

Chapter -1

INTRODUCTION

1.1 Background of the Study

The word 'mathematics' has been derived from the ancient Greek word 'Mathema' derived from "Manthenien" which meant "to learnt". This indicates that mathematics is taken as a process of learning and interpreting the natural phenomena of each individual. It has been explained in other ways such as it is the knowledge of numerical and calculation part of man's life. Mathematics, as we know it today, is the science of number and their operations, interrelations and combination of space configuration and their structure, measurement etc.

Hilbert defines mathematics as "Mathematics is nothing more than a game played according to certain simple rules with meaningless marks on paper." Locke, defines it as "Mathematics is a way to settle in the mind a habit of reasoning." According to oxford dictionary "Mathematics is the science of number and space.

From the above definitions mathematics and life are related to each other like a relation between nail and muscles in human body. It is essential for daily life as well as for higher study in the field of science and technology. Its aim to transfer the attitudes ideas, skill and knowledge of people in the community dislike mathematics, more so as they get older and many who find great difficulty with what, in reality, is very simple (Dienes, 1971). The majority of children never succeeds in understanding the concepts of mathematics. The common attitude is to get through the examination after which no further thought is given to mathematics. Aryal mention the situation in the following words.

To some students mathematics is a collection of meaningless symbols, to other rules and to still tricks and jargon. The some she is a queen "red is tooth and claws" in whose alter even " angle fear to tread."

Understanding of mathematics is very essential for everyday life as well as for higher students in the fields of science and applied science mathematics helps the students understand and interpret the very important quantitative aspect of living. To proved the students with necessary foundation for their future education, teachers and psychologists have sought a new teaching method that clarifies mathematical ideas and concepts, offers stimulating content and helps student for intelligent participation in the society (Bajracharya, I.K. 1007).

Mathematics is central part of the school curriculum not only in Nepal but also in entire world. Every society has observed mathematics as basic need of human civilization. Mathematics has started at the infancy level from beginning of human civilization.

Civilization the advanced level at twenty first century. New discoveries in mathematics are still in the continuation. During this period its trends and nature has been changed, still this is changing continuously and it can be predicted that it will never be stopped. Today other disciplines such as science, engineering, medicine and the world can't run smoothly without it. Thus the importance of mathematics is realized due to its role for the development of science and technology in one hand and on the other it has become a gatekeeper in the life of students for their carrier choice in further study. Those student who doesn't has good performance don't get chance of admission in socially valued fields of education such as engineering economics, computer related fields etc.

The importance of mathematics is increasing day by day. What occupation a student will choose in the future, the understanding and mastery of mathematical concept, skill and process will essentially develop his efficiency. Mathematical structure is characterized by undefined terms, defined terms, axiom and rule of logics. Mathematics is an organized body of knowledge. It arose from the needs of organized societies of the people.

"Every culture on earth has developed some cases, this mathematics has spread from one culture. Now there is one predominate international mathematics, and this mathematics has quite a history. It has root in ancient Egypt and Babylonia, then grew rapidly in ancient Greece. Mathematics written in ancient Greek was translated in to Latin and became the mathematics of western Europe. Over a period of several hundred year, it became the mathematics of the world. Mathematics continues to grow at a phenomenal rate. There is no end in sight and application of mathematics, in science becomes greater all the time.

Mathematics curriculum was more scientific after implementation of National Education System Plan (1971-1976 A.D). Mathematics was made compulsory at all levels of school curriculum. The hundred's fifty full marks were allote for primary school mathematics which was thirty percent of whole subject of teaching workload. In lower secondary level one hundred full marks was allotted which was twenty percent of teaching work load and one hundred full marks of compulsory mathematics was allotted of twelve percent of teaching workload in secondary level. In secondary level the students who were interested to take knowledge of mathematics the additional mathematics of one hundred full marks also introduced.

The next commission was National Education Commission (NEC, 1992 A.D). NEC introduced one hundred full marks out of seven hundred of mathematics in primary level. Similarly, one hundred full marks out of seven hundred fifty in lower secondary level and compulsory mathematics of one hundred full marks and additional mathematics of one hundred full marks for interested students out of eight hundred in secondary level.

