Sometime”, “Rarely” & “Never” respectively for each statement. For the negative statements, the score will assign in reverse order.

### **Data Analysis Procedure**

Data analysis is being considering an important step and heart of the research work. After the collection of data with the help of relevant tools and techniques, the next logical step is to analyze and interpret data to arrive empirical solution to the problem (Singh & Nayak, 2015). Collected data was analyzed by using both descriptive and inferential statistics. Statistical tally system was used to generate frequency count from the responses to prepare of frequency distributions. The hypothesis was tested by using U-test, Mann-Whitney test, Mean and Standard Deviation. The Mean and Standard Deviation were also used to find the students' perception in learning mathematics through the integration of ICT at M.Ed. level in

mathematics achievement. The Mean, Standard Deviation, U-test, and Mean weightage test at 0.05 level of significance with mathematics achievement were used for the analysis of data. To find the perception of boys and girls mathematics student towards ICT in teaching mathematics I used mean and percentage of each statement. For the analysis of the collection data the researcher used computer program SPSS software version 23.0.

### **Ethical Consideration**

This section deals with some sorts of considerations that were considered by the researcher while conducting this research. To maintain the ethical consideration, the re-searcher adopted various ethical considerations. First of all, the researcher informed the respondents about the purpose of the study. Then, the researcher conducted the research by taking consent from the participants. Then after, the researcher ensured to keep the responses of the respondent's confidentiality. Moreover, the researcher ensured that the achieved data will not be used for any other purposes except this study without taking consent from the participants.

## Chapter- IV

### Analysis and Interpretation

This is a quantitative study based on survey design conducted in Kathmandu district. The main purpose of this study was to find the perception of the students towards ICT in learning mathematics and compare it with gender wise. This chapter is mainly concerned with the analysis and interpretation of data which was collected from 50 students from Kathmandu district at M.Ed. level who studied mathematics education. The questionnaire was vital tools for the collection of data which are given in (appendix-A) consisting 30 statements related with the use of ICT, Facebook, YouTube, mobile apps and websites for learning mathematics. The scale of scoring each item of the questionnaire was used Likert's five-point rating scale giving scoring value 5 for strongly agree 4 for agree 3 for neutral 2 for disagree 1 for strongly disagree.

Regarding statistical description measure of percentage, mean attitude score were used to measure attitude of students towards the use of ICT in learning mathematics and also Mann-Whitney test, mean and standard deviation were used to compare the perception of boys and girls student at 0.05 %level of significance. While analyzing the data the total number of responses of the students were counted and changed into percentage. If the response were fifty percent or above, it was considered as positive attitudes and below it was considered as negative attitudes also, mean score value was calculated of each statement and analyze that if the mean score values were greater than 3 then it was considered as positive attitude of statements towards integration of ICT in learning mathematics. If the calculated mean score had less than 3 then there were negative perceptions towards ICT in mathematics. In this study the researcher used Mann- Whitney test (U-test). The researcher has found U value of both boys and girls and taken minimum U value. The perceptions of each statement were analyzed under the following heading;

- Boys' and girls' perception towards use of ICT in student's motivation.
- Boys' and girls' perception towards use of ICT in teaching & learning mathematics.
- Boys' and girls' perception towards use of ICT in skill development

- Boys' and girls' perception towards challenges in use of ICT
- Boys' and girls' perception towards internet suffering in use of ICT
- Comparison of boys' and girls' perception towards use of ICT

### Boys' Perception Towards Use of ICT in Students Motivation

Table 4.1: *Perception of boy's students in student motivation*

S. N	Statement	SA	A	N	D	SD	Mean	SD
1.	It makes easy to control the classes.	43.33%	23.33%	13.33%	16.67%	3.34%	3.86	1.25
2.	It helps to decrease the class repetition rate of students.	53.34%	33.33%	0.00%	13.34%	0.00%	4.26	1.02
3.	It helps to increase the attendance rate of students.	30.0%	23.34%	13.34%	10.0%	23.33%	3.26	1.56
4.	Using ICT in teaching mathematics encourage the students self-learning.	73.34%	13.33%	0.00%	3.10%	13.34%	4.43	1.13
5.	It helps to make student more creative.	50.0%	10%	6.67%	26.66%	6.67%	3.7	1.46
6.	It helps to decrease drop-out rate of the students.	43.33%	20%	20%	6.67%	10%	3.8	1.76

Table 4.1 refers that the mean score of the first statement “it makes control my classes” is 3.86 and 66.66% of students are agreed about this statement it shows that more than half of the total students have positive response towards this statement. In the second statement “It helps to decrease the class repetition rate of students” mean score of this statement is 4.26 and 26 students have given agree towards this; also, only 4 students have supported in disagree so more students are positive supported for this statement. On the third statement the result is disperse, only 16 students are agreed towards this statement and 4 students are neutral, 10 students are disagreeing

also the mean score of this statement is 3.26 which is comparatively less than above two statements so in this statement there are no more students have positive responses. On fourth statement “Using ICT in teaching mathematics encourage the students self-learning.” 86.67% students have given positive response and only 13.34 % students have given disagree also mean score of this statement is 4.43. This shows that most of the students are interested touse ICT in learning mathematics. The majority of the students have positive attitudes to- wards this statement. On fifth statements “It helps to make student more creative” 60 % of sample students are agreed with mean value 3.7 which shows that this statement have positive responses. In this statement 6.67% of students are neutral and 33.33% students are disagreed with this statement. Hence majority of students have positive response to- wards this statement. On the last statements “It helps to decrease dropout rate of the students.”63.33% of the sample students are agreed with mean score 3.8, among them 16.67% students are disagree and 20 % of them are neutral. What was seen in this statement? There are more neutral students than disagree students. So, some of them have not fix decision, they are still in neutral in this statement. Almost 64% of sample students have positive response.

