<center>**Chapter I**</center>

<center>**INTRODUCTION**</center>

Background of the Study

Present era is an era of science and technology and reason as such, as everything is analyzed from scientific and technical point of view. There is great value of mathematics in the modern living in twenty-one century, which has revolutionized our life style and great change in our attitudes, way of thinking and outlook. It has great value of aspect as communication, transportation, agriculture, health, industry, kitchen, environment, etc.

Audio visual resources according to Dike (1989), do not only increase the motivation of the teachers and learners; they add clarity to the topic taught and make learning more interesting. Permanent learning according to Njoku (1980) is the goal of education that the learners should be able to retain about what we taught. Audiovisual materials make learning more permanent since they appeal to more than one sense.

We can learn from test-3%, smell-3%, touch-6%, hearing- 13%, sight-75% and combination of sight and hearing account for 88%. (Poudel, 2016)

Theoretical learning has prevailed, the society for a long time. Children's were lacking behind in terms of audio-visual information. Education system throughout the world1is changing rapidly. With the increasing change, learning process for us has changed drastically. Few years ago, electronic learning was not even an option for schools. However, time has changed. Many schools and colleges in Nepalese context have recently adopted accordingly, learning gradually starts through various animated videos and audios. Therefore, to conducting this research the researcher is going to use the virtual videos which published by NCED. Therefore, the researcher hopes in

addition, it enables teachers to transform traditional chalk and board classroom into an interactive environment.

The study that has concerned with investigating the effect of the use of audiovisual resources on Mathematics teaching in secondary schools in Kathmandu is bound to be of immense benefits to students, teachers, school authorities, educational stakeholders, especially the State Ministries of Education. Specifically, the study would be of immense benefit because it would enhance the learning processes of the students and thereby improve on their overall academic performance, since it would increase the motivation of the students, add clarity to the topics taught, and make learning more interesting.

Currently, Audio Visual Aids (AVA) has a minimal to nonexistent role at secondary school level in Nepal. Lack of both resources and investment are among the reasons; however, a larger problem may be the low priority placed on building an education system which would enable Nepalese young people to function better in the modern world. For example, there was no clear vision regarding the use of AVA in the classroom by either teachers or students. Although the government of Nepal has initiated a school reform project in which AVA assisted and "child-friendly" teaching/learning has encouraged in all schools (Ministry of Education Nepal, 2007), no noticeable implementation is yet evident. Teachers simply do not know how to go about incorporating either of these. Some private secondary schools and some public schools do have computers, and in such settings there were attempts to motivate students to use this advanced technology; however, these efforts were limited in general as they only address students' computer literacy in very basic ways, for example by training them to access the internet, do word processing, and work with spreadsheets. Apart from these few instances, there appears to be little evidence in

Nepal of AVA use in secondary schools for broader educational purposes, nor do teachers appear to have encountered AVA use in subjects such as mathematics. Indeed, there appears to be little or no encouragement of students to explore concepts that they are expected to know or to enable them to do so in a digital environment. For the continue this practice NCED starts virtual classed systematically with 100 selected government secondary school of 75 districts for six compulsory subjects to focus the SEE exam. NCED brocast 3/3 compulsory subject in every day alternatively for selected government secondary school.

Statement of the Problems

Problem of this study is mainly concerned with effectiveness of Audio - visual aids on Mathematics teaching at secondary level students of Kathmandu district. Thus, this study attempts to seek the answer of the following questions:

❖ Is there any effectiveness of Audio - visual aids in teaching mathematics at secondary level?

❖ What types of challenges were arises while using audiovisual resources on Mathematics teaching and learning?

Significance of the Study

Every research is important in itself because it unfolds various unseen facts in any area of study. Specially, in the process of teaching, teacher is as profession and teaching is an art. Moreover, teaching is skilful occupation. Instead of this, mathematics is own self a scientific and logical subject. The objects of mathematics are the cultural products, facts skills, concepts, and principles. Audio visual aids were devices that help the teacher to clarify, establish, correlate and co-ordinate accurate concepts, interpretations and appreciations and enable him to make learning more concrete, effective, interesting, inspirational, meaningful and vivid. They help in

promoting the triangular process in learning is motivation, clarification and stimulation. The aids are the stimuli for learning 'why', 'how', 'when' and 'where'. The existing curriculum of mathematics is a rote-oriented program. According to Gandhiji "true education of an intellect can only come through a proper exercise and training of bodily organs, hands, feet, ears and nose Therefore, researcher has to suggest the effective approach, or method as well as material for teachers through research. Instructional materials play an important role in making meaningful learning on teaching and learning of mathematics but most of the mathematics teachers still follow traditional way, without using materials. Here is a lack of adequate number of experimental studies related to effectiveness of audio-visual aids on mathematics teaching. Therefore, the problems of efficiency dropout and failure of students in school are considerably high in mathematics. This studied will have given an evidence of the effectiveness of audio-visual aids in teaching Mathematics at secondary level. The significances of these studies are as follows:

➢ This study would help to find out the effectiveness of visual materials in teaching Mathematics.

➢ This study would help to compare the achievement of students taught by using audio-visual aids on experiment and control group in mathematics.

➢ This study that is concerned with investigating the effect of the use of audio-visual aids on mathematics teaching at secondary schools in Kathmandu bound would be of immense benefits to students, teachers, school authorities, educational stakeholders, secondary curriculum designer, especially the State Ministries of Education.

➢ It helps to find out the challenges while using audio-visual aids on mathematics teaching at public secondary school.

Objective of the Study

The objectives of the present study were as follows:

- To compare the achievement of students taught by using audio - visual aids and without audio - visual aids.

- To find out the challenges while using the audio-visual aids in mathematics teaching.

Hypothesis of the Study

Research hypothesis

The audio visual aids enriched mathematics instruction yields effective result in terms of the achievement of mathematics then the achievement of the students taught without using audio visual aids.

Statistical hypothesis

Formulation of null and alternative hypothesis was:

H_0: The average achievement of the students at mathematics of experimental group does not differ to the average achievement of the students at mathematics of control group on post-test, i.e. $\mu_1 = \mu_2$

H_1: The average achievement of the students at mathematics of experimental group is higher than the average achievement of the students at mathematics of control groups on post-test i.e. $\mu_1 > \mu_2$

Delimitation of the Study

The present study has based on:

- The study was limited two schools of Kathmandu district.

- From the total school of Kathmandu district, two schools were selected by adopting purposive sampling method and researcher was selected the students of grade X, mathematics teacher and head teacher of selected school as sample study.

➢ The design of this study was experimental.

➢ The study was concerned only at the selected lesson of grade X mathematics curriculum.

Definition of Related Terms

Audio visual aids

The teaching aids that use a sense of vision refer to audio - visual aids. In this research videos of NCED published in their website is audio visual aid.

Effectiveness

The magnitude of the score obtained by the experimental and control group in the Mathematics achievement test.

Achievement

In this research, achievement means score obtained by the students on the achievement test prepared by the researcher.

Experimental group

A group of students to whom researcher teaches the lesson using audio- visual aids is termed experimental group.

Control group

A group of students to whom researcher teaches the same lesson without using audio-visual aid is control group.

Secondary school

Grade X conducting school is referring to secondary school.

Instructional materials

Anything audible or visible this helps student learners the language more quickly or more accurately is instructional materials.

Technology

In this respect the audio visual aids is an important scaffold to bridge the ZPD.

Chapter II

REVIEW OF RELATED LITERATURE

The literature review is an integral part of the research process and makes a valuable contribution to almost every operational step. It has been the value even before the first step: that is, when you are merely thinking about a research question that you may want to find answers to through journey. According to Pokharel. Research has a formal and systematic structure, which generates appropriate norms for evaluating its outcomes. In this connection, a review of previous related research would help the research to formulate a satisfactory structure for his research. (Pokharel, 2006)

The literature review provides the basic information about the study related with present research and it helps to remove the unnecessary duplications. Audio - visual aids play a vital role in an instructional program as learning is based primarily on sensory experienced and teaching materials provide visual and sensory experiences for the students.

Empirical Literature

Yadav (2042), did a research work on "a study on the use of audio - visual aids in the instruction of mathematics in the primary schools of Dhanusha district". The study adopted a survey design aimed to find the instructional materials which used for teaching learning activities. He concluded that the trained teacher used teaching aid more frequently than the untrained ones and more than 80% schools lacked the essential teaching aids such as geo board, geometric and cubic square models etc. He further concluded that in 30% of the schools even the available materials are not used.

Jaishi (2009), did a research work on "the effectiveness of radio and television in mathematics result of SLC exam". The study adopted an experimental design aimed to compare the mathematics result of SLC exam before and after the Radio and Television programs were initiated and to find out the effectiveness of Radio and Television in mathematics result of SLC exam. He did this study in Kailali district, 30 students from 3 schools at the rate of 10 students from each school that involved the students in the large number in the SLC exam of 2064, three teachers from each school who are from mathematics subject as the sample. This study was based on qualitative and quantitative method due to the data are collected through the students questionnaire, teacher and DEO interview, instrument of primary information collection and mark ledger of SLC exam and through subsidiary instrument of information. The researcher concluded that the using radio and television cause better achievement in mathematics result of SLC exam.

Karki (2010), did a research on the topic "a study on the effectiveness of instructional materials in teaching geometry at grade X". The study adopted an experimental design aimed to find the effectiveness of instructional materials in teaching geometry at grade X from Bhaktapur district. From one school 40 students from grade 'X' had selected for sample of the study. For the result he used t-test. He found that the mean achievement score of students taught with using different instructional materials is higher than the mean score achievement score of students taught without using different instructional materials. Therefore, geometry teaching by the using different instructional materials causes better achievement than the teaching without using instructional materials.

Murtaza (2011), did a research on "effects of audiovisual aids in student learning at secondary levels in Rawalpindi." The study adopted experimental design

aimed to find out the effects of audio visual aids on students learning at secondary level. This study provides basic and comprehensive information to assist you in developing effective communication among teachers and students. The use of audio visual aids can create a lot of interest and make teaching- learning process more effective when these are coupled with good public speaking skills. The study puts emphasis to use audio visual aids frequently while teaching the students. No doubt, speaking style and stage presence of teachers are personal talents but these can be refined with much practice and experience and by using the audio visual aids quite often while teaching. In this study much emphasis is given to visual aids which are essential to all successful presentations. All the students studying in the secondary schools of district Rawalpindi constituted the population of the study. Data collecting instrument was objective type test. The collected data was tabulated, analyzed and interpreted by using correlation method. The researcher concluded that use of audio visual aids is more effective than usual.

Elijah (2014), carried out a research on titled "impact of audio-visual resources on teaching and learning in some selected private secondary in Makurdia." The study adopted a survey design aimed at investigating the extent to which audio-visual resources had used in teaching and learning and their impact on teaching and learning in some selected private secondary schools in Makurdi metropolis. Two research questions were stated and subsumed in a hypothesis. The review of related literature hinged on the clarification of conceptual underpinnings surrounding the study of audiovisual resources, while empirical studies on the area had also reviewed. One hundred and twenty respondents participated in the study. The instrument for data collection was questionnaire. Data collected had analyzed using simple percentages and frequencies while the hypothesis was tested using t-test statistics

technique at (0.05) level of Significance. The result revealed that the use of audiovisual resources have significant impact on the teaching and learning in secondary schools.

Therefore, a number of researches mentioned above carried out different researches, website, and book written different scholars have directly or indirectly highlighted with the importance of the teaching materials. This study is certainly different from the other studies. This study will show the effectiveness of audio-visual aids on Mathematics teaching in the context of Nepal. In my research work, the researcher will try to find out the effectiveness of audio-visual aids on Mathematics teaching at secondary level.

Theoretical Literature

The theoretical perspective of this study was the David's Kolb's experimental learning style theory and John Deway project method. The researcher discussed the theoretical review for the study that would support the significance of the effectiveness of audio visual aids in teaching mathematics at grade X. That is socio-economic status, school environment and home environment, teaching learning styles, parents' education and other more effectiveness of audio visual aids on teaching mathematics at grade X. There are many learning theories which can be used for the analysis and interpretation of data such as sociological theories, cultural theories, everyday life theories and constructivist theory and so on. So for analysis and interpretation of data the researcher used David Kolb's experimental learning style theory and John Dewey's project method.