Instructional material refers to any kind of material that has been used to facilitate the teachers and students. Teacher should be creative to decide whether the instructional material can be used or not in teaching process or to teach students. Instructional materials include textbooks, hand outs, worksheets video and audio tapes, computer software and visual aids. The influence the content and the procedures of learning.

Johnson (1978) speaks of the importance of materials in the following lines Instructional materials are as an essential for the mathematics teacher as spices are for the chief. They are necessarily extra ingredients that make teaching and learning mathematics pleasant satisfying experience. Models, pamphlets, films given to that would be difficult to obtain in any other way.

Geometry considered as a tool for understanding, describing and interacting with the space is perhaps the most institutive, concrete as well as reality based mathematics. Other aspect of mathematics and is capable of being extended for further generalization.

The word 'Geometry' is taken from the Greek word 'Geometrein, which means "measurement of the earth." It is the study of spatial concepts. In ancient time, the nature of geometry was informal and practical but now a days' its nature is

more formal. Also the space which students can easily understand Euclidean space because it is related to student's life (Upadhyay, 2061 B.S)

From the very beginning, the teaching of geometry has been controversial. What shall I get by learning these things? was a question raised by a disciple against his teacher, Euclid did establish Geometry as a discipline of mathematics but could not make the disciple agreeable among its stakeholders.

Geometry teaching has demonstrative values, it develops the power of reasoning. It provides opportunities for observation exercising the process and deductive opportunities for observation exercising the process and deductive logic. It is helpful while providing carrier to the student. It is also helpful in providing knowledge about space, spatial world and abstract of life.

Geometry is one of the most important subjects of the school education. While teaching geometry, we not only give a pupil a lot of useful knowledge but also develop him spiritually, intellectually and bring a child up in a cultural way. In doing so, the role of geometry is equally important for teaching both gifted pupils and those fall being with their development.

PRIME (1996) was remarkable movement in teaching of mathematics that occurred in Nepal's at the same duration as "New math" movement. This movement was meant for lower secondary and secondary level from grade VI through grade X. So far as the contents were concerned before PRIME movement (Program for Revision and Improvement in Mathematics Education movement) no difference was found other than the contents given in Euclid in his book "The Elements"

The effect of PRIME in geometrical content was the inclusion of practical aspects. Contents and exercise of the book were designated with practical value. Some contents of the transformational geometry were also introduced as a practical work.

Thus, practical geometry was introduced in to the textbook of lower secondary and secondary level, living the child with knowledge of the physical facts of geometry that can be organized theoretically at the secondary level.

Lecture method was cheap method for teaching geometry before PRIME experimental verification was very rarely used. But during PRIME movement many experimental activities were emphasized.

Most of the schools in Nepal are using the traditional methods characterized by mastery of subject matter through drill, repetition and memorization. The subject matter are presented with limited teaching aids, few textbook, chalkboard were used as the main instructional material since 1961/62 Janak Educational Materials for government school. Moreover, NESP (1971-1976) has emphasized on making mathematics life oriented and practical by introducing revised content, textbooks and conducting teacher training program and supervision system.

1.2 Statement of the Problems

Mathematics is a compulsory subject in our school education. Various kinds of researchers were done in the different area of mathematics. The view of people towards mathematics is not positive till now through the many researchers carried out.

Mathematics is still considered as a complex subject on the view point of student and their parents. People think mathematics is hard subject, which is still a burning issues in mathematics teaching. Previous studies showed that materials play in important role in teaching mathematics.

The researcher intended to study the effectiveness of instructional materials in teaching geometry of school level. So, this study focused on to give answer to the following research question:

- Is there effectiveness of instructional materials in teaching geometry?
- Does achievement differ significantly when instructional materials are used?

1.3 Significance of the Study

The objectives of mathematics are the culture products "facts, skills, concepts and principles."The existing curriculum of mathematics is a reform-oriented program. Reform brings some new contents more on teaching learning. So we have to suggest the effective approach, or methods as well as materials for teacher through research. Instructional materials play an important role in making learning meaningful and help people to over comes their difficulties. Even though the wide range of its impact of materials on teaching and learning of mathematics has not been studied. Most of the mathematics teacher teach following traditional way, without using of materials. So, the rate of dropout and failures of students in school are increasing in mathematics. These studied will have given an evidence of the effectiveness of instructional material in teaching at school level. It also tries to give an advice to use the materials during the teaching and learning process.