### **Girls' Perception Towards Use of ICT in Students Motivation**

Table 4.2: *Perception of girls' students in student motivation*

<b>S. N</b>	<b>Statement</b>	<b>SA</b>	<b>A</b>	<b>N</b>	<b>D</b>	<b>SD</b>	<b>Mean</b>	<b>SD</b>
1.	It makes easy to control the classes.	60%	20%	5%	15%		4.25	1.09
2.	It helps to decrease the class repetition rate of students.	40%	35%	-	10%	15%	3.75	1.45
3.	It helps to increase the attendance rate of students.	65%	25%	10%	-	-	4.55	0.67
4.	Using ICT in teaching mathematics encourage the students self-learning.	55%	25%	-	15%	5%	4.1	1.26
5.	It helps to make student more creative	50%	10%	15%	25%	-	3.85	1.28

6. It helps to decrease dropout rate of the 15% 65% 5% 15% - 3.8 0.88 students.

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Table 4.2 shows that, on the first statement, there are 16 students have positive responses out of 20 students. So, 80% students have supported for this statement. Here only 15% students have supported in disagree, but only one student is in neutral. It concludes that the majority of girl's students have positive supported for this and also there are more girls' students than boys' students for positive response in this statement. On the second statement, the mean value of this statement is 3.75 and the total of 75% students are agreed, 25% of them are disagreed with this statement. It shows that most of the student are accepted this statement with positive response. On third statement, "It helps to increase the attendance rate of students." 90% of the sample students are agreed but there are no students who have supported for disagree in this statement. 10% of total sample students are neutral it means 4 students are neutral. The calculated mean of this statement is 4.55 which show that the high rate of students is agreed towards this statement. On the fourth statement 4 students it means 20% of the total sample students are disagreed but 80% students of them are agreed so it shows that the high rate of girl's student have positive supported for this statement. The mean score of this statement is 4.1 which is less than third statement. But the majority of the students are supported for positive response. On fifth statement, 60% of the total students are agreed, 15% are neutral and 25% of them are disagreed with mean value is 3.8 it shows that there are no more students supported comparatively first, second, third, fourth statement but more than half of the sample student are agreed with this. On the sixth statement, 80% students are agreed, 5% are neutral and 15% are disagreed. But mean score is less than mean score of fifth statement, it was seen that in fifth students 10 students are strongly agreed but, in this statement, only 3 students are strongly agreed so, mean score is comparatively less than mean score of fifth statements but agreed students of sixth statement is more than fifth statement.

I had taken an interview with 3 boys and 3 girls of Master Degree in Mathematics Education. On the interview time I asked the question, "How does ICT help to increase the student's motivation?" In this question the boys and girls have different view, which are presented as follows;

*“Yes of course, ICT is really helpful in mathematics education because it helps to find new idea, knowledge and information from YouTube Google etc.”*  
(Girl 1)

*“Yes, it is helpful in mathematics. It can be increase learning interest in mathematics; al-so it helps to decrease the drop out students in mathematics education”.* (Girl 2)

*“Yes, I am agreed with use of ICT is helpful in learning mathematics, because ICT can help to increase the rate of students and it helps to students more creative in learning mathematics”.* (Girl3)

*“Yes of course. It is really helpful in mathematics. By using ICT, it can remove the students boring in learning in mathematics”.* (Boy 1)

*“Yes, it helps to increase the rate of attendance in learning mathematics and it is helpfull to seek new idea, information”.* (Boy 2)

*“It makes the students more creative and Laboure's.”* (Boy 3)

From above answers, we conclude that ICT does the students really motivated. According to these view and perception of statements ICT makes the students more creative and it helps to motivate to learn mathematics. The majority of the students have given positive response in this question. So social constructivist theory refers that teacher just as a facilitator and students are knowledge creator, it means that teacher must be helpin every path when the students need of them.

### **Boys' Perception Towards Use of ICT in Teaching & Learning Mathematics**

Table 4.3: *Perception of boys' students in teaching & learning mathematics*

S. N	Statement	SA	A	N	D	SD	Mean	SD
1.	I feel confident to teach math's on the computer.	23.33%	26.67%	23.33%	20%	6.67%	3.4	1.23
2.	It clears the concept of 2D and 3D figures, graphs and charts.	46.67%	16.67%	16.67%	20%	-	3.9	1.2

3.	ICT makes my lessons easier.	16.67%	33.33%	23.33%	10%	16.67%	3.23	1.31
4.	It is easy and effective for mathematical calculation.	30%	16.67%	6.67%	36.67%	10%	3.2	1.44
5.	ICT makes my lessons more interesting.	73.33%	10%	6.67%	10%	-	4.47	0.98
6.	It is easy and effective for mathematical visualization.	20%	40%	16.67%	13.33%	10%	3.46	1.25

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From the table 4.3, the first statement “I feel confident to teach math’s on the computer”. In this statement the opinion is more disperse because 23.33% students have given positive response. They are strongly agreed and 23.33% students have given no response about this statement as similarly 26.67% students have supported for agree accordingly 20 and 6.67 percent students are disagreed. The mean value of this statement is which show that only 50% students are agreed so there is no high rate of students support for this statement. On the second statement of this table, 19 students are agreed it means 63.34% students are given positive response for this statement. The calculated mean value of this statement is 3.9. There are 20% students are disagreed and 16.67% students are neutral. This result concluded that nearly 65 % students have given positive response for this statement. it means most of the students are clear about 2D and 3D figures graphs and charts. On third statement of this table was showed that only 50% students have given positive response for this statement also in this statement 23.33% are neutral, 10% are disagreed and 16.67% are strongly disagreed. It shows that only half of the sample students have given positive response with mean value 3.23. Their views show that there are equal students for agree and disagree. On forth statement, out of 20 sample students, only 46.67% students are agreed 26.67% students are disagreed and 23.33% are neutral with mean value 3.2. From this opinion less than half of the sample students are only given positive response. There is only 3 % different between disagreed students and neutral students so; fewer students are like for using mathematic calculation through the ICT. On the fifth statement, “ICT makes my lessons more interesting” in this statement 22 students are strongly agreed and three are agree, so the 25 students have given

positive response about this statement with mean value 4.47. There two students are neutral and 3 are disagreed .it shows that 83.33% students are positive in this statement. On sixth statement of this statement, it has 3.46 mean value and 60% students are agreed. In these statements 16.67% students are neutral and 23.33% students are disagreeing. It shows that the majority of students have positive response for this statement.