David Kolb's experimental learning style theory

Kolb explains that different people naturally prefer a certain learning style. Various factors influence a person's preferred style. For example, social environment,

educational experiences or the basic cognitive structure of the individual. Kolb's theory of learning, which is also called experimental learning theory, emerges as a result of the influences between the individual and his surroundings. And it continues as a cycle created by experiences from the concrete to the abstract, by observation and reflection and by implication and behaviors. So, the reason Kolb referred to this theory as the "experimental learning theory" is because experience is the source of learning and development. Learning is the process of the knowledge and concepts that emerges as result of the transformation of experience, then reorganizing and restructuring cognitive structures according to this new knowledge and finally preparing the ground for new concrete and abstract experiences.

According to Kolb, there are six basic principles of experimental learning theory, which are as follows:

- Learning is not a result or a product but a process.

- Learning is an uninterrupted process based on experiences.

- Learning requires a resolution between forms of accordance to the world that are dialectically country to one another.

- Learning is a holistic process of accordance to the world.

- Learning includes the interaction between an individual and his surroundings.

- Learning is the process by which knowledge is created as a result of interaction between social knowledge and personal knowledge.

Kolb's theory describes learning as the amalgamation of experiences, knowledge, perception and behavior. New knowledge, skills or approaches can occur by existing within four type of experience based learning. Students require four different abilities or learning stages in order to learn effectively. These abilities are;

concrete experience based on feeling, reflective observation based on watching, abstract conceptualization based on thinking, Active experimentation based on doing or living. And these abilities or stages forms four individual learning styles as diverges, assimilations, converges and accommodators.
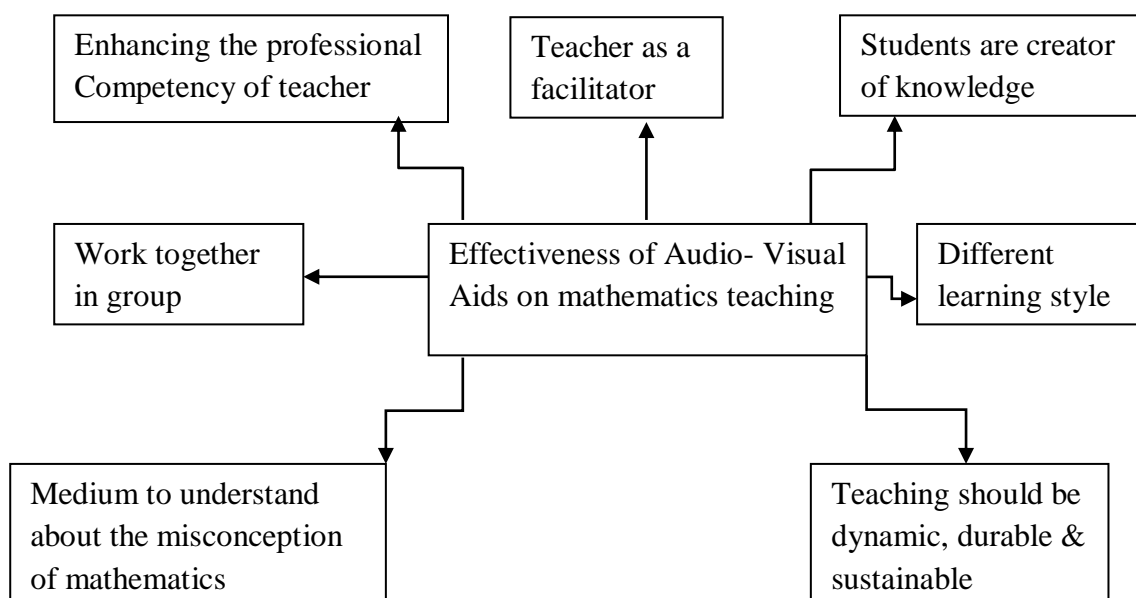
John Dewey's Project Method

John Dewey was the creator of the project method, a method that encourages students to work together in groups and to figure out the solutions to different problems that may arise as they continue to complete the assigned project (Dewey, 1916). John Dewey and Jean Piaget are the leading progressive education theorists of the last century. Dewey (1916) stated that the project method is a method of discovery and proof in so much as "all thinking results in knowledge, ultimately the value of knowledge is sub ordinate to its use in thinking". The way that we interpret things is the eye that we see them through. Dewey thought that the student is dynamically involved in the learning that is going on around him/her, and the instructor should only be considered a director of the learning and not an actor (Joyce, Weil, & Calhoun, 2002).

The above research review related to effectiveness of instructional and visual materials on teaching shows that when we apply this to classroom teaching, audio-visual aid play an important role in concept formation and therefore in permanent learning. If we see teaching of mathematics in school of our country, mostly we will find teachers lecturing or even reading out from the books and explaining few things on the blackboard. Some teachers use some demonstrations, charts and models but not very frequently and many a times students memorize things without understanding. Audio - visual aids if, properly used help in teaching learning process in many ways and can ensure quick and effective learning.

Conceptual Framework

The conceptual framework is the key design of the basic concept of the research. Here audio visual aids plays vital role in teaching process. Audio visual aids encourages the students to try their best, repeat the task and regain the reward, regular performance in classroom, to make the clear concept of mathematics abstract, pay attention and learn better and finally increases the learning ability. This study had based experimental learning theory to investigate the how audio visual aids assisted instruction was used by both students and teachers to co-engage creating meaning from course content. The conceptual framework links audio visual aids assisted learning to student's motivation and instructional design.

Figure 1: Conceptual framework

```
┌──────────────────────┐    ┌──────────────┐    ┌──────────────────┐
│ Enhancing the        │    │ Teacher as a │    │ Students are     │
│ professional         │    │ facilitator  │    │ creator of       │
│ Competency of teacher│    │              │    │ knowledge        │
└──────────────────────┘    └──────────────┘    └──────────────────┘
         ↑                        ↑                     ↑
┌──────────────┐    ┌──────────────────────────┐    ┌──────────────┐
│ Work together│ ←  │ Effectiveness of Audio-  │ →  │ Different     │
│ in group     │    │ Visual Aids on           │    │ learning     │
│              │    │ mathematics teaching     │    │ style        │
└──────────────┘    └──────────────────────────┘    └──────────────┘
         ↓                                               ↓
┌─────────────────────┐                     ┌──────────────────────┐
│ Medium to understand│                     │ Teaching should be   │
│ about the           │                     │ dynamic, durable &   │
│ misconception       │                     │ sustainable          │
│ of mathematics      │                     │                      │
└─────────────────────┘                     └──────────────────────┘
```

(Source: Murtaza, 2011)

In the field of education, the student lies at center. The goal of this discussion was to assist teacher in thinking about how to motivate students using audio visual aids. In focusing on student as center, experimental learning theory can be used by teachers to inform the instructional design process. Incorporating audio visual aids into instructional design was the specific strategy posed by this discussion. Therefore,

student's motivation is major issue faced by educators in the teaching learning activities. In this study, AVA was introduced as a scaffold to bridge the ZPD.

The above illustrated figures indicate the whole research study is based on this conceptual framework. The mathematics teachers have been facing problem by creating above stated ingredients. The study identified and analyzed what is the challenge that arise problems in using audio visual aids in teaching mathematics. The researcher identified and analyzed by the using of questionnaire, interview and class observation form with the based on framework. Thereafter, has cross –matched the collected information with specific problems that yielded the basic ideas about creates the problems as well as discoursed with sampled teachers, students, parents about ways of solution of challenges. Finally, introduced the solution by this way with based on frame work.

Chapter III

METHODS AND PROCEDURES

Research methods and the procedure are very important part of the research. Tools and the techniques applied in the research process are called methods. The research methods are the procedures that researcher followed order to collect data and analysis the data.

The aim of this study was to find out the effectiveness of the audio visual aids in teaching mathematics a secondary level. The method used for this study was experimental study design. The chapter describes the design of the study, population and sample of the study, data collection procedure and data analysis process. The major procedures of this study were described as follows:

Design of the Study

This was experimental study. Having two groups one is experimental and another control group. The researcher taught experimental group using audio visual aids and on the other hand control group was taught without using audio visual aids. The pre test, post test and the non equivalent group design was adopted for the study. The independent variable was the treatment and the dependent variable was achievement of the students. The design of this study was as follows:

Table 3.1: Design of the Study

Groups	Pre-tests	Treatment	Post-tests
Experimental	O_1	X	O_2
Control	O_3	-	O_4

At the process of selecting the experimental and control group no randomization has used. This design is the most effective to minimize the treats to external validity. Two groups have made homogeneous as possible as by selecting

school of similar status with respect to physical facilities and as per as possible group has made with focusing same cognitive structure of students.

In this design, O_1 and O_3 represent the pre-test for experimental group and control group, while, O_2 and O_4 represent the post-test for experimental group and control group, X represent use audio visual aids. Both groups are given the same pre-tests after being exposed to one of the teaching methods. Pre-test has used to assess similarities between groups. The researcher has implemented AVA in the treatment group and the traditional methods of teaching in the control group. After taking post test to compare effectiveness of AVA, perception test has imposed to the students for measuring perception towards AVA in mathematics. All students of grade X of Kirtipur secondary school, Kirtipur taken as experimental group and all students of grade X of Shree Bishwo rastriya secondary school, Kirtipur taken as control groups. The researcher taught the students of experimental group by audio visual aids and the control group as usual.

Population of the Study

The population of this study was all the students of grade X in Kathmandu districts. And the sample for the study was determined from the population. The researcher took only two public schools namely Kirtipur secondary school and Shree Bishwo Rastriya secondary school to fulfill the motto of this study, selecting them by purposive sampling technique. All together 39 students from two selected schools of grade X as a sample of the study. The experimental and control group was determined by tossing a coin.

Source of Data

The two main sources of data in social mathematics research are people and paper. The responses to questions put to people constitute the major sources of data in

social research. These sources refer to the primary sources of data. A large amount of data is already available in the forms of paper sources. This includes documents, historical records, diaries, biographies, statistical records and the like. The paper sources have commonly known as secondary sources of data (Pokharel, 2006). In this research study, the researcher was used both the primary and secondary sources for the collection of data. The sources are as follows:

Primary source of data

The primary source of data for this study was achievement test obtained by the students in pre- test and post-test on the experiment. Similarly, the data collected from each selected mathematics teacher and head teacher of these schools through unstructured questionnaire were taken as a primary source of data.

Secondary sources of data

The secondary data was obtained from the review of various related books, document, website, national and journal, forum and unpublished master's thesis etc.

Variables of the Study

Independent variable

The independent variables are the conditions or characteristics that the experimenter manipulates or controls in his or her attempt to ascertain their relationship to observed phenomena. In this study audio visual aid was independent variable.

Dependent variable

The dependent variables are the conditions or characteristics that appear, disappear or change as the experimenter introduces, removes or changes independent variables (Best & Khan, 2009). In this study student's achievement in mathematics was dependent variables.

Extraneous variables

Extraneous variables are those uncontrolled variables (i.e., variables not manipulated by the experimenter) that may have a significant influence on the results of a study. Many research conclusions are questionable because of the influence of these extraneous variables.

Some major affecting variable controlled in the experiment

In my present research work, some non experimental variables such as teacher variables, subject matter, teaching aids, length of experiment, evaluation applied to students and school environment and group formation were controlled in order to minimize the effect on dependent variables. Since the experiment was conducted in one school, grade X students were taught by selected in naturally assembled class so that there was no artificiality constructed. Students were taught some topic of mensuration, circle and trigonometry in both groups by giving equal time. To control the influence such type of variables following exercise were done.

Evaluation applied: In this research work, after the end of experiment same test was given to evaluate the students of control and experimental groups.

Selection of school: Such two schools were selected in sample which is similar in socio-economic status, facilities and result of students.