There are various areas of mathematics knowledge but in our mathematics curricula selected topic are included. Geometry is one of them. There is a general belief that an instructional materials also governs the achievement of student. To improve quality of education, use of instructional material is one of the most essential factor. It plays a vital role in developing mathematical concept in students and helps them to get a roadmap from different obstacles. This study is essential to identify the effectiveness of instructional materials in teaching geometric concept at secondary level (grade-X). It also helps to improve the understanding of students and enables the mathematics teachers to use appropriate materials.

This study will also help the teachers, students, textbook writers to choose appropriate instructional material according to the subject matter.

1.4 Objectives of the Study

The objectives of the study are listed below:

- To compare the achievement of thought by using instructional materials and without instructional materials.
- To find out the effectiveness of instructional materials on teaching geometry at secondary level.

1.5 Hypothesis of the Study

Research Hypothesis

There is no significance difference between students achievement in geometry teaching with and without using instructional material at grade X students.

Statistical Hypothesis $H_0: \mu_1 = \mu_2$ (Null Hypothesis)

$H_1: \mu_1 \neq \mu_2$ (Alternative Hypothesis)

where μ_1 and μ_2 are the mean achievement score of the student by using instructional material for experimental groups and without using material for control group.

1.6 Delimitation of the Study

The study will be limited in the following criteria: The study was limited in one school of Rasuwa Only the public school was included in this study. The experimental duration of this study was done only 3 weeks. The researchers was taught only geometry of grade X

Definition of the Related Terms

Public School: Public schools are those schools which receive the government grant for the salary of teacher and other purposes.

Instructional Materials: In this study Instructional materials refer to concrete object which can be manipulated by both students and teacher.

Effectiveness: The effectiveness in this study is defined in terms of the magnitude of the score obtained by experimental and control groups in the mathematics achievement test.

Achievement: It is concerned only with scores on the test which is specially designed for this purpose.

Chapter II

REVIEW OF RELATED LITERATURE

It is essential to review the related literature to compare the study which provides the strong knowledge about the related topic "Effectiveness of instructional materials on teaching geometry". Number of books, research reports, papers, and other booklet can be found that concerned with curriculum, teaching materials, methods and so on. Instructional materials play a vital role in an instructional program as learning is based primary on sensory experiences and teaching materials provides visual and sensory experiences for the student. To compare the achievement of thought by using instructional materials and without instructional materials. To find out the effectiveness of instructional materials on teaching geometry at secondary level.

Risk (1947) pointed out the importance of the use of concrete materials in meaningful understanding of many abstract relationship in the following words. "The use of visual material plays an important role in mastering abstract or general concept. Visual materials are an aid to think in abstract terms and to see abstract relationship. They are helpful, not because we want an accurate image of the things used but because they make it easier to concentrate on or to see the relationship. They thus facilitate learning because we can attend to concrete things more reality than imagined things."

Coller and Lerch (1969) wrote "In the elementary program, geometric intitles should be discussed as set of points. The use of set of points, lines and curves are set of points. The use the set of language' will allow children to be precise in their geometric ideas. When physical objects are used to introduced geometric ideas, children should be allowed to handle the objects, to make observation and to express

ideas in their own words. Children should be encouraged to recognize familiar shapes in the physical models and to associate descriptive terms or names with those shapes." Some studies about instructional materials have been conducted in Nepal. In this chapter the investigators surveyed some researches that are analogous to the present study."

Gautam (2005) conducted a study on "Effectiveness of instructional materials in teaching mensuration at secondary level" to explore the effectiveness of instructional materials in teaching mensuration of secondary level and to compare the mathematics achievement of boys and girls in mensuration. For the study , two public schools of Rupandehi district school were selected randomly. Twenty eight students of class ten including different socio- economic status and different castes students were selected purposively with the equal number of boys and girls on the basis of their pre- test scores. A pre- test and post test equivalent group design was adopted for the purposes of study. Experimental and controlled groups were determined by tossing a coin. Researcher taught both the group, but used treatment to the experimental group for fifteen days. He constructed and applied achievement test on both group. The t-test and f-test were applied for comparing the achievement of two group and for comparing the variance of two groups respectively. He concluded that experimental group performed better than the control groups. It was also found that the boys and girls of experimental group equally benefited in understanding the concept of mensuration when taught by using instructional materials.