### **Girls' Perception Towards Use of ICT in Teaching & Learning Mathematics**

Table 4.4: *Perception of girls' students in teaching & learning mathematics*

S. N	Statement	SA	A	N	D	SD	Mean	SD
1.	I feel confident to study math on the computer.	45%	10%	35%	5%	0	4	1.00
2.	It clears the concept of 2D and 3D figures, graphs and charts.	15%	25%	25%	30%	5%	3.15	1.16
3.	ICT makes my lessons easier.	20%	25%	10%	35%	10%	3.1	1.14
4.	It is easy and effective for mathematical calculation.	55%	30%	15%			4.4	0.74
5.	ICT makes my lessons more interesting.	75%	10%	-	5%	10%	4.35	1.31
6.	It is easy and effective for mathematical visualization.	35%	25%	20%	10%	5%	3.7	1.22

Table 4.4, describes that the opinion of girl's student towards teaching learning activities through integration of ICT. On the first statement shows that confident level of students using computer for study. In this statement mean score is 4 as well as the agreed students are 55% and 5% students are disagreed which shows that 35% students are still neutral. It indicates that more students are in neutral still now. On the second statement "It clears the concept of 2D and 3D figures, graphs and charts. "Only 40% students are agreed, 25% are neutral and 35% are disagreed with

mean value 3.15. it shows that there are no more students for positive response in this statement. Hence the majority of students are not motivated to use ICT for clear the concept of 2D and 3D figures, graphs and charts. On the third statement, there is equal number of agreed students and disagreed students which is 45%. It shows that only two students, it means 10% students are neutral. If we compare the mean value of second and third statement, we can see the mean value of second statement is less than mean value of third statement. Although the mean value of third statement seems low but the number of agreed students of second statement is high. On the fourth statement, "It is easy and effective for mathematical calculation." In this statement 85% students are agreed, only 15% students are neutral and no students are in disagreed with mean value 4.4. It shows that almost students are more positive response for this view. On the second last statement, "ICT makes my lessons more interesting." There are no neutral students and 85% students are agreed but 3% students have given disagree for this view. The mean value of this statement is 4.35, it indicates that majority of students have positive response towards this statement. In the last statement the result is disperse. There are 35% are strongly agreed 25% are agreed 20% are neutral 10% are disagreed also 10% are strongly disagreed. The mean value of this statement is 3.7, it shows that more than half of the total sample students have given positive response towards this view. I had asked "how Does ICT helps in mathematics teaching and learning?" their opinions are presented as below;

*"She told that ICT makes students more creative and it helps to increase the confidence level of students and by showing the 2D, 3D figures, graphs students can easy to under-stand mathematical knowledge". (Girl 1)*

*"She said that by seeking new idea, knowledge and we can use different mathematical app for calculation like math way, math solver etc.". (Girl 2)*

*"It is helpful in learning mathematics. There are several ICT tools like Google, drive, blog, you tube etc., from these tools we can find short court method of theorem and history of mathematician etc.". (Girl 3)*

*"It makes our lesson easier and it helps to lesson more interesting. So, it is very useful in teaching learning mathematics". (Boy 1)*

*"By visualizing different figures like 2D, 3D figures, graphs and we can do easy way to communicate students-students & teachers to students". (Boy 2)*

*“It is effective for mathematical visualization and sharing the information with friends and teacher”.* (Boy 3)

From above these answer shows that students are using ICT in learning mathematics. They have positive response to use ICT in learning mathematics. These views of the students show that the majority of the students have used ICT in learning mathematics. social constructivist approach can be achieved through integration and use of ICTs in the classroom, which supports creating a social constructivist learning environment through the provision of access to interactive and collaborative tools (such as interactive whiteboards, wikis, blogs, mobile devices, and social networking sites). All of these tools provided students different ways to create and build upon content effectively.

### **Boys' Perception Towards Use of ICT in Skill Development**

Table 4.5: *Perception of boys' students in skill development*

S. N	Statement	SA	A	N	D	SD	Mean	SD
1.	It helps to increases me confidence	43.33%	16.67%	10%	13.33%	6.67%	3.6	1.42
2.	I enjoy using computers to learn mathematics	40%	23.33%	10%	26.67%	-	3.76	1.25
3.	It enhances my career prospects.	60%	10%	16.67%	13.33%	-	4.16	1.15
4.	It helps me to discuss learning ideas.	23.33%	56.67%	10%	6.67%	3%	3.9	0.95
5.	It helps to develop documents, notes assignments etc.	20%	33.33%	6.67%	23.33%	16.67%	3.16	1.43
6.	It can change my learning style of mathematics.	20%	13.33%	10%	43.33%	13.33%	2.83	1.38

Table 4.5 refers that, on the first statement “It helps to increases my confidence” 60% students are agreed, 20% students are disagreed and 10% students

are neutral. This statement has 3.6 mean values which is less than boys' students mean value. It indicates that the boy's students have given more positive response than girls students. Nearly 60% students are agreed in this statement. On the second statement, "I enjoy using computers to learn maths" 19 students are agreed out of 30 sample students, it means nearly 64% students are agreed in this statement. Likewise, 26.67% students are disagreed and 10% students are neutral. Hence the more than 60% students are interested to use computer in learning mathematics. On the third statement "It enhances my career prospects" 16.7% students are neutral and 13.34% students are disagreed. In this statement 70% students are agreed with mean value 4.16 which is higher than mean value of first and second statements. It concludes that most of the students are motivated in their career development. On the fourth statement, 80% students are agreed with 3.9 mean value. In this statement only 3 students are disagreed also 3 students are neutral. In third statement there are 18 students are strongly agreed but in this statement 7 students are strongly agreed and 17 students are agreed, so the mean value of third statement is greater than of this statement. This result shows that majority of students have positive response towards this statement. On the fifth statement, 53.33% students have given positive response for this statement. The mean value of this statement is 3.16 and 40% students are disagreed. It shows more than 50% students use ICT to develop documents, notes, assignment etc. On the last statement only one third of total sample students have positive response towards this statement. The mean value is 2.86 and 56.67% students are disagreed in this statement so, the most of the students aren't agree with ICT change learning style. It shows that they are following previous learning style. Therefore, most of the students are agreed with ICT helps student's skill development.