Teacher: To control the teacher variables as behavior, personality, emotion and qualification, the researcher himself taught both the experimental and control groups.

Students: Students having the age betweens 13-18 & not having the regular extra class (tuition) of mathematics was selected in the sample.

Subject matter: Some contents were taught to the both the experimental and control groups from the same text book presented by government of Nepal.

Equivalence of the groups: Experimental and control group of students was made comparable using their score on the pre-test, as mentioned above.

Length of the experiment: Researcher had provided equal time duration (one month) to teach both experimental and control group.

Test: Same test paper was conducted for the both group after the time of experimentation.

Scoring: Researcher himself give the score of students in text paper appeared by the students of both group.

Module: To conduct the experiment, the researcher was developed a daily teaching module for the same topic of mensuration, circle and trigonometry.

Some uncontrollable affecting variable in the experiment

Student's labor: Students may labor more or less than expected by the researcher & self study of the students may affect in the result of research which is out of control.

Student's home environment: Student's home environment has great effect on student's behavior and attitude but it cannot be controlled by the researcher.

Experimental Validity Treats

Every researcher attempts to achieve maximum validity in his/her research work. To make a significant contribution to the development of knowledge, an experiment must be valid (Best & Khan, 2009). There are two types of experimental validity which are following discussed:

Internal validity

An experimental has internal validity to the extent that the independent variables have been manipulated actually have genuine effect on the dependent variables. Many factors play key role to decrease effect of manipulated variables upon

independent variables. Effects of controlling such type of variables ways are following discuss:

History

Events outside of the study experiment or between repeated measures of the dependent variable may affect participants' responses to experimental procedures. Often, these are large scale events (natural disaster, political change, etc.) that affect participants' attitudes and behaviors such that it becomes impossible to determine whether any change on the dependent measures is due to the independent variable, or the historical event. But in this present study was done in one month of time so these treat no more effect in my research.

Subject characteristics

First of all, subject characteristics are one of the possible threats to internal validity in the present study. The characteristics of subjects which might affect the internal validity were students' ages. Students who participated in the present study were at the same grade level, so their ages were close to each other. So, these characteristics did not influence the results accidentally.

Selection bias

Selection bias which is likely to affect the internal validity results when the researcher makes a comparison between the non-equivalent experimental and control group. It is another treat to the experiment. But in this study, the equivalency of two groups at the beginning of this study was censured by the analysis of pretest result.

Experimental mortality

Experimental mortality means the loss of subjects during the period of experimentation. But here, no participant of the experimental and the control group

lost during the experiment. There were same number of respondent in the pre-test and post-test both groups.

External validity

External validity is the extent to which the variable relationship can be generalized to other treatment variables, other measurement variables and other populations (Best and Khan, 2009). The possible factors that affect the external validity and their controls are discussed as below:

Artificial situation of the experiment

The researcher tries his/her best to control all extraneous variables so that they may produce any experimental change. As a consequence of this effort, the experimental situation becomes more artificial and less resembles the life situation regarding which generalizations are to be made. But to control such problem the groups were formed in the naturally assembled class.

Interaction effect of testing

The use of a pretest at the beginning of a study may sensitize individuals by making them more aware of concealed purposes of the researcher and may serve as a stimulus to change. The study was doing short period of time as well as the researcher made question structure of pre and post-test differ.

Tools for Data Collection

In this research the researcher himself was visit the related schools to collect the data and information related to the study. If necessary, the researcher made a set or some sets of questionnaire to get the information on various variables as given in the index. The instrument has been used in this study is the achievement tests; pre-achievement test and post- achievement test and also a set of questionnaire. The

achievement tests used to compare what they knew before in a pre-performance test and what have they experienced in the post- achievement test.

Achievement Test

The main purpose to use this tool was to find out the effectiveness of audio-visual aids in mathematics teaching. The main tools for the data collection were the test items used for both groups during the research study. For that, the researcher was constructed different level (knowledge, skill, and problem solving) of test item, based on prescribed curriculum and textbook of grade ten. These models of test items are presented in Appendix 'B'. Specifically this tool was used for collection of quantitative data.

Unstructured Questionnaire

To find out the challenges of audio-visual aids in mathematics teaching at secondary level. The researcher prepared and administered unstructured questionnaire for mathematics teacher and head teacher in the sample schools. And the researcher made 2 unstructured questionnaires for two schools head teachers and 2 unstructured questionnaires for two mathematics teachers. The format of unstructured questionnaire of math teacher and head teacher is presented in Appendix 'G' and Appendix 'H'. This tool was used to collect the data for qualitative purpose.

Interview schedule

Interview is a kind of widely used data collection method of educational research. It is also a kind of oral questionnaire, which helps us to understand participant's perception, reactions, views and his/her facial expression about the particular real situation. Researcher constructed an interview schedule with mathematics teachers and students including such elements as achievement of

students, persistence, engagement, relevant activities and feedback of students and teachers.

Pilot test and item analysis

It is necessary to pilot a test before it is finally administered. It is not known what answer will be elicited by a question or a task unless it is tried out before hand. Pilot testing is necessary to be sure; that the test does what it is intended to do. Pilot testing is also to know how difficult a task or a question is. Furthermore, it is also necessary to pilot a test to know whether an item really works or not. To check what is intended and what happens in real sense piloting is necessary (Kumar, 2012). An item analysis carried out for test improvement by identifying the too easy or too difficult items based on pilot study. It is a process which examines student's responses to individual test items in order to assess the quality of these items and of the test as a whole. Item analysis is the process of collecting, summarizing and using information from students' responses to assess the quality of test items, Difficulty index (P) and discrimination index (D) are two parameters which help to evaluate the standard of a test. The researcher conducted the test among 20 students of Shree Bishwo rastriya secondary school, Kirtipur and 19 students of Kirtipur secondary school, Kirtipur. For each test item, the correct answer was given '1' (one) mark and wrong answer was given '0' (zero) marks. Then the difficulty level (P) and discrimination index (D) of test items were calculated. The difficulty level ranging between 30% and 70% was considered acceptable and the discriminating indexes (D) above 0.20 to 0.80 were considered acceptable (Jabara, 2068). Thus, based on these P-value and D-value for achievement test, I have prepared 30 questions. Out of these questions, only 20 appropriate test items were selected. These test items were used to administer in the achievement test. The table of the test item analysis has been mentioned in the

Appendix 'J'. The formula used for the calculating P-value and D-value were given below.

Difficulty Level (P) $= \dfrac{\text{No.of students getting correct answer}}{\text{Total no.of students participate in the item analysis}} \times 100$

$$P = \frac{R}{N} \times 100$$

Discriminating Index (D.I) $= \dfrac{R_u - R_l}{\dfrac{N}{2}}$

Here,

$R_u =$ Number of students in upper group giving right answer

$R_l =$ Number of students in lower group giving right answer

$N =$ No. of students participate in the achievement test

Stages of Experiment

There are three stage of experiment during this research work, namely pre experimental stage, experimental sage and post experimental stage, which are given below:

Pre experimental stage

The researcher identified two non equivalent groups of students. The achievement test paper-I was administered on the students of grade X of both school. The time allocated to complete the test was 20 items. The score of these students were tabulated and mean, variance calculated by using statistical formula. The calculation formula given in the Appendix E. In this study, audio visual aid was independent variable and student's achievement in mathematics was dependent variable.

Experimental stage

The researcher took students of grade X of Kirtipur secondary school as for experiment. During this period, the researcher prepared six videos on the different topics of three chapters: Mensuration, circle and trigonometry and the students should be taught by using the videos at the class time duration. After a month posttest was

administered on the both groups. The post test contains same test item that were used previously in pre test. But serial number of some item was interchanged. The duration of test was same as pre test. The score of this student were tabulated and their mean and variance were calculated by using statistical formula given in Appendix F. And for descriptive data the researcher took unstructured questionnaire, interview schedule for head teacher and math teacher.

Post experimental stage

In this stage researcher compare the obtained marks of students in experimental and pre experimental period. After that, analyze of data from using mean, standard deviation, t-test and the qualitative data were analyzed by suing conceptual framework. At last researcher prepared the result, conclusion and recommendation of this research.

Data Collection Procedure

For the research work, first, researcher prepared a set of tools for research work then researcher went to the field and got permission from the respected authority to consult with the mathematics teachers. Researcher built rapport with the respondents and explained them about the purpose. Then after the researcher distributed the students in different two groups for the purpose of quantitative study i.e., controlled group and experimental group with the help of tossing a coin. A pre-test administered to determine the proficiency level of students in the selected topic before treatment. Both groups taught the same lesson by the researcher with the help of respective mathematics teacher. The control groups were taught by using conventional method and experimental groups by using interactive audio-visual materials. Out of two schools of Kathmandu district, the researcher used experimental research in one school for a month and teaching control group in other school for a

month. Each group was taught only 45 min in a day during a month with teaching plan. At the end of every teaching learning session of the selected lessons the students of experimental and controlled group were administer the same standardized achievement test i.e., post-test. The result obtained from pre-test and post-test of both group were compare and analyzed with the help of statistical devices then determine the relative effectiveness of the use of interactive audio-visual aid in mathematics teaching of the selected teaching lessons at secondary level, grade X. Similarly, for the collection of qualitative data the researcher distributed the unstructured questionnaire to the mathematics teacher and head teacher of different two schools. Finally, the researcher interpreted and triangulated the data based on literature review, theoretical review and the data collected from unstructured questionnaire conducted over the selected schools mathematics teacher.

Data Analysis Procedure

The data analysis for this research was done by quantitatively as well as qualitatively with the help of both descriptive and inferential statistics. Thus, achievement test scores have been analyzed using inferential statistics. After collecting the necessary data, the researcher used the mean, standard deviation and variance were calculated for both the groups with their secured mark in the test. After that, t-test for the independent samples was used 0.05 level of significance to determine the significant difference between students achievement taught by using experimental approach and traditional approach of teaching. Before the treatment was given these two groups were given an achievement tests O_1 and O_3. In this design the experimental groups received the experimental treatment till one month. But the control groups were taught by traditional method. Finally, both groups were given achievement tests O_2 and O_4 on the same test paper, which has already been used in

the pretest. After taking pilot study researcher refined the achievement test papers. By using achievement test paper-1, the mean, variance and standard deviation of the scores were found for both experimental and control groups. These mean difference and standard deviation were compared with the help of the test statistics formula. For the challenges using Audio visual aids to analyze by unstructured questionnaire, interview schedule for head teacher, mathematics teacher and related students of selected schools. To collect the data for head teacher, mathematics teacher and students by different tools after that triangulate the data for analysis which was shown in chapter fourth.

Mainly, data were analyzed according to the categories of students, math teachers and head teachers. Those different themes such a career choice of students. After that similar themes/concepts of the respondents were explained and analyzed qualitatively/descriptively by using survey design. The qualitative data were analyzed by using conceptual framework of this study.

Chapter IV

ANALYSIS AND INTERPRRETATION OF DATA

The present study entitled "Effectiveness of audio – visual aids on

mathematics teaching at secondary level of grade X is quan – qual in nature. So that,

this chapter deals with the analysis and interpretation of collected data by using

quantitative and qualitative tools. Hence, the collected quantitative data were analyzed

and interpreted in term of statistical devices like mean, standard deviation, variance

and two tailed t-test. The mean differences between experimental and control group

were computed by adopting two tail at 0.05 level of significance but the difficulties or

challenges faced by teacher while using audio – visual aids was analyzed from the

unstructured questionnaire conducted over the selected school mathematics teacher

and head teacher in term of descriptive way.

Result of Pre-Test

The pre-test of total mean score, standard deviation, variance, and *t-* value of

score obtained by experimental and control group of two schools have been given as

below.