Baral (2006) conducted a study on "Impact of instructional materials in teaching mathematics at secondary level schools of Lamjung district." With the aim of investigation the impact of instructional materials in teaching geometry at secondary level(Grade-10). He concluded that the achievement of the students of experimental

group better than the achievement of the control group. So, the study indicated that geometry teaching by using different instructional materials yielded better achievement than the teaching without using instructional materials.

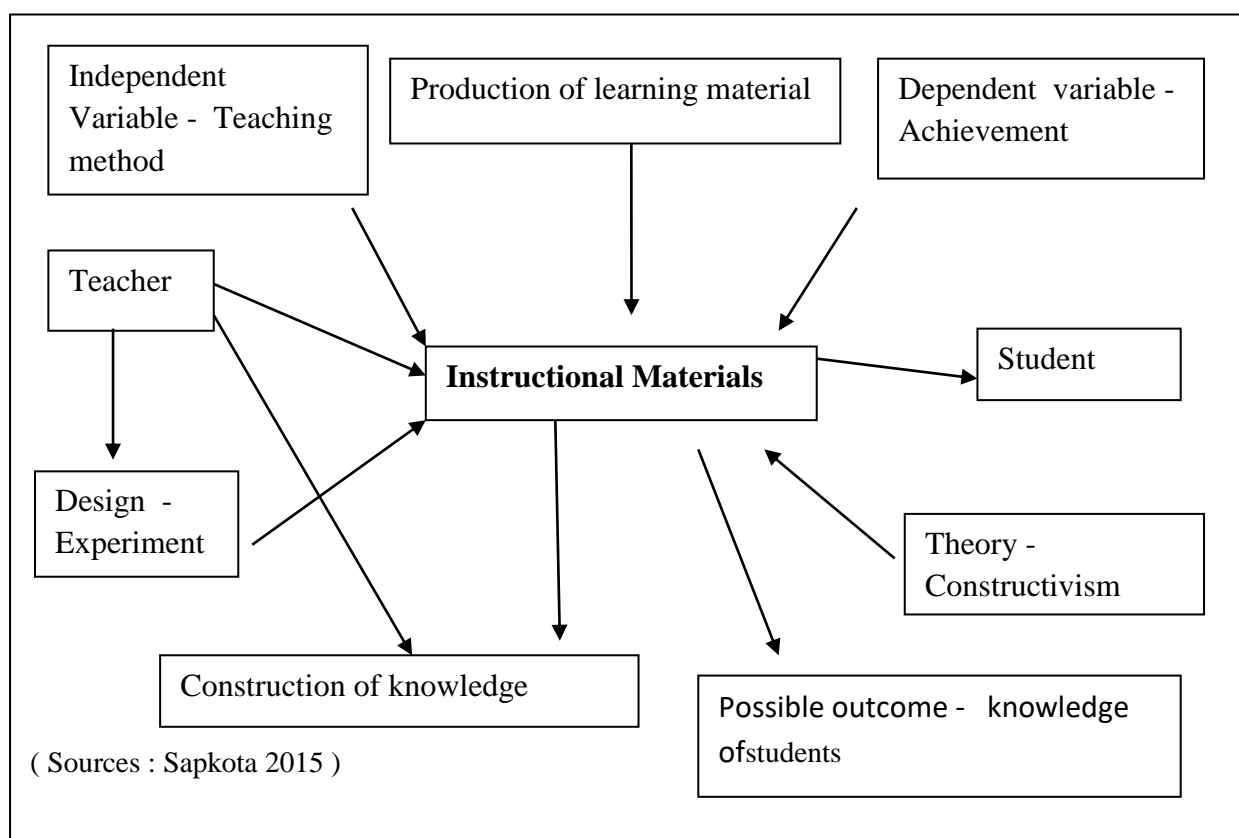
Kunwar (1997) did a study on "Effectiveness of utilizing materials in teaching geometry in a secondary class" with the objective of investigation the effectiveness of utilizing the materials in teaching geometry and to measure the differences between the achievement of boys and girls at grade 10. One experimental and one control group having 40/40 number of students were made. Researcher taught both group and gave treatment to the experimental group. After three months a post-test was administrated. The t-test was applied and conceded that the mean difference between the achievement of boys and girls was significance. Experimental group perform better than the control group in every respect. The interaction effect of sex and materials was found significance.