### **Girls' Perception Towards Use of ICT in Skill Development**

Table 4.6: *Perception of girls' students in skill development*

S. N	Statement	SA	A	N	D	SD	Mean	SD
1.	It helps to increase my confidence	50%	15%	10%	20%	5%	3.85	1.35
2.	I enjoy using computers to learn math.	10%	45%	30%	15%		3.5	0.88

3.	It enhances my career prospects.	55%	10%	15%	10%	10%	3.95	1.27
4.	It helps me to discuss teaching ideas.	25%	35%	15%	25%	-	3.6	1.11
5.	It helps to develop documents, notes assignments etc.	5%	25%	15%	55%	-	2.8	0.98
6.	It can change my learning style of mathematics.	30%	15%	25%	20%	10%	3.35	1.35

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On the first statement of this table 4.6, "It helps to increases my confidence" thereare 65% students are agreed and 25% students are disagreed with the mean value 3.15. it concludes that the majority of students are agreed with this statement. The second statement is "I enjoy using computers to learn math". In this statement 55% students are agreed, 30% students are in neutral and 15% it means three students are disagreed. More than the halves of the students are agreed with the mean value 3.50 in this statement. On the third statement, "It enhances my career prospects"65% students are agreed and 20% students are disagreed with mean value 3.95. it shows that the majority of girl's students are aware their career development. On the fourth statement "It helps me to discuss teaching ideas" 60% students are agreed and 25% students are disagreed. The mean valueof this statement is 3.6. It indicates that most of the girl's students have positive responsetowards these statements. On the second last statement is "It helps to develop documents,notes assignments etc.". In this statement a few students are agreed it means only 30% students are agreed. In this statement 55% students are disagreed with 2.80 mean value. it shows that the majority of the students have negative response with this statement so we can say most of the girl's students does not have taken for ICT to develop the documents assignment, notes etc. On the sixth statements 45% students are agreed and 30% students are disagreed, 25% are neutral in this statement the mean value is 3.35. This result refers that most of the student's views has dispersed. In this statement less than the half of the total sample of the students have positive attitude. On the interview time, I had asked, "How Does ICT help in skill development of students in mathematics?" In this question they have given different views which are presented as below;

“She said that, it does help in skill development because; by using ICT materials we can learn different types of journal, article, and research paper which helps to further study”. (Girl 1)

“Yes of course, even though COVID19 disturbed in teaching learning education, the skillof online learning and online teaching was developed”.  
(Girl 2)

“There are several ICT tools in this time, so mathematics and other subjects can also belearned using ICT. It develops the habit of searching.” (Girl 3)

“Yes, it really helpful in skill development, while reading, many things can be a problem,how to solve those problems is also an important thing. So, students can easily solve suchproblems by opening the internet”. (Boy 1)

“Although COVID has made the education sector suffer a lot, I have found that teachersand students have been able to receive education online”. (Boy2)

“It helps to use computer to learn, we can use android mobile to search different types ofjournal, article, research paper for study. It develops the habit of online learning also wecan learn from online meeting, sharing different learning materials etc.”. (Boy3)

From these above views; students have positive attitude towards ICT in mathematics. Bythis above perception, students are able to use internet for learning sharing information students and teachers meeting etc. They gave positive perception towards ICT in learningmathematics.

### **Boys' Perception Towards Challenges in Use of ICT**

Table 4.7: Perception of boys' students towards challenges in use of ICT

S. N	Statement	SA	A	N	D	SD	Mean	SD
1.	It takes more time to use.	26.67%	20%	6.67%	36.67%	10%	3.16	1.43
2.	It is more expensive for regularuse at school and at home.	73.33%	16.67%	10%	-	-	4.63	0.68

3.	It increases the work load.	46.67%	23.33%	10%	20%		3.96	0.98
4.	It is difficult to use for each unit of mathematics teaching.	63.33%	20%	3.33%	10%	3.33%	4.3	1.13
5.	It decreases the students' writing speed up.	43.33%	10%	13.33%	30%	3.33%	3.6	1.38
6.	It doesn't support for book reading skill of students.	10%	23.33%	-	56.67%	10%	2.66	1.24

Table 4.7, refers that the first statement is “It takes more time to use.” In this statement 46.67% students have given positive response towards this statement and 46.67% students are disagreed. The mean value of this statement is 3.16. This result shows that there are equal students for positive and negative response to this statement. On the second statement, out of total sample students 90% students are agreed with this statement only 10% students are neutral. it has 4.63 mean value. So, this result shows that majority of the students says that ICT is expensive to use in mathematics classroom. On third statement 70% students are agreed, 10% are neutral and 20% are disagreed. The mean value of this statement is 3.96. This shows that the majority of students have given positive response in this statement. Hence the result of this statement indicates that most of the students have negative felt. The fourth statement is “It is difficult to use for each unit of mathematics teaching” in this statement 83.33% students have given positive response with mean value 4.3. And also 13.33% students are disagreed so, from this result students have realized the use of ICT in mathematics is difficult. On the fifth statement the perception of the students is spread out. In this statement only 53.33% students are agreed and 33.33% students are disagreed, 13.33% students are neutral. This data shows that there are not any more students for positive support in this statement. On the last statement, 21 students are disagreed out of 30 students and mean value of this statement is 2.66 which is less than 3. From this perception of students, we can say students are not agreed with ICT helps increase the book reading skill.

### **Girls' Perception Towards Challenges in Use of ICT**

Table 4.8: *Perception of girls' students towards challenges in use of ICT*

S. N	Statement	SA	A	N	D	SD	Mean	SD
1.	It takes more time to use.	60%	30%	10%	-		4.5	0.67
2.	It is more expensive for regular use at school and home.	65%	20%	-	15%		4.35	1.06
3.	It increases the work load.	60%	15%	5%	15%	5%	4.1	1.3
4.	It is difficult to use for each unit of mathematics teaching.	15	30%	10%	35%	10%	3.05	1.29
5.	It decreases the students writing speed up.	15%	35%	-	40%	10%	3.05	1.32
6.	It doesn't support for book reading skill of students.	10%	5%	25%	45%	15%	2.5	1.11

This table 4.8, analyzes that the perception of challenges towards using ICT in mathematics. In this table, 90% girls' students are agreed with this statement and 30% students are neutral and only 10% students do not have the positive views. Also, its mean value is 4.5 which are higher than boys mean value so this result shows that the perception of girl's students is more positive than boy's students. On the second statement, "It is more expensive for regular use at school and at home" 80% students are agreed with this statement and no students are neutral also in this statement 15% students are disagreed. The mean value is 4.35 which is less than boys mean value. It indicates that majority of students have felt the use of ICT is more expensive for regular classroom activities. The next statement, "It increases the work load" 4.1 is mean value of this statement and there are 75% students are supported with this, so we concluded that they have realized use of ICT in mathematics class gives work load. On the fourth statement, "It is difficult to use for each unit of mathematics teaching." in this statement, the result is dispersing, here 15% students are strongly agreed, 30% students are agreed 10% are neutral 35% are disagreed and 10% are strongly disagreed. It has 3.05 mean values. It shows that there is same perception towards this statement with equal percent. On the fifth statement, "It decreases the students writing

speed up.”50% students are agreed and 50% students are disagreed so there is equal perception between positive and negative views. On the last statement, only 15% students are agreed with the mean value 2.5. it shows that most of the students does not support for this statement. So, the majority of students have given positive response towards the use of ICT increase the book reading skill. On the interview time, I asked “what types of problem have you seen while using ICT in mathematics?” In the question the responses of respondents are presented as follows;

*“Not all students have android mobile and laptop so, they cannot get chance to learn mathematics using ICT”.* (Girl 1).