Table No. 2: Result of pre-test

Group	Sample size	Mean	S.D.	Variance	t-value	Remarks
Control group	20	12.25	2.55	6.5	0.01	0.01<2.021
Experimental group	19	12.26	2.51	6.3		

Degree of freedom (*df)*$_{37}$,t= 2.021

The above table shows that, the number of students in control group and

experimental group were 20 and 19 respectively. In pre-test total, mean score of the

control groups and experimental groups were 12.25 and 12.26 respectively. The

calculated standard deviation for control and experimental group were 2.55 and 2.51

respectively. Similarly, the variance of experimental group was 6.3 and control group

was 6.5. The calculated t-value (0.01) at degree of freedom 37 was less than the tabulated value (2.021). Thus, the difference in mean score of experimental and control group on pre-test score was found to be insignificant at 0.05 levels with degree of freedom at 37.

The total mean score, standard deviation, and variance of both groups were found to be approximately equal. It means the divided two groups (experimental and control group) were equivalent or homogeneous in nature before using treatment. Similarly, the calculated t-value of total pre-test result show that, the null hypothesis was accepted and alternative hypothesis was rejected. Thus, the students of experimental and control group were equivalent in the understanding of teaching lesson before the experimentation.

Result of Post-Test

The post-test of total mean score, standard deviation, variance, and *t*- value of score obtained by experimental and control group of two schools have been given as below.

Table No. 3: Result of post-test

Group	Sample size	Mean	S.D.	Variance	*t*-value	Remarks
Control group	20	14.15	1.63	2.66	3	3>2.021
Experimental group	19	16.16	2.52	6.35		

Degree of freedom (*df)*$_{37,}$t= 2.021

This table shows the number of students were 20 and 19. The mean score of the students in control group and experimental group were found to be 14.15 and 16.16 respectively. The standard deviation of the students in control and experimental groups were 1.63 and 2.52 respectively. Similarly, the variance of students of control and experimental group were 2.66 and 6.35. The calculated *t*-value was 3 at 0.05, level of significance with 37 degree of freedom. From above data it shows that, the

calculated *t*-value (3) was greater than the tabulated *t*-value 2.021. Thus, there is significant difference between experimental and control group due to experimental treatment provided to that of experimental group and conventional treatment for the control group. Hence, the null hypothesis was rejected and the alternative hypothesis was accepted. It concludes that the achievement of experimental group was significantly better than the control group.

Therefore, the researcher analyzed that the audio-visual aids plays the vital role in teaching learning activities because with the help of audio-visual aids learners can get chance to see as well as hear from which they can learn many more.

Effectiveness of Audio – Visual Aids

To find out differences, the researcher used both the methods i.e., conventional method and experimental method, both of these methods were used for treatment to find out more effectiveness of audio- visual aids. To find out which method is more effective the researcher has used this produce comparatively. By doing comparative analysis of pre-test and post-test result, the researcher would find out the better one. Result of pre-test and post-test are compared under the following sub headings.

Scores in mathematics teaching obtained by control group

The pre-test and post-test mean score, standard deviation, variance and corresponding t-value obtained by control group of students has been given below.

Table No. 4: Scores in mathematics teaching obtained by control group

Group	Sample size	Mean	S.D.	Variance	*t*-value	Remarks
Pre test	20	12.25	2.55	6.5	2.79	2.79>2.021
Post test	20	14.15	1.63	2.66		

Degree of freedom (*df*) $_{38,}$ t = 2.021

The above table shows, the pre-test and post-test mean score of students in control group (taught without using audio- visual aids) were found to be 12.25 and 14.15 respectively. The standard deviation and variance were 2.55, 6.5 for pre-test, 1.63 and 2.66 for post-test. The calculated *t*-value was found to be 2.79, which was greater than tabulated *t*-value (2.021) at 0.05 level of significance with degree of freedom 38. It shows that, there is a significance difference between two mean achievement score in pre-test and post-test.

Hence, the null hypothesis was rejected and the alternative hypothesis was accepted i.e., there is a significant difference between pre-test and post-test was slightly increased in the absence of interactive audio visual aids than pre-test.

Scores in mathematics teaching obtained by experimental group

The pre-test and post-test mean score, standard deviation, variance and corresponding t-value obtained by experimental group of students has been given below.

Table No. 5: Scores in mathematics teaching obtained by experimental group

Group	Sample size	Mean	S.D.	Variance	t-value	Remarks
Pre-test	19	12.26	2.51	6.3	4.81	4.81>2.021
Post-test	19	16.16	2.52	6.35		

Degree of freedom (df)$_{36}$ t = 2.021

The above table shows the comparative study of the pre-test and post test result of the students. The number of students involved in pre-test and post-test were nineteen. The mean score obtained in pre-test was 12.26 and post-test was 16.16. The standard deviation and variance of the scores obtained in pre-test were 2.51 and 6.3 respectively. Similarly, the standard deviation and variance of the scores obtained in post-test were 2.52 and 6.35 respectively. The calculated t-value was 4.81 in two-

tailed test at 0.05 level of significance with degree of freedom 36, which was greater than the tabulated t-value.

Hence, the null hypothesis was rejected and alternative hypothesis was accepted. It has concluded that the pre-test and post-test achievement of experimental was significantly better than the control group. So that, the researcher concluded that the audio-visual aids plays the vital role in teaching learning activities because with the help of audio-visual aids learners can get chance to see as well as hear from which they can learn many more.

Challenges of using the audio-visual aids in mathematics teaching.

This study also focused on the challenges while using audio-visual in mathematics teaching at secondary level in Kathmandu district. To conduct this study the researcher has prepared different unstructured questions for the mathematics teachers and head teacher. All the questions were related to teaching aids to find out the challenges for using it. Although, the interactive audio-visual aids easy to use, difficulties occur when teacher use it. In the content of my research area and the answer of respondent mathematics teacher, there had been different kinds of challenging factors or difficulties while using audio-visual aid in mathematics teaching. These challenges were due to many reasons. These reasons were like teachers lack of computer competency, physical infrastructure and economical aspect of school, community around the school, policy of government, proper available of audio- visual materials, management of school and the number of students in the classroom. Here, the researcher had tried to analyzed and summarized that challenging factor in term of challenges related to teacher, administrator of school, technical support and students which are mentions below.

Challenges related to teacher

According to interview of respondent mathematics teacher researcher found some challenges, which are given below.

"I don't know how to use these audio visual aids and I don't know how to search."

(Math Teacher)

What kinds of audio-visual materials are to be used and consult during the period of mathematics teaching is determined by the competency of teacher. Similarly only few teacher were competent in computer. Most of the teacher they don't know about such videos as well from where to bring such videos.

"It is so boring to use Audio visual aids, while using this class was noisy."

(Math Teacher)

There was a big gap between teachers practice and pedagogical framework of the audio-visual aids. Still most of the teacher used teacher-centered approach to teach. If they are using such videos then class was so excited any they ask so many questions about these videos, so teacher feel boring.

"I have no more time to search such videos in home because there are so many tuition classes." (Math Teacher)

In mathematics teacher are so busy to check class work, homework as well as exams paper. In other time also mathematics teacher are so busy for tuition as well as schools extra classes.

Teacher faced different problems due to lack of knowledge about management and trouble shooting of audio-visual classroom. Most of the teachers complained about their busy schedule of school as well they have other classes also. Thus, these all factors were directly and indirectly responsible to create an obstacle while using audio-visual aid in mathematics teaching.

Challenges related to school administration

There are so many advantages of audio-visual material. Moreover, it has a vital role in mathematics subject because it provides reliable and concrete knowledge by removing the different misconception of mathematics through visually. The educational materials played important role to the teaching learning programs as well as it make them long lasted so there is no objection about it. Among them some challenges related to school administration are given below:

"Our school economically and physically not affords such kind of program because we have not extra class and extra teacher." (Head Teacher)

Till now most of the government school have not sufficient infrastructures. Thus to run such program is burden of the head teacher as well as school management committee. To run such program school needs some extra teacher, so till now some schools have not got sufficient teacher.

"In our school unable to raise teacher's skill, like as computer skill." (Head Teacher)

Most of the schools are unable to give computer training for their teachers because of lack of time as well lack of materials to run such program. So, most of the schools administration provided only class of theoretical load rather than interactive classroom and they did not provide sufficient interactive learning materials and professional training to raise teacher's skill of using computer technology in mathematics teaching. Thus, to be well informed about the merits and effectiveness of audio-visual aid, visual materials, some teacher of the secondary school were unable to use them in mathematics teaching due to lack of proper support of schools administration.

"In our school there is not technician to run this program." (Head Teacher)

Most of the teachers were agreed with this statement but the majority of teacher emphasized that, technician is not available when technical problem occur. They also complained that, there is a lack of technician; lack of ICT based training for teacher. Due to, minor problems appeared in the computer and technology they wait one weak to month for technician. Nearly all mathematics teachers complain about computer program and antivirus protection, which were not updated regularly. It was considered the biggest challenges that affect teacher's performance inside the classroom.

Challenges related to students

According to interview of respondent students I found some challenges, which are given below.

"In our class there are different learning capacities students some are so talent and some are so poor." (Student)

Today's students are to be tomorrow's citizens. Some students learns faster than some are slowly so it takes long time to teach mathematics content by using by using audio-visual aid. They are entering a workforce that needs the talent of better educated students, capable of life-long, self-directed learning and of contributing to sound decision-making for their community and their country. So that, the teacher must be understand the psychology of each and every students are also taken as a challenging factor because due to varied ability of students in the classroom teacher has difficult to understood same subject matter at a single time.

"In our class some students are doing homework regularly and some students are not doing homework regularly." (Student)

It is also problem to using audio visual aids some of students are doing homework regularly and some are not doing regularly, so if students are not doing homework regularly then they don't know what they learned and what they will learn. *"I don't know how to open computer and how to search such videos"*   (Student)

Most of the students are unable to open computer as well as the majority of students did not access educational websites. Similarly in some schools, learner knows better than teacher about technology. They were competent user of technology. Sometimes they changed computer setting to disturb the audio-visual classes.

Perhaps no one of those factors by itself is a determining factor for the interactive audio-visual teaching; however, it has a very profound effect on teacher performance so that these factors were considered key challenges by the researcher. The challenges that appeared while using were considered key challenges that appeared while using audio-visual aids can be improve training through providing access to educational resources, breaking the traditional isolation of teachers and enabling individualized training opportunities.

Chapter V

FINDINGS, CONCLUSION AND RECOMMENDATION

The study was carried out to find the effectiveness of using audio-visual aids for Mathematics teaching and the challenges while using them in mathematics teaching at secondary level of grade X. Based on the analysis and interpretation of quantitative and qualitative data, findings were presented as below.

Findings

From the total analysis of the average mean scores, standard deviation of the students of control and experimental group were 12.25, 2.55 and 12.26, 2.51 respectively in pre-test. The t-value obtained from these mean score and standard deviation is 0.01, which was less than the tabulated value 2.021 at 0.05, level of significance with degree of freedom 37. The t-value of pre-test score between control and experimental group shows that, there is no significance difference in the mean score of both groups in pre-test. So, the null hypothesis was accepted and alternative hypothesis was rejected. It means the understanding level of two group were equivalent or homogeneous before treatment.

The analysis of the mean score of control group and experimental group in post-test were 14.15 and 16.16 which was greater than the control group by 2.01 respectively. The t-value calculated from these two scores was 3 which were greater than the tabulated t-value (2.021) at 0.05, level of significance with degree of freedom 37. It shows that, there was significance difference in the mean score of experimental and control group in post-test.

Conclusion

This study investigated the effectiveness of audio-visual aids in mathematics teaching of selected public secondary schools in Kathmandu district. The objective of the study was to determine the effectiveness of audio-visual aids in mathematics teaching and find out the challenges while using them at secondary level of grade X. The above findings concluded that the selected public schools in Kathmandu district were using various types of audiovisual materials in teaching and this has significance positive impact on the teaching and learning in these schools.

The quantitative result concluded that there was significant difference between the mean achievement of students of control and experiment group in mathematics teaching and learning process. Therefore, null hypothesis was rejected and alternative hypothesis was accepted. It was also concluded that, the most effective learning pathway for a student is through audiovisual learning. It is only possible by teaching aids being in the classroom nearer to real life of bring the outside world into the classroom, because audio-visual aid helps to the utilization of more number of senses ultimately resulting to a better learning. So that, it can be easily concluded that the use of animated, interactive audio-visual aids enhanced the achievement and understanding level of students in mathematics teaching lesson, which is also support by the different theories and review of the literature of my study.