After the analyzing the revising above the studies, the researcher arrives at the conclusion that the research would be truthful to find the higher achievement of secondary level (Grade -10) students in geometry teaching with using instructional material than without using instructional material.

Conceptual Framework of the Study

A conceptual framework is the representation either graphically or narrative form of the main concept or variable and the relationship of the independent variable with dependent variable. The conceptualized framework of instructional materials is given below.

Figure: Conceptual Framework of the Study



The above mentioned shows that instructional materials were used as tools which are used to produce learning aids by teacher and they are helpful to construct knowledge by students as well as to connect teacher and students for knowledge construction. The knowledge is constructed by students through their active base learning. Teacher plays the role of facilitator in the process of knowledge. Furthermore above mentioned figure shows that the students achievement are dependent variable and teaching method where were used by using instructional materials is independent variable. Likewise the figure shows that the design of the research is given that is experiment.

Chapter III

METHODS AND PROCEDURES

3.1 Introduction

This chapter will be designed for describing the methodology. It describes the design of the study, population sampling, data collection procedure, data analysis procedure which is given below.

3.2 Design of the study

This study will be conducted with the help of pretest, posttest, non-equivalent group design which is present as following table.

Table 1

Design of the study

Group	Pre-test	Treatment	Post-test
Experimental	E_1	Using material (x)	E_2
Control	C_1	Without using material (-)	C_2

In this study, there were two groups experimental and control group. Experimental group was taught by using instructional material whereas the control group was taught by using instructional material. Two groups were made equivalent by random selection. There will be 16 students in each group. The experimental duration was three weeks. After completing the experimental teaching the achievement test was prepared by researcher and administered to the students and the mean score was calculated. The difference in mean score was tested by t-test at 0.05 level of significant level to determine the static difference between them.

3.3 Control process in the Experiment

On this research comparative methodology were used for testing the effectiveness of independent variables over dependent variable. This research try to know the effect of independent variable 'materials' over the dependent variables 'achievement' keeping that all other independent variables are silent as the achievement result was effected by those variables. Researcher keeps all these intervening variables as silent expect instructional materials. He main objectives of this research was to find the effectiveness of independent variables 'instructional materials' over dependent variables 'achievement'.

3.4 Population of the Study

The population of the study was consisted of all student of grade X in public secondary schools of Rasuwa district.

3.4 Sample of the Study

This was experimental study. Researcher was chosen one school Shree Nirku Bhume Secondary school purposively. For the selection of the student, the whole student of grade X divided in to two group often two group was made homogeneous as possible as on the basis of their Pre achievement score. In each group there was 16 sample students. For the selection of experimental and group researcher tossed the coin.

At first in each group there were 16 students, the researcher indirectly code their name and roll no and not include their achieved score on the test for this research. From the 32 students the researcher again formed two groups on the basis of tossing a coin. One is consider as the experimental group and the second one as control group.

3.5 Tools

At the end of experiment period, the researcher was developed an achievement test on the basis of prescribed curriculum and text book of grade X on the topic's of geometry. Achievement test consisting subjective (very short, short and long) type of questions. It was main tools used in collecting data for the study. Some question was asking to students about use of instructional material and without use of instructional material in teaching geometry for qualitative data.

3.6 Estimation of Validity and Reliability of the Tools and Instruments

The content validity of the tools and instruments was established as approved by mathematics experts as well as school subject teachers. The reliability of the tools and instruments had established by using split – half method. The split half reliability of the test had found 0.96. It indicates that test was reliable

3.7 Item Analysis of the Test

For the item analysis of the test paper researcher made thirteen items in which four were very short answer type, five were short answer type and four were long answer type question. To analyze those item these are selected 27 percent upper level scores students and 27 percent lower scores students out of 16 students. For this purpose researcher administrated the test among 16 students of class – X of Nirku Bhume Secondary School Naukunda - 4, Rasuwa for pilot study.

Correct response was denoted by '1' and in correct response was denoted by '0'. The difficulty level and discriminating index of two and four marks question will separated by step wise with one mark and the average difficulty level and discriminant index will calculated. The item analysis of writes: The items having (30-70%)

difficulty level and discriminate index about 2,4 of one marks, item number 6 of two marks and item number 12 were rejected after pilot study and item 13 were modified.