*“Yes, of course, it is more expensive for regular use at school and at home because, there must be good type of android mobile, laptop to always uses ICT at home and school”.* (Girl 2)

*“Students should be given more time to use it, when they faced new problem, they can use internet to search solution so, they should spend a lot of time searching for new idea, knowledge and solution etc.”* (Girl 3)

*“It is difficult to use for each unit of mathematics teaching because, when using ICT during teaching time, it is difficult to complete the course on time”.* (Boy 1)

*“It takes more time to use and learners should have good mobile and laptop for learning mathematics using ICT”.* (Boy 2)

*“Yes, there are so many problems i.e. lack of computer repair center, projector, electricity that we faced as problems in teaching learning activities”.* (Boy 3)

So, these views conclude that still there so many problems while using ICT in mathematics. Lack of repair ICT lab, lack of good management of ICT materials in each class, lack of enough ICT materials like computer, projector we have been face different problems.

### **Boys' Perception Towards Internet Suffering in Use of ICT**

Table 4.9: *Perception of boys' students towards internet suffering in use of ICT*

S. N	Statement	SA	A	N	D	SD	Mean	SD
1.	Share information with friends, parents and teachers.	46.67%	20%	6.67%	10%	16.6%	3.7	1.53
2.	Download and install mathematics related software.	10%	20%	20%	46.67%	3.33%	2.86	1.11
3.	Use of Internet for information. (browsing information)	76.6%	10%	6.67%	6.67%	-	4.56	0.92
4.	Download subject related materials.	56.67%	23.33%	-	13.33%	3.33%	4.06	1.40
5.	Watch mathematics related videos on YouTube.	43.33%	40%	3.33%	10%	3.33%	4.1	1.20
6.	Use of Gmail, Blog, Drive for teaching and learning mathematics.	23.33%	50%	10%	16.67%	-	3.8	0.98

Table 4.9, describes that the perception of boy's students towards the internet surfing or use of internet. In this table, 66.67% students are agreed with first statement and 26.67% students are disagreed with mean value 3.7. it indicates that most of the students are use internet for share information with friends, parents and teachers. On the second statement, "Download and install mathematics related software" there are only 30% students are positive in this statement and 50% students are disagreed, also 20% students are neutral with mean value 2.86. This result of perception shows that a few students are only recognized with mathematics related software. On the third statement, "86.67% students are agreed and 6.67% students are disagreed also the mean value of this statement is 4.56. it indicates that most of the student are using internet for information. On the fourth statement 80% students are using ICT for download subject related materials. In this statement 4.06 is mean value and 17% students are disagreed. It shows that most of the students have positive response towards this statement. The second last statement is "Watch mathematics

related videos on YouTube” 83.33% students are agreed 13.33% students are disagreed and 3.33% students are neutral. The mean value of this statement is 4.1. This shows that, they have spent time to watch mathematics related videos on YouTube. On the last statement, “Use of Gmail, Blog, Drive for teaching and learning mathematics” 73.33% students are using Google blog and drive for sharing information. And there are 16.67% students do not have given positive response. So, this result shows that most of the students have got benefit from Google Gmail, blog drive etc.

### Girls' Perception Towards Internet Suffering in Use of ICT

Table 4.10: *Perception of girls' students towards internet suffering in use of ICT*

S. N	Statement	SA	A	N	D	SD	Mean	SD
1.	Share information with friends, parents and teachers.	30%	35%	5%	20%	10%	3.55	1.35
2.	Download and install mathematics related software.	15%	20%	15%	45%	5%	2.95	1.20
3.	Use of Internet for information. (browsing information)	25%	65%	-	10%	-	4.05	0.80
4.	Download subject related materials.	50%	35%	-	15%	-	4.2	1.02
5.	Watch mathematics related videos on YouTube.	65%	20%	5%	10%	-	4.4	1.92
6.	Use of Gmail, Blog, Drive for teaching and learning mathematics.	35%	20%	15%	25%	5%	3.55	1.30

Table 4.10 describes on the first statement “Share information with friends, parents and teachers” 65% students are agreed, 30% students are disagreed and 5% students are neutral. This statement has 3.55 mean value which is greater than boys' students mean value. It indicates that the boy's students have given more positive response than girls students. Nearly 66% students are agreed in this statement. On the second statement, “Download and install mathematics related software” 7 students are

agreed out of 20 sample students, it means 35% students are agreed in this statement. Likewise, 50% students are disagreed and 15% students are neutral. Hence a smaller number of students is only use ICT for download mathematical software. On the third statement “Use of Internet for information. (browsing information)” 1 no number of students are neutral but 10% students are disagreed. In this statement 80% students are agreed with mean value 4.16 which is higher than mean value of first and second statements. It concludes that most of the students are using ICT to get knowledge and information. On the fourth statement, 85% students are agreed and 15% students are disagreed with man value 4.2. It shows that the majority of students are given positive response in this statement. On the fifth statement, maximum students are given positive response to- wards this. There are 85% students have given positive response about this statement with mean value 4.4. It indicates that, many students are watching the mathematics related videos to information and knowledge. On the sixth statement, there are options of Use of Gmail, Blog, and Drive for teaching and learning mathematics. There are 55% students agreed, 15% are neutral and 30% students are disagreed. The mean value of this statement is 3.55. This result shows that more than half students have given positive response in this statement. On the interview time, I asked “what do you use the internet for? In this question most of the students replied that, I use internet for sharing information, for searching idea, knowledge, for new method of learning style, for solve mathematical problems, for solve numerical problems and I have used internet for communicate my friend's teachers and my parents also.