Similarly, from the descriptive analysis and findings about the challenges of audio-visual aids while using in mathematics teaching classes conducted that, there were different kinds of challenges related to the audio-visual aids. These challenges were due to many reasons like a teachers lack of computer competency, overload of theoretical classes for mathematics teacher, lack of pedagogical support, lack of the clear vision of school administration towards use of technology, traditional thinking

of society, intelligences level between the students, infrastructure of the schools, lack of the proper availability of reliable audio-visual materials, between in the common understanding of the school's goals among who hold the decision making power and insufficient technical support. There was no significant difference between experimental group and control group students in pre-test results. Thus, the performance of both groups in mathematics was same before the treatment.

There was significant difference in pre-test and post-test mean scores of students in mathematics taught with using audiovisual aids and without audiovisual aids. The mean achievement of students taught by using audiovisual aids was significantly better than the students taught by without using audiovisual aids. Thus, the study reveals that the use of audiovisual aids in teaching mathematics is more effective at secondary level. From this study it was concluded that the use of audiovisual aids helps the students to understand mathematics in better way and consequently students perform better in achievement over conventional method.

Recommendations

In the light of these findings, the researcher suggested that technology such as animated and interactive audio-visual aids should be used accurately in order to facilitate teaching and provide fun opportunities for learners to learn mathematics. The responsibility is share between schools, administration related to education and teachers themselves to integrate the use of audio-visual aid in mathematics teaching to perceive reliable knowledge and reduce the challenges when they occur. From the findings of this study, the researcher suggests the followings recommendations for the better improvement in mathematics teaching and learning process.

➢ The secondary school mathematics teachers should use audio-visual aids in mathematics teaching to get better achievement in mathematics.

- Mathematics teacher should be given training in using audio-visual aids and computers that could foster the potentiality of mathematics concepts and thus create interest in teaching learning mathematics.

- At least one audio-visual aids should be managed in each and every secondary school which helps the students to learn better. If there is no electricity solar power can be used instead of electricity. Now a days, pocket multimedia projectors are available that consume low electricity and can be run by solar power.

- Teacher should be aware of learner's need and their different learning styles. They should be accommodated in mathematics teaching classes.

- Schools should provide strong pedagogical, physical, social support as well as technological support to novice mathematics teacher.

- The government should increase the number of technician in the field of ICT based education implementation. In addition, Curriculum planners should encourage the use of audio-visual materials by including them in the educational syllabus of all levels of education.

- The school facilities should be modified to accommodate the use of audio-visual by building audiovisual center students could be exposed to practical exercise.

- Infusion of the use of audio-visual materials by inculcating them in the educational syllabus of all levels of education.

- Teacher should read about audio-visual pedagogy innovation in teaching and changing in method to meet the need of 21st century learner.

- Computer training programme should be launched for the teachers who are unskilled in computers.

For Further Study

➢ This study was an experimental study limited to grade X students from two public schools of Kathmandu district on the some topic of mensuration, circle and trigonometry. Hence the researcher should not find that the effectiveness of using Audio visual aids be applicable other than.

➢ Similar study should be carried out with a large sample and various schools of different parts of Nepal.

➢ This kind of students should also be conducted at all levels of schools and in other subject as well.

➢ It would be worthwhile of to study the opinions and attitudes of teachers and students towards the Audio visual aids.

References

Best, J.W. & Khan, J,V. (2009). *Research in Education*, (10th ed), New Delhi, Prentice Hall of India Pvt.Ltd.

Costigan, J.T. (1987). *A comparison of Video, avatar & face-to-face in Collaborative virtual learning environments at Chicago.*

Dewey, J. (1916). *How we think. Boston,* MA: D.C. Heath & Company Publishers.

Dike, H.L (1989). *Strategies for producing instructional materials*. Owerri: The Government printers.

Elijah, Ode. (2014). *Impact of audio-visual resources on teaching and learning in some selected private secondary schools in Makuradi.*

Jaishi, K.P. (2009). *The effectiveness of radio and television in mathematics result of SLC exam".* Unpublished Master's Thesis. Tribhuvan University, Department of Mathematics Education, Kirtipur.

Karki. T.B. (2010). *A study on the effectiveness of instructional materials in teaching Geometry at Grade 'X'* Unpublished Master's thesis). Tribhuvan University, Education Mathematics Department, Kirtipur.

Murtaza, Ali; Ud Din & Khan, F. (2011), Effects Of Audio Visual Aids In Student's Learning At Secondary Levels In District Rawalpindi.

NCTM. (2000). *Principles and Standards for School Mathematics.* Reston, VA: National Council of Teachers of Mathematics

Ode, E.O & Omokaro, D.A (2007). *Basic principles and practice of Librarianship*. Nigeria: PSG- France Publications.

Okojie, M. U (2009). *Enhancing the teaching and learning of Social studies in secondary schools through ICT*. Nigerian journal of Teacher Education

Pokharel, B. (2006). *Research Methodology in Rural Development.* Kirtipur,

    Kathmandu: Dikshant Prakashan. Kalimati Kathmandu: Parngya

    Publication.

Poudel, et. al (2016) *Ideal Entrance Preparation for Masters of Nursing.* Sigdel Press,

    Kanti Marga, Basundhara, Kathmandu.

Sing , A.K. (2008), *Test, Measurement and Research Methods in Behgaviroural*

    Science. Patna: Bharati Bhawan.

Stevick, (1957), *Progess in Lanuage Planning, International Proespectives.* Mouton

    Publisher, Berlin: New York, Amsterdam.

Vygotsky, L.S. (1978). *Mind in society: The development of higher psychological*

    processes. Cambridge, MA: Harvard University Press.

Yadav, R.C. (2042). *A study on the use of Audio - visual aids in the instruction of*

    *mathematics in the primary school of Dhanusha District. (*Unpublished

    Dissertation), T.U. Nepal

Appendix - A

Teaching Content

1) **Unit: 3 Mensuration**

   a. Teaching Lesson- Problem on total surface area, curved surface area and volume of cone.

2) **Unit: 6 Circle**

   a. Teaching Lesson- The angle at the center of a circle is twice the angle of its circumference standing on the same arc.

3) **Unit: 6 Trigonometry**

   a. Teaching Lesson- Simple problems on height and distance

Teaching Plan – 1

(Teaching with using audio-visual aids on experiment group)

Teaching content: Mensuration   **Time Period: 45 min.**

Unit: 3   **Class: 10**

Teaching Lesson- Problems on total surface area of cone.

Behavioral objectives-: On the completion of this lesson, the students will enable to:

- Define cone with its examples.

- Solve the problem related to total surface area of cone.

Instructional materials-: Virtualization of total surface area.

Tasks:

➤ First, researcher wrote the topic on whiteboard, and then motivated the students by asking some questions related this chapter.

➤ The researcher explained in short about the cone, total surface area of cone in the context of daily life activities.

➤ Then the researcher shown the Virtualization of total surface area of cone.

➤ If the students not clear, the researcher would again shows this videos and discuss with students where necessary.

➤ At last, the researcher summarized the whole lesson.

 Evaluation

Find the total surface area of the given figure.

15cm

10 cm
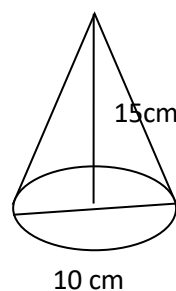
Teaching Plan – 2

(Teaching with using audio-visual aids on experiment group)

Teaching content: Mensuration   **Time Period: 45 min**

Unit: 3   **Class: 10**

Teaching Lesson - Problem related curved surface area and volume of cone.

Behavioral objectives-: At the end of this lesson, students should be able to:

- Solve the problem related curved surface area and volume of cone.

Instructional materials-: Virtualization of curved surface area and volume of cone.

Tasks:

➢ First, researcher wrote the topic on whiteboard, and then motivated the students by asking some questions related this chapter.

➢ The researcher explained in short about the cone, curved surface area and volume of cone in the context of daily life activities.

➢ Then the researcher shown the Virtualization of curved surface area of cone and volume of cone.

➢ If the students were not clear, the researcher would again shows this videos and discuss with students where necessary.

➢ At last, the researcher summarized the whole lesson.

Evaluation

Find the volume of the given figure.

10cm

12 cm
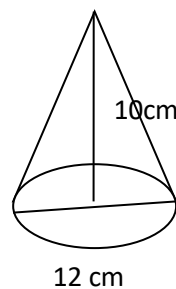
Teaching Plan – 3

(Teaching with using audio-visual aids on experiment group)

Teaching content: Circle   **Time Period: 45 min**

Unit: 6   **Class: 10**

Teaching Lesson: The angle at the center of a circle is twice the angle of its circumference standing on the same arc.

Behavioral objectives-: After completion of this lesson, students should be able to:

- Solve the problem related to the angle at the center of a circle is twice the angle of its circumference standing on the same arc.

Instructional materials-: Virtualization of the angle at the center of a circle is twice the angle of its circumference standing on the arc.

Tasks:

➢ First, researcher wrote the topic on whiteboard, and then motivated the students by asking some questions related this chapter.

➢ The researcher explained in short about the circle, the angle at the center of a circle is twice the angle of its circumference standing on the arc.

➢ Then the researcher shown the Virtualization of the angle at the center of a circle is twice the angle of its circumference standing on the arc.

➢ If the students were not clear, the researcher would again shows this videos and discuss with students where necessary.

➢ At last, the researcher summarized the whole lesson.

Evaluation

Find the value of y of the given figure.
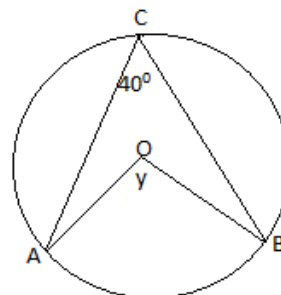
Teaching Plan – 4

(Teaching with using audio-visual aids on experiment group)

Teaching content: Trigonometry　　　　　　　**Time Period: 45 Min.**

Unit: 17　　　　　　　　　　　　　　　　　　**Class: 10**

Teaching Lesson: - Simple problems on height and distance

Behavioral objectives-: After completion of this lesson, students should be able to:

- Define angle of elevation and angle of depression.
- To solve the problem related to angle of elevation.

Instructional materials-: Virtualization based on trigonometry.

Tasks:

➢ First, researcher wrote the topic on whiteboard, and then motivated the students by asking some questions related to previous lesson.

➢ To discuss about the lesson, researcher classified the experimental class into 2 to 3 groups based on the interest and learning capability of students.

➢ After that, by using visual videos about trigonometry researcher again discussed on definition of the angle of elevation and angle of depression.

➢ If the students were not clear researcher would again show these videos and discussed with students where necessary.

➢ At last, researcher summarized the lesson once.

Evaluation

In the figure AB is height of house C is the point of a boy which is 20m far from house and the angle of elevation is 30^0.Find the height of house.

Teaching Plan – 5

(Teaching with using audio-visual aids on experiment group)

Teaching content: Trigonometry   **Time Period: 45 Min.**

Unit: 20   **Class: 10**

Teaching Lesson- Simple problems on height and distance

Behavioral objectives-: At the end of this lesson, students should be able to:

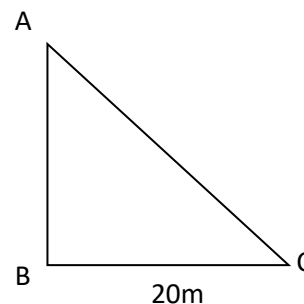- Solve the problem related angle of depression.

Instructional materials-: Virtualization related to the trigonometry.

Tasks:

➢ First, researcher wrote the topic on whiteboard, and then motivated the students by asking some questions related to previous lesson.

➢ To discuss about the lesson, researcher was classified the experimental class into 2 to 3 groups based on the interest and learning capability of students.

➢ After that, by using visual videos about trigonometry researcher again discussed on the problem related to angle of elevation and angle of depression.

➢ If the students were not clear, the researcher would again show these videos and is cussed with students where necessary.