3.8 Data Collection Procedure

The experimental and control groups were taught by researcher himself 45 minutes per group every day. The experimental group was taught by using instructional materials whereas the control group was taught by without using instructional material. At the end of instructional period the achievement test were administered to both groups students. The answer sheets were collected and scored by the researcher and then the score was tabulated for the analysis. For qualitative part the researcher asked some question to students about use of instructional material and without use of instructional material in teaching geometry. For this researcher was conducted focus group discussion of students.

3.9 Scoring the Data

For the scoring the data researcher was made different level and types of question. Each of type of questions varied according to difficulty level. Knowledge level question demands simple information carry 1 mark as score, the comprehensive level question demands simple information carry 1 mark as score, the comprehensive level question demands the both the information and skill, carry 2 marks each whereas the application type of question are higher level which demands knowledge as well as comprehensive level of 4 marks.

3.10 Data analysis Procedure

The collected data was analyzed and interpreted using statistical devices. Mean, standard deviation and variance was calculated for both groups with their obtained score in the achievement test. The t-test for difference between two means was used at 0.05 level of significant to find significant difference between the

achievement of the group of sample students. For qualitative part, the researcher organized focus group discussion (FGD) of 8-12 person where teachers and students were selected by researcher. Focus group discussion was conducted from half an hour to one hour reaching geometry. For example, what type of effect did you find from the class conducted by using instructional material ?what type of difference did you find in teaching between using instructional material and without using instructional material and without using instructional material ? In this way researcher analyzed the use of instructional material was effective or not effective in teaching geometry.

Chapter –IV

ANALYSIS AND INTERPRETATION OF DATA

This is an experimental research related to find out the effectiveness of instructional materials in teaching Geometry grade X. The objectives of this study were "To compare the achievement of students taught by using instructional materials and without using instructional materials" and "To compare the student's motivation towards mathematics learning with and without using instructional materials". Pre-test, post- test, non equivalent group design were adapted. For this 32 students were taken as sample of Shree Niru Bhume Secondary School Nakunda as experimental and control groups respectively. The main tools of data collection were achievement test papers and interview guideline. Pre-test was administrated before the experiment started and the post-test was administrated after the experiment. Then comparing the achievement score of pre-test and post-test of both groups were analyzed using t-test and Split-half method to find the reliability, at 0.05 Level of significance. The data scores on achievement test were analyzed by using quantitative technique.

Comparison of Mean Achievement Scores of Experimental and Control Groups

The research was experimental in nature. The achievement test was the basic tool for data collection to achieve the result for the objectives. 32 students from Nirku Bhume Secondary School Rasuwa were selected. Research was intended to explore the effectiveness of the Geometry Instructional teaching materials in teaching mathematics in this study. The obtained data were analyzed and interpreted under the following headings.

Analysis of Pre-Test Result

Score of the pre-test of students of the experimental and control groups have been given in Appendix-B together with the statistical calculation of mean, standard deviation and variance. The pre-test analysis for the comparison of the mean achievement scores of pre-test has been summarized in table.

Table – 2

Comparison of Experimental and Control Groups on Pre-test Score

Group	N.	Mean	Standard Deviation	Variance	t-value	Level of significance	Remarks
Experimental	16	17.75	4.14	17.14	-0.59	0.05	H_o is acceptable
Control	16	16.86	4.30	18.56			

The table 2 shows that the mean, standard deviation and variance of the experimental and control groups on the pre-test. The mean score of experimental group was 17.75 and the mean score of control group was 16.86 the standard deviation of experimental group was 4.14 and the standard deviation of control group was 4.30 the variance of experimental group was 17.14 and the variance of control group 18.56. Mean achievement scores of both groups were compared statically using two tailed t-test at 0.05 levels of significance. The table shows that the calculated value of t-test was -0.59 which is less than the tabulated value 1.96 at 0.05 (from t-table) level of significance with degree of freedom ($N_1 + N_2 - 2$) = 16+16 -2=30. So the null hypothesis was accepted. This shows that there is significant difference existed between the experimental and control group on pre-test.

Analysis of Post-test Result

The post-test was administrated to both experimental and control groups after the treatment was given. The post-test scores of students of experimental and control group had been presented in Appendix – 3. The calculated value of mean, standard deviation variance and t-value had mentioned in following table 3.