### **Comparison of Boys' and Girls' Perception Towards Use of ICT**

The boy and girl students were asked 30 statements as a questionnaire, which is mentioned in Appendix-A. in this study the researcher have established two objectives. Among these two objectives first objective ha previously analyzed by mean score and percentage of each statement. Now, for the second statement, the researcher has used Mann Whitney test to compare the perception of boys and girl's student towards ICT in mathematics education. For this purpose, the researcher has constructed the following null hypothesis ( $H_0$ ). “There is no significant difference between the boy's perception and girl's perception towards the integration of ICT in learning mathematics.” for this, the researcher used Mann-Whitney test (U test), Mean Rank, and also Z value.

Table 4.11: *Boys' and girls' student's perception towards the integration of ICT in mathematics learning*

<b>Gender</b>	<b>Sample Students</b>	<b>Sample Statement</b>	<b>Mean Value</b>	<b>Sum of the Mean Rank</b>	<b>U-value</b>	<b>Z-value</b>	<b>Conclusion</b>
Boys	30	30	30.2666	908	443	0.103	Z=0.1038
Girls	20	30	30.7333	922	457	4	<1.6745

Critical region: reject  $H_0$  if  $Z > Z_{0.05} = 1.6745$  and Accept  $H_0$  if  $Z < Z_{0.05} = 1.6745$ .

Note: The null hypothesis is accepted if the calculated Z value is less than tabulated Z value, otherwise rejected.

The analysis of the information mentioned in the above table represents there were 50 students for sample, and from them 30 students were boys and 30 students were girls. The group of the boy's sample students had asked 30 sample statements similarly 30 sample statements were asked to girl's students. The above table have shown that the mean value of boys is 30.2666 and 30.7333 is mean value of girl's students. We can see the sum of the mean rank of girl's student is more than boy's students which are the sum of the mean rank of the boys' students are 908 and the girl student's sum of mean rank is 922. The mean difference of boys and girl's student is only 0.4667 which shows that they have nearly same perception towards the mathematics learning by using ICT. From the above table the Z value is 0.1034 which is less than tabulated value of Z so the null hypothesis is accepted. The null hypothesis is there is no significant difference between the boy's students and girl's students towards mathematics teaching learning activities through the integration of ICT. It concludes that there is no significant difference between boys and girl's student towards ICT in learning mathematics.

## Chapter V

### Findings, Conclusion and Implications

This chapter includes that a summary of the whole study. It also includes findings and conclusions derived from the analysis and interpretation of the previous chapter and finally recommends how these findings can be used in the academic field. This chapter concerns in the following heading or sections;

- Findings of the study
- Conclusion of the study
- Implications of the study
- Recommendation for the further researcher

#### Findings of the Study

The study was carried out to examine the perception of students towards the use of ICT in learning mathematics and compare it with gender wise. To achieve these objectives researcher used a set of questionnaires as data collection tool based on Likert's five-point scale. When the data was collected and tabulated then analyzed by U test, Per-centage, Mean Score and Standard Deviation. After statistical analysis of calculated data, the researcher yielded the following results as finding of the study;

- All the students were favor for all the statements that are based on attitude of students towards the use of ICT in learning mathematics.
- The mean score of boy's student's opinion towards the use of ICT in mathematics was less difference than girl's student's opinion.
- The Z value was found 0.1034 which is less than tabulated Z value.
- There was no significant difference between boys and girl's opinion towards ICT in learning mathematics.
- It is found that, the mathematics related software as GeoGebra, Mathematica, Latex, Maple, Math lab helps to develop the documents, notes, assignments.
- It was found that almost all students have positive attitude towards integrating ICT in learning mathematics.

## **Conclusion**

From the above findings of the study, it concludes that the M.Ed. level students have positive opinion towards the use of ICT in learning mathematics. The boy's students and girls' students have nearly same response towards the ICT in learning mathematics. There is no significant difference between boys' and girls' opinion towards ICT in education. The mean score of boys and girls are nearly same in each statement. Moreover, the researchers concluded that almost students have positive response in learning mathematics by using ICT. On the interview time according to students, most of the students are using YouTube, Google, Wikipedia and mathematical related software like as GeoGebra, Mathematica and etc. for learning mathematics. Mostly students are watching YouTube to get mathematical information and they are also very interested to use ICT in mathematics. However, some students are agreed with it is difficult to use in daily classroom activities and also, they are agreed it work load, expensive and difficult to manage time during 1-hour class time. From the finding it is concluded that ICT helps to decrease the drop out students and it increase the rate of attendance so it is important that ICT should be integrate with mathematics teaching learning activities. Due to positive response towards this study, educators' teachers, and policy maker need to be prepared to explore the learning possibilities of ICT in math education.

## **Recommendation for the Educational Implication**

Since the present study was limited in M.Ed. level within the Kathmandu district, so finding of the study can be generalized for the same district but it can't be generalized to all the level and national wise. Due to the limitation of the study, there were several areas where the researcher suggests some recommendations and education implication.

- Teachers, educators, and policy makers need to be prepared to explore the learning possibilities by ICT in mathematics education.
- Campus should be organized seminars, workshops for effective ICT learning practices.
- Every institute of higher education should be supported to develop as a resource and support center for ICT learning practices in mathematics education.

- Universities should maintain ICT lab and others ICT materials of each classroom.
- Teachers and students should be do well management to use ICT in classroom during 1 hour.
- Mathematics teachers should use ICTs learning materials and it shares with students.
- ICT is very interesting if learners and tutors integrate with teaching and learning of mathematics education. So, government of Nepal should have good policies and curriculum

### **Recommendations for Further Researcher**

This study has not included teachers and parents' viewpoints towards ICT in mathematics learning. Therefore, future research should include other stakeholders, such as teachers, principals and parents. Experimental research can be done to examine the effectiveness of ICT in mathematics. To establish the findings, similar study should be carried out regional and national level. Also find out the effect of ICT in students mathematics education.