➢ At last, researcher summarized the lesson once.

Evaluation

A top of 50m tall house a boy look at the bottom of the tree at angle of depression 60^0. Find the distance between house and tree.

Teaching Plan – 6

(Teaching without using audio-visual aids on control group)

Teaching content: Mensuration   **Time Period: 45 Min**

Unit: 3   **Class: 10**

Teaching Lesson- Problems on total surface area of cone.

Behavioral objectives-: On the completion of this lesson, the students will enable to:

- Define cone with its examples.

- Solve the problem related to total surface area of cone.

Instructional materials-: Marker, marker board, pin, figure of cone.

Tasks:

➢ First, researcher wrote the topic on whiteboard, and then motivated the students by asking some questions related this chapter.

➢ By using lecture method, the researcher was written the definition of cone the blackboard and clarifies them with proper examples.

➢ The researcher explained in short about the cone, total surface area of cone in the context of daily life activities.

➢ If the students were not clear, the researcher would again teach and discuss with students where necessary.

➢ At last, the researcher summarized the whole lesson.

 Evaluation

Find the total surface area of the given figure.

10cm

8 cm
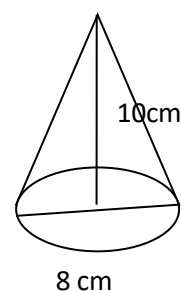
Teaching Plan –7

(Teaching without using audio-visual aids on control group)

Teaching content: Mensuration   **Time Period: 45 min**

Unit: 3   **Class: 10**

Teaching Lesson - Problem related curved surface area and volume of cone.

Behavioral objectives-: At the end of this lesson, students should be able to:

- Solve the problem related curved surface area and volume of cone.

Instructional materials-: Marker, marker board, pin, figure of cone.

Tasks:

➢ First, researcher wrote the topic on whiteboard, and then motivated the students by asking some questions related this chapter.

➢ The researcher explained in short about the cone, curved surface area and volume of cone in the context of daily life activities.

➢ By using lecture method, the researcher wrote the definition of curved surface area of cone to the whiteboard and clarifies them with proper examples.

➢ If the students were not clear, the researcher would again teach and discuss with students where necessary.

➢ At last, the researcher summarized the whole lesson.

 Evaluation

Find the volume of the given figure.

8cm

10 cm
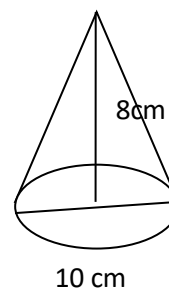
Teaching Plan – 8

(Teaching without using audio-visual aids on control group)

Teaching content: Circle   **Time Period: 45 min**

Unit: 6   **Class: 10**

Teaching Lesson: The angle at the center of a circle is twice the angle of its circumference standing on the same arc.

Behavioral objectives-: After completion of this lesson, students should be able to:

- Solve the problem related to the angle at the center of a circle is twice the angle of its circumference standing on the same arc.

Instructional materials-: Marker, marker board, pin, figure of circle.

Tasks:

➢ First, researcher wrote the topic on whiteboard, and then motivated the students by asking some questions related this chapter.

➢ The researcher explained in short about the circle, the angle at the center of a circle is twice the angle of its circumference standing on the arc.

➢ By using lecture method, the researcher wrote the definition of circle whiteboard and clarifies them with proper examples.

➢ If the students were not clear, the researcher would again teach and discuss with students where necessary.

➢ At last, the researcher summarized the whole lesson.

Evaluation

Find the value of x of the given figure

Teaching Plan –9

(Teaching without using audio-visual aids on control group)

Teaching content: Trigonometry   **Time Period: 45 Min.**

Unit: 17   **Class: 10**

Teaching Lesson: - Simple problems on height and distance

Behavioral objectives-: After completion of this lesson, students should be able to:

- Define angle of elevation and angle of depression.

- To solve the problem related to angle of elevation.

Instructional materials-: Marker, marker board, pin, figure of angle of elevation.

Tasks:

➢ First, researcher wrote the topic on whiteboard, and then motivated the students by asking some questions related to previous lesson.

➢ The researcher explained in short about the angle of elevation and angle of depression with the appropriate examples.

➢ The researcher solved one problem related to angle of elevation with giving clear concept.

➢ If the students were not clear, the researcher would again teach and discuss with students where necessary

➢ At last, researcher summarized the lesson once.

Evaluation
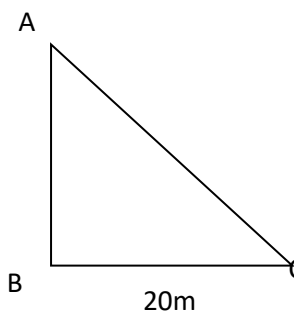
In the figure AB is height of house C is the point of a boy which is 20m far from house and the angle of elevation is 30^0.Find the height of house.

Teaching Plan – 10

(Teaching without using audio-visual aids on control group)

Teaching content: Trigonometry   **Time Period: 45 Min.**

Unit: 20   **Class: 10**

Teaching Lesson- Simple problems on height and distance

Behavioural objectives-: At the end of this lesson, students should be able to:

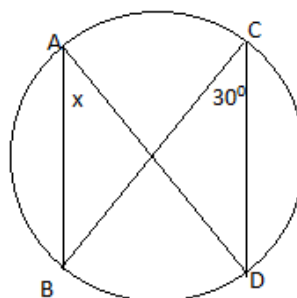- Solve the problem related angle of depression.

Instructional materials-: Marker, marker board, pin, figure of angle of depression.

Tasks:

➢ First, researcher wrote the topic on whiteboard, and then motivated the students by asking some questions related to previous lesson.

➢ To discuss about the lesson, researcher was classified the experimental class into 2 to 3 groups based on the interest and learning capability of students.

➢ By using lecture method, the researcher solved the problem related to the angle of depression with giving clear concept.

➢ If the students were not clear, researcher would again teach and discuss with students where necessary.

➢ At last, researcher summarized the lesson once.

Evaluation

A top of 60m tall house a boy look at the bottom of the tree at angle of depression 30^0. Find the distance between house and tree.

Appendix - B

Mathematics Achievement test in Pre-test

Class – X   Full mark: 20

Sub: C. Mathematics   Pass mark: 8

Give the circle (O) for the correct answer. -;lx pQ/df uf]nf] lrGx lbg'xf];_

;f]lnsf] aQm ;tx, k'/f ;txsf] lf]qkmn / cfotg

!= ;f]lnsf] cfotg lgsfNg] ;'q s] xf] <

a)$\frac{1}{3} \pi r^2 h$ b) $\frac{1}{3} \pi r h$ c) $\pi r l$ d) $\pi r(r + l)$

@= ;f]lnsf] aQm;txsf] lf]qkmn lgsfNg] ;'q s] xf] <

$a) \frac{1}{3} \pi r^2 h$ b)$\frac{1}{3} \pi r h$ c) $\pi r(r + l)$ d) $\pi r l$

#== ;f]lnsf] k'/f ;txsf] lf]qkmn lgsfNg] ;'q s] xf] <

$a) \frac{1}{3} \pi r^2 h$ b)$\frac{1}{3} \pi r h$ c) $\pi r l$ d) $\pi r(r + l)$

$= Pp6f ;f]lnsf] cfwf/sf] cw{Aof; & ;]=ld= / 58\s] prfO{ @% ;]=ld= 5 eg] cfotg slt   xf]nf <

a) 1232cm³   b) 1283.33cm³   c) 8983.33cm³ d) 8624cm³

%= Pp6f ;f]lnsf] cfotg !*$* 3=;]=ld= / o;f] cw{Aof; !$;]=ld= 5 eg] o;f] prfO{ slt   xf]nf <

a) 4cm   b) 9cm   c)8cm   d) 10cm

^= Pp6f ;f]lnsf] cfotg &&) 3=;]=ld= / o;f] prfO{ !% ;]=ld= 5 eP cfwf/sf] cw{Aof; slt   xf]nf <

a) 7cm   b) 8cm   c) 6cm   d)9cm

&= cw{Aof; & ;]=ld= / prfO{ @$;]=ld=ePsf] ;f]lnsf] aqm ;txsf] lf]qkmn kQf nufpg'xf]; <

a) 500cm²   b) 550cm²   c) 600cm³   d) 400cm²

*= cw{Aof; & ;]=ld= / prfO{ @$;]=ld= ePsf] ;f]lnsf] k'/f ;txsf] lf]qkmn kQf nufpg'xf]; <

a) 400cm²   b) 550cm²   c) 682cm³   d) 704cm²

prfO / b'/L

(= tnaf6 dfyL s'g} Ps laGb'df x]bf{ aGg] sf]0fnfO{ s'g sf]0f elgG5 <

s_ caglt sf]0f   v_ pGgtf+z sf]0f   u_ ;/n sf]0f

3_ cfj{tg sf]0f

!)= s'g} a:t'sf] dfyLaf6 tnsf] s'g} Ps laGb'df x]bf{ aGg] sf]0fnfO{ s'g sf]0f elgG5 <

s_ pGgtf+z sf]0f v_ cfj{tg sf]0f   u_ caglt sf]0f   3_ PsfGt/ sf]0f

!!= Sin 60^0 sf] dfg slt xf]nf <

    s_ $\frac{1}{2}$ v_ $\frac{\sqrt{3}}{2}$ u_ $\sqrt{3}$ 3_ $\frac{1}{\sqrt{3}}$

!@= Cos60^0 sf] dfg slt xf]nf <

    s_ $\frac{1}{2}$ v_ $\frac{\sqrt{3}}{2}$ u_ $\sqrt{3}$ 3_ $\frac{1}{\sqrt{3}}$

!#= glbsf] Ps lsgf/fdf @) ld= cUnf] 6fj/ 5 / glbsf] csf]{ lsgf/faf6 6fj/sf] 6'Kkf]df x]bf{ pGgtf+z sf]0f #)) /x]5 eg] glbsf] rf}8fO{ slt xf]nf <

    s_ #$;]=ld=   v_ #$=%) ;]=ld=   u_ #$=^$;]=ld   3_ #% ;]=ld=

!$= Pp6f :tDesf] 6'Kkf]af6 :tDe b]lv ^) ld= 6f9f /xsf] @) ld= cUnf] 3/sf] 5tdf x]bf{ ^)) sf] cjglt sf]0f kfOof] eg] :tDesf] prfO{ kQf nufpg'xf]; .

    s_ !@# ;]=ld=   v_ !@#=(@ ;]=ld=   u_ !@$;]=ld   3_ !@% ;]=ld=

!%= Pshgf dflg;n] rËf p8fO/x]sf] lyof] olb wuf]]sf] nDafO{ #)) ld=lyof] / o;n] llflth;+u $%)sf] sf]0f agfPsf] lyof] eg] rËf llflthaf6 slt prfOdf pl8/x]sf] lyof] <

    s_ !%) ld=   v_ !^) ld=   u_ !$) ;]=ld   3_ !%)$\sqrt{2}$ ld=

                          j[Q

!^= Pp6} a[Qsf a/fa/ lhjfx?n] s]Gb|df s:tf sf]0fx? Afgfpb5g <

    s_ a/fa/   v_ bf]Aa/   u_ cfwf   3_ Ps ltxfO{

!&= Pp6} a[Qsf a/fa/ s]lGb|o sf]0fsf] ;Dd'v rfkx? s:tf x'G5g <

    s_ bf]Aa/   v_ a/fa/   u_ Ps ltxfO{   3_ cfwf

!*= tn lbOPsf] lrqdf x sf] dfg slt x'G5 <

    a) 40^0 b) 30^0 c)60^0 d) 90^0
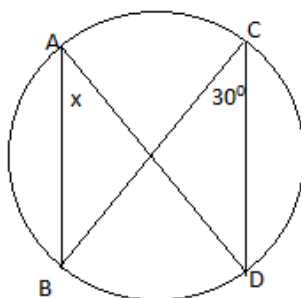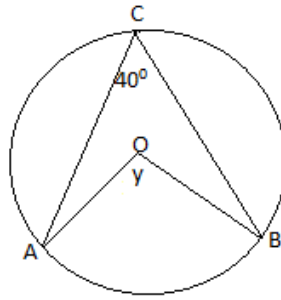
!(= tn lbOPsf] lrqdf y sf] dfg slt x'G5 <

a) 80^0 b) 40^0 c)120^0 d) 20^0

@)=tn lbOPsf] lrqdf z sf] dfg slt x'G5 < hxfF) s]Gb| ljGb' xf] .
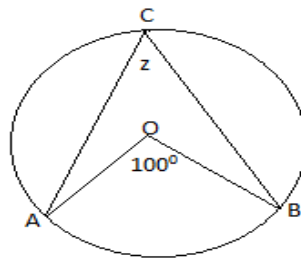
a) 40^0 b) 25^0 c)100^0 d) 50^0

Appendix - C
Mathematics Achievement test in Post-test

Class – X   Full mark: 20
Sub: C. Mathematics   Pass mark: 8
   Give the circle (O) for the correct answer. -;lx pQ/df uf]nf] lrGx lbg'xf];_

;f]lnsf] aQm ;tx, k'/f ;txsf] If]qkmn / cfotg

!= ;f]lnsf] k'/f ;txsf] If]qkmn lgsfNg] ;'q s] xf] <
   a) $\frac{1}{3} \pi r^2 h$ b)$\frac{1}{3} \pi rh$ c) $\pi r(r + l)$ d) πrl

@= ;f]lnsf] cfotg lgsfNg] ;'q s] xf] <
   a) $\frac{1}{3} \pi rh$ b) $\frac{1}{3} \pi r^2 h$ c) πrl d) $\pi r(r + l)$

#== ;f]lnsf] aQm;txsf] If]qkmn lgsfNg] ;'q s] xf] <
   a)$\frac{1}{3} \pi r^2 h$ b)$\frac{1}{3} \pi rh$ c) πrl d) $\pi r(r + l)$

$= Pp6f ;f]lnsf] cfwf/sf] cw{Aof; & ;]=ld= / 58\s] prfO{ @% ;]=ld= 5
eg] cfotg slt   xf]nf <
   a)   1232cm^3 b) 1283.33cm^3 c) 8983.33cm^3 d) 8624cm^3

%= Pp6f ;f]lnsf] cfotg !*$* 3=;]=ld= / o;f] cw{Aof; !$;]=ld= 5 eg]
o;f] prfO{ slt   xf]nf <
   a) 4cm   b) 9cm   c)8cm   d) 10cm

^= cw{Aof; & ;]=ld= / prfO{ @$;]=ld=ePsf] ;f]lnsf] aqm
;txsf] If]qkmn kQf   nufpg'xf]; <
   a) 550cm^2 b) 500cm^2 c) 600cm^3 d) 400cm^2

&= Pp6f ;f]lnsf] cfotg &&) 3=;]=ld= / o;f] prfO{ !% ;]=ld= eP
cfwf/sf] cw{Aof; slt   xf]nf <
   a) 7cm   b) 6cm   c) 8cm   d)9cm

*= cw{Aof; & ;]=ld= / prfO{ @$;]=ld= ePsf] ;f]lnsf] k'/f ;txsf] If]qkmn
kQf nufpg'xf]; <
   a) 400cm^2 b) 550cm^2 c) 704cm^2 d) 682cm^3

prfO / b'/L

(= s'g} a:t'sf] dfyLaf6 tnsf] s'g} Ps laGb'df x]bf{{ aGg] sf]0fnfO{ s'g
sf]0f elgG5 <
      s_ pGgtf+z sf]0f   v_ caglt sf]0f u_ cfj{tg sf]0f   3_
PsfGt/ sf]0f

!)= tnaf6 dfyL s'g} Ps laGb'df x]bf{{ aGg] sf]0fnfO{ s'g sf]0f elgG5 <

s_ pGgtf+z sf]0f   v_ caglt sf]0f   u_ ;/n sf]0f

3_ cfj{tg sf]0f

!!= Sin 60^0sf] dfg slt xf]nf <

     s_ $\frac{\sqrt{3}}{2}$ v_ $\frac{1}{2}$ u_ $\sqrt{3}$ 3_ $\frac{1}{\sqrt{3}}$

!@= glbsf] Ps lsgf/fdf @) ld= cUnf] 6fj/ 5 / glbsf] csf]{ lsgf/faf6 6fj/sf] 6'Kkf]df x]bf{   pGgtf+z sf]0f #)) /x]5 eg] glbsf] rf}8fO{ slt xf]nf <

     s_ #$;]=ld=   v_ #$=^$;]=ld   =   u_#$=%) ;]=ld

3_ #% ;]=ld

!#= Cos60^0 sf] dfg slt xf]nf <

     s_$\sqrt{3}$ v_ $\frac{\sqrt{3}}{2}$ u_ $\frac{1}{\sqrt{3}}$ 3_$\frac{1}{_2}$

!$= Pshgf dflg;n] rËf p8fO/x]sf] lyof] olb wfuf]sf] nDafO{ #)) ld=lyof] / o;n] llflth;+u $%)sf] sf]0f agfPsf] lyof] eg] rËf llflthaf6 slt prfOdf pl8/x]sf] lyof] <

     s_ !%)$\sqrt{2}$ ld=   v_ !^) ld=   u_ !$) ;]=ld   3_ !%) ld=

!%= Pp6f :tDesf] 6'Kkf]af6 :tDe b]lv ^) ld= 6f9f /xsf] @) ld= cUnf] 3/sf] 5tdf x]bf{ ^)) sf] cjglt sf]0f kfOof] eg] :tDesf] prf]{ kQf nufpg'xf]; .

     s_ !@# ;]=ld=   v_ !@$;]=ld=   u_!@#=(@ ;]=ld   3_ !@% ;]=ld=

j[Q

!^= Pp6} a[Qsf a/fa/ s]lGb|o sf]0fsf] ;Dd'v rfkx? s:tf x'G5g <

     s_ bf]Aa/   v_ Ps ltxfO{   u_ a/fa/   3_ cfwf Pp6}

!&= a[Qsf a/fa/ lhjfx?n] s]Gb|df s:tf sf]0fx? Afgfpb5g <

     s_ Ps ltxfO   v_ bf]Aa/   u_ cfwf   3_ a/fa/

!*= tn lbOPsf] lrqdf x sf] dfg slt x'G5 <

     a) 30^0 b) 40^0 c)60^0 d) 90^0

!(= tn lbOPsf] lrqdf z sf] dfg slt x'G5 < hxfF) s]Gb| ljGb' xf] .

a) 40^0 b) 25^0 c) 50^0 d) 100^0

@)= tn lbOPsf] lrqdf y sf] dfg slt x'G5 <

a) 20^0 b) 40^0 c) 120^0 d) 80^0

Appendix - D

Answer Key of Pre-test

S.N	Answer	S.N	Answer	S.N	Answer
1	a	8	d	15	d
2	c	9	b	16	a
3	d	10	c	17	b
4	d	11	b	18	b
5	b	12	a	19	a
6	c	13	c	20	d
7	b	14	b		

Answer Key of Post-test

S.N	Answer	S.N	Answer	S.N	Answer
1	c	8	c	15	c
2	b	9	b	16	c
3	c	10	c	17	d
4	d	11	a	18	a
5	b	12	b	19	c
6	a	13	d	20	d
7	b	14	a		

Appendix - E
Score of Pretest

S.N.	Scores of students in Control group	Scores of students in Experimental Group
1	13	14
2	14	9
3	12	13
4	11	13
5	13	11
6	7	14
7	11	12
8	10	14
9	12	10
10	13	15
11	9	13
12	15	7
13	13	13
14	10	8
15	15	17
16	14	13
17	17	14
18	15	13
19	8	10
20	13	
	$\sum X = 245$, x = 12.25, $\sigma = 2.55$ $\sigma^2 = 6.5$	$\sum X = 233$, x = 12.26, $\sigma = 2.51$ $\sigma^2 = 6.3$

Appendix - F
Score of Posttest

S.N.	Scores of students in Control group	Scores of students in Experimental Group
1	14	19
2	16	13
3	13	17
4	14	12
5	17	16
6	13	15
7	14	16
8	15	17
9	15	19
10	14	17
11	12	17
12	15	12
13	14	13
14	12	13
15	16	20
16	14	16
17	16	18
18	15	18
19	10	19
20	14	
	$\sum X = 283$, x $= 14.15$, $\sigma = 1.63$ $\sigma^2 = 2.66$	$\sum X = 307$, x $= 16.16$, $\sigma = 2.52$ $\sigma^2 = 6.35$

Appendix - G
Unstructured questionnaire format for
Mathematics teacher

School Name: …………………………   Gender: Male/ Female

School Address: ………………………   Teaching Experience: ……

Name of Mathematics Teacher: ……………

Qualification: ……………………….

Unstructured questions

1. z}llfs ;fdfu|Lsf] k|of]u ubf{ lzlf0f l;sfO{ lqmofsnfk /f]rs, k|efasf/L, / al9 l6sfpk"0f{ x'G5, elgG5 . tkfO{ s] o; s'/df ;xdt x'g'x'G5 < -It is believed that teaching learning materials makes teaching activities interesting, effective and durable for long time. Are you agreeing with that statement?)

   ....

   ....

2. tkfO{n] dfWolds txsf] ul0ft lzlf0f ubf{ k|fo k|of]u ug{] b[Zo, >Ao, / >Aob[Zo ;fdfu|L dWo] ;a}eGbf al9 s'g ;fdfu|L k|of]u ug'{x'G5 / lt ;fdfu|L k|of]u ug'{sf sf/0fx? s] s] x'g <

   (While teaching Mathematics in secondary level which materials: audio, visual and audio-visual materials do you use most of the time? What are the reasons behind using this material?)

   ……………………………………………………………………………………

   ………………………………………………………………………………...……

3. ljwfno If]q ;'wf/ of]hgf (SIP,2009-2015) cg';f/ ;fd'bflos ljBfnosf] lzlf0f k2ltsf] u'0f:t/ j[lb ug{ g]kfn ;/sf/ lzlffdGqfno / z}llfs hgzlQm ljsf; s]Gb« eQmk'//jf6 Virtual Classes clxn] ahf/df pknAw 5g / s] tkfOn] cf^gf] ljBfnodf klg ltgsf] k|of]u ug{ s]lx of]hgf agfpg' ePsf] 5 <

   (According to the SIP report, to increase the quality of education different Virtual materials like Audio-visual materials are easily available in the market. Do you have any further programme for using such items in your school?)

   ……………………………………………………………………………………

   ……………………………………………………………………………………

4. cGtlqmofoTds >Aob[Zo ;fdfu|Lx? k|of]u u/L dfWolds txsf] ul0ft ljifosf] lzlf0f ubf{ tkfO{n] s] – s:tf kmfObfx? kfpg' ePsf] 5 < 5f]6f] cg'ej atfpg'xf];\ .

   (How many advantages do you find while teaching Mathematics in secondary level with the help of audio-visual materials? What do you think these materials brought interaction among teachers and students or students and students? Please share your experience.)

………………………………………………………………………………………………
………………………………………………………………………………………………
………………………………………………………………………………………………

5. ljleGg z}llfs ;fdfu|L dWo] ljz]if u/L >Aob[Zo ;fdfu|Lx? k|of]u u/L dfWolds txsf] ul0ft lzIf0f ubf{ tkfO{n] ef]Ug' ePsf ;d:ofx? s] s] 5g <

(What are the problems that you have faced while teaching Mathematics through audio-visual materials in secondary level? What kinds of problems occurred in your classroom and what are the reasons behind that?)

………………………………………………………………………………………………
………………………………………………………………………………………………
………………………………………………………………………………………………

6. cGtlqmofTds >Aob[Zo ;fdfu|Lx? k|of]u u/L ul0ft lzIf0f ubf{ tkfO{sf] nfuL d'Vo r'gf}ltx? s] s] 5g\ .

(What are the major challenges for you while teaching Mathematics through audio-visual materials?)