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## Appendix-A

### Closed Ended Questionnaire

Name:

Gender:

Level:

Semester:

Note: SA= Strongly Agree, A= Agree, N=Neutral, D=Disagree, SD=Strongly Disagree

Please tick (✓) any one and only one of each row

S. N	Statements	SA	A	N	D	SD
<b>Student Motivation</b>						
1	It makes easy to control the classes.					
2	It helps to decrease the class repetition rate of students.					
3	It helps to increase the attendance rate of students.					
4	Using ICT in teaching mathematics encourage the students self-learning.					
5	It helps to make student more creative					
6	It helps to decrease dropout rate of the students.					
<b>Teaching Learning</b>						
7	I feel confident to study mathematics on the computer.					
8	It clears the concept of 2D and 3D figures, graphs and charts.					
9	ICT makes my lessons easier.					
10	It is easy and effective for mathematical calculation.					

11	ICT makes my lessons more interesting.					
12	It is easy and effective for mathematical visualization.					
<b>Skill Development</b>						
13	It helps to increases my confidence					
14	I enjoy using computers to learn math's.					
15	It enhances my career prospects.					
16	It helps me to discuss learning ideas.					
17	It helps to develop documents, notes assignments etc.					
18	It can change my learning style of mathematics.					
<b>Challenges</b>						
19	It takes more time to use.					
20	It is more expensive for regular use at school and at home.					
21	It increases the work load.					
22	It is difficult to use for each unit of mathematics teaching.					
23	It decreases the students writing speed up.					
24	It doesn't support for book reading skill of students.					
<b>Internet Surfing (Use of internet)</b>						
25	Share information with friends, parents and teachers.					
26	Download and install mathematics related software.					

27	Use of Internet for information.(browsing information)					
28	Download subject related materials.					
29	Watch mathematics related videos on YouTube.					
30	Use of Gmail, Blog, Drive for teaching and learning mathematics.					

## Appendix-B

### Perception of Boy's Students

S. N	Statements (Please tick (√) any one and only one of each row)	Agree	Neutral	Disagree	Total score	Mean score
<b>Students motivation</b>						
1	It makes easy to control the classes.	20	4	6	116	3.86
2	It helps to decrease the class repetition rate of students.	26	2	2	130	4.33
3	It helps to increase the attendance rate of students.	16	4	10	98	3.26
4	Using ICT in teaching mathematics encourage the students self-learning.	26	0	4	133	4.43
5	It helps to make student more creative	18	2	10	111	3.70
6	It helps to decrease dropout rate of the students.	19	6	5	114	3.8
<b>Teaching and learning</b>						
7	I feel confident to study maths on the computer.	15	7	8	102	3.40
8	It clears the concept of 2D and 3D figures, graphs and charts.	19	5	6	117	3.90
9	ICT makes my lessons easier.	15	7	8	97	3.23
10	It is easy and effective for mathematical calculation.	14	2	14	96	3.20
11	ICT makes my lessons more interesting.	25	5	2	141	4.70

12	It is easy and effective for mathematical visualization.	18	5	7	106	3.46
<b>Skill development</b>						
13	It helps to increases my confidence	18	3	6	108	3.60
14	I enjoy using computers to learn math's.	19	3	8	113	3.76
15	It enhances my career prospects.	21	5	4	125	4.16
16	It helps me to discuss learning ideas.	24	3	3	117	3.90
17	It helps to develop documents, notes assignments etc.	16	2	12	95	3.16
18	It can change my learning style of mathematics.	10	3	17	85	2.83
<b>Challenges</b>						
19	It takes more time to use.	14	2	14	95	3.16
20	It is more expensive for regular use at school and at home.	27	3	0	139	4.63
21	It increases the work load.	21	3	6	119	3.96
22	It is difficult to use for each unit of mathematics teaching.	25	1	4	129	4.3
23	It decreases the students writing speed up.	16	4	10	108	3.6
24	It doesn't support for book reading skill of students.	10	0	20	88	2.93
<b>Internet surfing (use of internet)</b>						

25	Share information with friends, parents and teachers.	20	2	8	111	3.7
26	Download and install mathematics related software.	9	6	15	86	2.86
27	Use of Internet for information. (browsing information)	26	2	2	137	4.56
28	Download subject related materials.	24	1	5	125	4.16
29	Watch mathematics related videos on YouTube.	25	1	4	123	4.1
30	Use of Gmail, Blog, Drive for teaching and learning mathematics.	22	3	5	114	3.8

## Appendix C

### Perception of Girl's Students

S. N	Statements (Please tick (✓) any one and only one of each row)	Agree	Neutral	Disagree	Total score	Mean score
<b>Students motivation</b>						
1	It makes easy to control the classes.	16	1	3	79	3.95
2	It helps to decrease the class repetition rate of students.	15	0	5	75	3.75
3	It helps to increase the attendance rate of students.	18	2	0	91	4.55
4	Using ICT in teaching mathematics encourage the students self-learning.	16	0	4	82	4.1
5	It helps to make student more creative	12	3	5	77	3.85
6	It helps to decrease dropout rate of the students.	16	1	3	76	3.8
<b>Teaching learning</b>						
7	I feel confident to study maths on the computer.	12	7	1	80	4
8	It clears the concept of 2D and 3D figures, graphs and charts.	8	5	7	63	3.15
9	ICT makes my lessons easier.	9	2	9	62	3.1
10	It is easy and effective for mathematical calculation.	17	3	0	88	4.4
11	ICT makes my lessons more	17	0	3	87	4.35

	interesting.					
12	It is easy and effective for mathematical visualization.	12	4	4	74	3.7
<b>Skill development</b>						
13	It helps to increase my confidence	13	2	5	77	3.85
14	I enjoy using computers to learn math's.	11	6	3	70	3.5
15	It enhances my career prospects.	13	3	4	79	3.95
16	It helps me to discuss learning ideas.	12	3	5	72	3.6
17	It helps to develop documents, notes assignments etc.	6	3	11	56	2.8
18	It can change my learning style of mathematics.	9	5	6	67	3.35
<b>Challenges</b>						
19	It takes more time to use.	18	2	0	90	4.5
20	It is more expensive for regular use at school and at home.	17	0	3	87	4.35
21	It increases the work load.	15	1	4	82	4.1
22	It is difficult to use for each unit of mathematics teaching.	9	2	9	61	3.05
23	It decreases the students writing speed up.	10	0	10	61	3.05
24	It doesn't support for book reading skill of students.	3	5	12	50	2.5

<b>Use of internet</b>						
25	Share information with friends, parents and teachers.	13	1	6	71	3.55
26	Download and install mathematics related software.	7	3	10	59	2.95
27	Use of Internet for information. (browsing information)	18	0	2	81	4.05
28	Download subject related materials.	17	0	3	84	4.2
29	Watch mathematics related videos on YouTube.	17	1	2	88	4.4
30	Use of Gmail, Blog, Drive for teaching and learning mathematics.	11	3	6	71	3.55

## Appendix- D

### Number of Boys Students

S. N	Statements (Please tick (✓) any one and only one of each row)	S. A	A	N	D	S. D
<b>Students motivation</b>						
1	It makes easy to control the classes.	13	7	4	5	1
2	It helps to decrease the class repetition rate of students.	16	10	0	4	0
3	It helps to increase the attendance rate of students.	9	7	4	3	7
4	Using ICT in teaching mathematics encourage the students self-learning.	22	4	0	3	1
5	It helps to make student more creative	15	3	2	8	2
6	It helps to decrease dropout rate of the students.	13	6	6	2	3
<b>Teaching and learning</b>						
7	I feel confident to study math on the computer.	7	8	7	6	2
8	It clears the concept of 2D and 3D figures, graphs and charts.	14	5	5	6	0
9	ICT makes my lessons easier.	5	10	7	3	5
10	It is easy and effective for mathematical calculation.	9	5	2	11	3
11	ICT makes my lessons more interesting.	22	3	2	3	0
12	It is easy and effective for mathematical	6	12	5	4	3

	visualization.					
<b>Skill development</b>						
13	It helps to increases my confidence	13	5	3	4	2
14	I enjoy using computers to learn maths.	12	7	3	8	0
15	It enhances my career prospects.	18	3	5	4	0
16	It helps me to discuss learning ideas.	7	17	3	2	1
17	It helps to develop documents, notes assignments etc.	6	10	2	7	5
18	It can change my learning style of mathematics.	6	4	3	13	4
<b>Challenges</b>						
19	It takes more time to use.	8	6	2	11	3
20	It is more expensive for regular use at school and at home.	22	5	3	0	0
21	It increases the work load.	14	7	3	6	0
22	It is difficult to use for each unit of mathematics teaching.	19	6	1	3	1
23	It decreases the students writing speed up.	13	3	4	9	1
24	It doesn't support for book reading skill of students.	3	7	0	17	3
<b>Internet surfing</b>						
25	Share information with friends, parents and teachers.	14	6	2	3	5

26	Download and install mathematics related software.	3	6	6	14	1
27	Use of Internet for information. (browsing information)	23	3	2	2	0
28	Download subject related materials.	17	7	3	4	1
29	Watch mathematics related videos on YouTube.	13	12	1	3	1
30	Use of Gmail, Blog, Drive for teaching and learning mathematics.	7	15	3	5	0

## Appendix-E

### Number of Girls students

S. N	Statements (Please tick (√) any one and only one of each row)	S. A	A	N	D	S. D
<b>Students motivation</b>						
1	It makes easy to control the classes.	12	4	1	3	0
2	It helps to decrease the class repetition rate of students.	8	7	0	2	3
3	It helps to increase the attendance rate of students.	13	5	2	0	0
4	Using ICT in teaching mathematics encourage the students self-learning.	11	5	0	3	1
5	It helps to make student more creative	10	2	3	5	0
6	It helps to decrease dropout rate of the students.	3	13	1	3	0
<b>Teaching and learning</b>						
7	I feel confident to study math on the computer.	9	3	7	1	0
8	It clears the concept of 2D and 3D figures, graphs and charts.	3	5	5	6	1
9	ICT makes my lessons easier.	4	5	2	7	2
10	It is easy and effective for mathematical calculation.	11	6	3	0	0
11	ICT makes my lessons more interesting.	15	2	0	1	2
12	It is easy and effective for mathematical visualization.	7	5	4	3	1
<b>Skill development</b>						

13	It helps to increases my confidence	10	3	2	4	1
14	I enjoy using computers to learn math's.	2	9	6	3	0
15	It enhances my career prospects.	11	2	3	2	2
16	It helps me to discuss learning ideas.	5	7	3	5	0
17	It helps to develop documents, notes assignments etc.	1	5	3	11	0
18	It can change my learning style of mathematics.	6	3	5	4	2
<b>Challenges</b>						
19	It takes more time to use.	12	6	2	0	0
20	It is more expensive for regular use at school and at home	13	4	0	3	0
21	It increases the work load.	12	3	1	3	1
22	It is difficult to use for each unit of mathematics teaching.	3	6	2	7	2
23	It decreases the students writing speed up.	3	7	0	8	2
24	It doesn't support for book reading skill of students.	2	1	5	9	3
<b>Internet surfing</b>						
25	Share information with friends, parents and teachers.	6	7	1	4	2
26	Download and install mathematics related software.	3	4	3	9	1
27	Use of Internet for information. (browsing information)	5	13	0	2	0
28	Download subject related materials.	10	7	0	3	0
29	Watch mathematics related videos on YouTube.	13	4	1	2	0

30	Use of Gmail, Blog, Drive for teaching and learning mathematics.	7	4	3	5	1
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## Appendix F

### Comparison of Boys and Girls Students' Perception

Gender	Number of sample students	Number of sample statement	Mean value	Sum of the mean rank	U value	Z value	conclusion
Boys	30	30	30.2666	908	443	0.1034	Z=0.1038<1.6745
Girls	20	30	30.7333	922	457		

Level of significance ( $\alpha$ ) =0.05

Therefore, Critical region: reject  $H_0$  if  $Z > Z_{0.05} = 1.6745$  and Accept  $H_0$  if  $Z < Z_{0.05} = 1.6475$ .

## Appendix G

### Statistical Techniques Used for Data Analysis

1. Mann Whitney test (U-Test)  $U_1 = w_1 - n_1(n_1+1)/2$

$$U_2 = w_2 - n_2(n_2+1)/2 \quad U_1 + U_2 = n_1 \cdot n_2$$

U value = min (U<sub>1</sub>, U<sub>2</sub>) Where,

$n_1 = n_2 =$  sample statements.

$w_1 =$  sum of the rank of mean of boys and  $w_2 =$  sum of the rank of mean of girls

2. Z- Test Statistic

$$Z =$$

$$\mu = n_1 \cdot n_2 / 2$$

$$\sigma^2 = n_1 \cdot n_2 (n_1 + n_2 + 1) / 12 \quad \text{Agree} = \text{strongly agree} + \text{agree}$$

Disagree = strongly disagree + disagree