………………………………………………………………………………………………....……
………………………………………………………………………………………………
………………………………………………………………………………………………

7. >Aob[Zo ;fdfuLx? k|of]u u/L ul0ft lzIf0f ubf{ b]vfk/]sf ;d:ofx?nfO{ tkfO{n] s;/L ;dfwfg ug]{ ug'{{x'G5 < ;du|df ;dfwfgsf pkfox? s] s] xf]nfg\ .

(If any problems occurred in your classroom while teaching with the help of audio-visual materials, how would you solve such problems? In your view, what are the ways to reduce/solve such problem that really occur in the classroom?)

………………………………………………………………………………………………
………………………………………………………………………………………………
………………………………………………………………………………………………

Appendix - H

Unstructured questionnaire format for

Head teacher

School Name: …………………………   Gender: Male/ Female

School Address: ………………………   Teaching Experience: ……

Name of Head Teacher: ……………   Subject: ………………..

Qualification: ………………………….

Unstructured questions

!= tkfO{sf] ljBfnosf] ef}lts / cfly{s cj:yf s]–s:tf] 5 <

(What is the physical and financial condition of your school?)

……………………………………………………………………………………

……………………………………………………………………………………

@= tkfO{ ljBfnosf] k|d'v k|zf;s / ;'k/La]lfssf] gftfn] tkfO{sf] ljBfnodf cWofkg u/fpg] ul0ft lzIfsn] s] z}llfs ;fdfu|Lx? k|of]u u/L k9fPsf] kfpg'ePsf] 5 <

(By being a head and supervisor of this school, did you find that how many teaching material are used by your Mathematics teacher while teaching inside the classroom?)

……………………………………………………………………………………

……………………………………………………………………………………

……………………………………………………………………………………

#= ljwfnodf ul0ft ljifosf nfuL cfjZos z}llfs ;fdfu|Lsf] at{dfg cj:yf, ltgsf] slffsf]7fdf k|of]u / Aoj:yfkgdf Ps s'zn k|=c= sf] klbo lhDd]jf/Lsf] gftfn] s] s:tf] e'ldsf lgjf{x ug'[{ ePsf] 5 .

(By being a responsible person of this school, what role do you play to manage teaching materials in the present condition, to use such materials in the classroom and management of such materials for Mathematics teaching?)

……………………………………………………………………………………

……………………………………………………………………………………

……………………………………………………………………………………

$= ljwfno If]q ;'wf/ of]hgf (SIP,2009-2015) cg';f/ ;fd'bflos ljBfnosf] lzIf0f k2ltsf] u'0f:t/ j[lb ug{ g]kfn ;/sf/ lzlff dGqfno / z}llfs hgzlQm ljsf; s]Gb« eQmk'/jf6 Virtual Classes clxn] ahf/df pknAw 5g / s] tkfOn] cf^gf] ljBfnodf klg ltgsf] k|of]u ug{ s]lx of]hgf agfpg' ePsf] 5 <

(According to the SIP report, to increase the quality of education different Virtual materials like Audio-visual materials are easily available in the matket. Do you have any further programme for using such items in your school?)

……………………………………………………………………………………………
……………………………………………………………………………………………
……………………………………………………………………………………………

%= z}llfs ;fdfu|Lsf] k|of]u u/L lzlf0f ug{] qmddf d'Vo u/L ul0ft lzlfsn] AoQm u/]sf u'gf;f / ;d:ofx? s] s] kfpg'ePsf] 5 <

(Do you know any challenges and difficulties that Mathematics teacher face while teaching? What are the matters that they utter to you regarding the teaching materials related with Mathematics?)

……………………………………………………………………………………………
……………………………………………………………………………………………
……………………………………………………………………………………………

^= b}lgs ?kdf z}lfl0fs ;fdfUf|Lx?sf] k|of]u u/L lzlf0f ug{ lzlfsx?sf nfuL ljBfnon] s] s:tf] k|]/0ff / k|f]T;fxg k|bfg ug{] Aoj:yf 5 <

(In day to day teaching learning activities how would you inspire or motivate them to teach with the help of materials?)

……………………………………………………………………………………………
……………………………………………………………………………………………
……………………………………………………………………………………………

&= ;fd'bfoLs ljBfnodf >Aob[Zo ;fdfu|Lx?sf] k|of]u u/L cWofkg ubf{ b]vf kg{] ;Df:of tyf r'gf}ltx?nfO{ s;/L ;dfwfg ug{ ;lsPnf < tkfO{sf] AolQmut ;'emfjx? atfpg'xf];\ .

(How can we solve the challenges and difficulties that appeared in the classroom while teaching through audio-visual materials? What are your personal suggestions?)

……………………………………………………………………………………………
……………………………………………………………………………………………
……………………………………………………………………………………………

Appendix - I
Interview Schedule with Head teachers

Name:

Qualification:

School Name:

Address:

The interview with the head teacher on the basis of following topics:

- School environment in the learning

- Physical facilities in the school

- Available of teaching materials

- Special classes for students

Appendix - J

Interview Schedule with Mathematics teachers

Name:

Schools' Name:

Qualification:

Teaching Subject:

The interview with the mathematics teacher on the basis of following topics:

- Teaching methods in mensuration, circle and trigonometry.

- Problems of students in mensuration, circle and trigonometry.

- Encouragement of the students in learning mensuration, circle and trigonometry.

- Participation of the students in the classroom

- Participation on individual/group

- Relation between teacher and students

- Impact of age and school environment in teaching mensuration, circle and trigonometry.

- Cause of learning problems in mensuration, circle and trigonometry.

Appendix - K

Interview Schedule with Students

Name:

Schools' Name:

The interview with the student on the basis of following topics:

- − Environment at school for learning

- − Teaching techniques of mathematics teacher in mensuration, circle and trigonometry class.

- − Participation in the classroom

- − Problems in mensuration, circle and trigonometry.

- − Basis knowledge about mensuration, circle and trigonometry.

- − Cause of learning problems in mensuration, circle and trigonometry.

- − Evaluation techniques used by teacher

- − Teaching materials used by mathematics teachers

Appendix - L
Name list of the Research conducting school

S.N	Name and Address
1	Kirtipur secondary school, Kirtipur
2	Shree Bishwo rastriya secondary school, Kirtipur

Statistical Formulas Used for Analysis

For individual series

1. $\left(\overline{x}\right) = \frac{\Sigma X}{N}$ Where, $\left(\overline{x}\right) = $ Mean

    X= Score obtained by individual student

    $\Sigma X = $ Sum of all score

    N = Total no. of students

2. Standard Deviation $(\sigma) = \sqrt{\frac{\Sigma X^2}{N} - \left(\frac{\Sigma X}{N}\right)^2}$

    Where,

    ΣX^2 = Sum of the square of each score

    ΣX = Sum of each score,
    N = Number of students

3. Variance $(\sigma^2) = \frac{\Sigma X^2}{N} - \left(\frac{\Sigma X}{N}\right)^2$

4. For (t-test), $t = \dfrac{\overline{X_1} - \overline{X_2}}{\sqrt{\frac{(N_1-1)S_1{}^2+(N_2-1)S_2{}^2}{N_1+N_2-2}\left(\frac{1}{N_1}+\frac{1}{N_2}\right)}}$

    Here,

    $\overline{X}_1$ = Mean of first group

    $\overline{X}_2$ = Mean of second group

    $S_1{}^2$ = Square of the standard deviation of first group

    $S_2{}^2$ = Square of the standard deviation of second group

    ` N_1 = Total number of students in participate in first group

    N_2 = Total number of students in participates in second group

5. Degree of freedom (df) = $N_1 + N_2 - 2$

Where,

N_1 = Number of students in first group

N_2 = Number of students in second group

6. Difficulty Level (P) = $\frac{R}{N} \times 100$

Where,

R = No. of students getting correct answer

N = Total no. of students participate in the item analysis

7. Discriminating Index (D.I) = $\frac{R_u - R_l}{\frac{N}{2}}$

Where,

R_u = Number of students in upper group giving right answer

$R_{l\,=}$ Number of students in lower group giving right answer

N = No. of students participate in the achievement test

Discrimination Index

Analysis for Test items

No. of Questions	No. of Students																				Total	P%	D.I	Remarks
	Upper Level 27%						Middle Level 46%								Lower Level 27%									
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20				
1	1	1	1	1	1	1	0	1	1	1	0	1	0	1	1	0	1	0	1	1	15	0.75	0.16	Rejected
2	1	1	1	0	0	1	1	1	0	1	1	0	1	0	1	0	0	1	0	0	11	0.30	0.33	Accepted
3	1	1	0	0	1	1	1	0	1	0	0	0	1	1	1	1	0	0	0	0	10	0.50	0.33	Accepted
4	0	0	1	1	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	3	0.15	0	Rejected
5	0	1	1	1	0	1	1	1	0	0	1	0	1	0	0	0	1	0	1	0	10	0.50	0.33	Accepted
6	1	0	0	0	0	0	0	0	0	1	0	0	1	0	1	0	0	1	0	0	2	0.25	0.16	Rejected
7	1	1	1	1	1	0	1	1	1	0	1	1	0	1	1	0	0	0	1	1	14	0.70	0.33	Accepted
8	1	1	1	0	1	0	1	1	0	0	0	1	0	1	0	0	1	0	1	0	10	0.50	0.33	Accepted
9	1	1	1	1	0	0	0	0	1	0	0	0	1	1	0	0	1	0	0	0	8	0.40	0.50	Accepted
10	0	0	1	0	0	0	1	0	0	0	0	1	0	0	1	0	0	0	0	0	4	0.20	0	Rejected
11	1	1	1	1	0	0	0	0	0	0	1	0	0	0	0	0	1	1	0	0	7	0.35	0.33	Accepted
12	1	1	1	1	0	0	0	1	0	1	0	1	0	1	0	1	0	1	0	0	10	0.50	0.33	Accepted
13	1	1	1	0	0	0	0	1	0	0	1	0	1	0	0	0	0	0	0	1	7	0.35	0.33	Accepted
14	1	0	1	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	4	0.20	0.16	Rejected
15	1	1	1	1	0	1	1	1	1	1	0	1	0	1	0	0	0	1	1	0	13	0.65	0.25	Accepted

#																								
16	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	3	0.15	0	Rejected
17	1	1	1	1	1	0	1	1	0	1	1	0	1	1	0	1	1	1	0	0	13	0.65	0.33	Accepted
18	1	1	1	1	1	1	1	1	1	0	1	1	0	1	1	0	1	1	0	1	16	0.75	0.16	Rejected
19	1	1	0	1	1	1	1	1	0	1	1	1	1	1	0	1	1	0	0	0	13	0.65	0.56	Accepted
20	1	1	0	1	1	1	1	1	0	1	0	0	0	1	1	0	1	1	0	0	12	0.60	0.33	Accepted
21	1	1	1	0	0	0	1	0	1	0	1	1	0	1	0	1	0	0	0	0	9	0.45	0.33	Accepted
22	1	1	1	1	1	1	1	1	0	1	0	1	0	1	1	1	1	1	0	1	16	0.75	0.16	Rejected
23	1	0	1	0	1	0	1	0	0	1	1	1	0	0	0	1	1	0	0	0	9	0.45	0.33	Accepted
24	0	1	1	1	1	1	0	1	0	1	0	0	1	1	0	0	0	1	1	1	12	0.60	0.33	Accepted
25	1	1	1	1	1	1	1	0	1	0	1	0	1	1	1	1	1	0	0	1	16	0.75	0.16	Rejected
26	1	1	0	0	0	1	1	0	0	0	0	1	0	0	0	1	0	0	0	0	6	0.30	0.33	Accepted
27	1	1	1	0	1	0	1	0	0	1	0	0	0	1	1	0	0	1	0	0	9	0.45	0.33	Accepted
28	1	1	1	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	0	0	5	0.25	0.16	Rejected
29	1	0	0	1	0	1	0	1	1	0	1	0	0	1	0	1	0	0	0	0	8	0.40	0.33	Accepted
30	1	1	1	0	1	0	1	1	1	0	0	0	0	1	1	1	0	0	0	0	10	0.50	0.33	Accepted