Table – 3

Comparison of Experimental and Control Groups on Post-Test Score

Group	Number	Mean	Variance	Standard Deviation	t-value	Level of Signification	Remarks
Experimental	16	23.19	15.77	3.97	2.94	0.05	H ₁ is Accepted
Control	16	20.81	19.02	4.36			

The above table indicates that mean, S.D. and variance are different. The mean scores of experimental group was found to be 23.19 and the mean score of control group was 20.81. The standard deviation of experimental group was 3.97 and standard deviation of control group 4.36 and variance are 15.77 and 19.02 respectively. The difference in the mean achievement between experimental group and control group is found to be 2.38. In order to see whether initial difference existed between two groups t-test was employed with 0.05 level of significance. The above table shows that the calculated value of t-test was 2.94 which is greater than the tabulated value 1.96 at 0.05 level of significance. The result of the t-test does not support the null hypothesis that there is no difference between mean achievement scores of experimental and control group on post-test scores. It supports alternative hypothesis of their existence.

of the difference. Analysis of the pre-test scores indicates that the groups were comparable at 0.05 levels of significance. The better performance of experimental group over control group on the post-test scores might have been attitude due to use of geometry Geoboard, Geometric chart, Scale, Protractor, Compass, pencil and given to experimental groups in the reference of control exercised in the experimental. This means after conducting the treatment both groups experimental and control had different level of achievement scores in mathematics

Achievement between Control and Experimental Groups

The pre-test and post-test scores of 32 students experimental and control group are presented and the summary of statistical calculation for the both groups on the pre-test and post-test are presented in the table.

Table - 4

The Comparison based on the Total Average

Group	Pre-test (mean)	Post-test (mean)	Pre-test (variance)	Post-test (variance)	Pre-test (SD)	Post-test (SD)
Experimental	18.87	17.75	23.19	17.14	4.81	4.14
Control	16.87	16.87	20.81	19.02	4.30	4.36

In this achievement of the students are observed and micro level of comparison between the achievement of the experimental and control groups is presented. The above table shows that the mean score of the students of experimental groups is increased by 5.45 averages out of 30 marks of 16 students. Mean score of of the control group is increased 3.94 averages out of 30marks of 16 students. The progress rate of control group was only 1.6 averages which is very low in comparison with mean score of experimental group .The whole achievement scores of

experimental group performance was more than the control group because the SD value of scores of the experimental group was 3.97 in comparison to 3.34 of control group. Thus, the researcher concludes that the achievement of the grade X students, who were taught geometry with using instructional's teaching materials, achieved better achievement than the students who were taught by using without instructional's teaching materials.

Table – 5

Result of Motivation Scale on Two Groups

Group	Mean	Variance	Standard Deviation	t-value	Level of significane	Tabulated t-value	Remarks
Experimental	40.94	32.91	5.73	1.59	0.05	1.96	H_1 is
Control	37.68	34.88	5.90				Accepted

Since $1.32 < 1.96$, the Null hypothesis. "students' of the experimental group and students of the control group are equally motivated towards mathematics" was accepted. and the alternative hypothesis, "the students of experimental groups were more motivated on mathematics than the students of control group" was rejected.

Qualitative Analysis and Interpretation of the students' Motivation towards Mathematics

Qualitative analysis is made on the basis of observation reports made by the researcher. On the basis of class room instruction the researcher observe the students activities and noted daily. Geometry provided the opportunities for divergent thinking and creative problem while developing student logical thinking abilities. Students

experienced that from geometric materials it helped them learning vocabulary, properties of geometry laws. Geoboard, Geometry chart, scale, protractor, compass, pencil help them and challenged to find alternative solutions. It also helped them to communicate their thinking in geometry. On the other hand, teaching Geometry in control groups without use of instructional materials Geoboard was less interesting and motivating to clarify Geometry concept. It was also difficult to activate students as well as to create interest in the problem.

Researchers request the subject teachers to observe her class and provide the feedback. Along the period of experimental group the subject teacher were stayed in the same class in both groups. Experimental groups the subject teacher gave positive response about teaching. In experimental period, subject teacher and students of experimental group had given thanks for teaching by using instructional teaching materials. The researcher concluded that it was possible due to the materials.

Similarly, the researcher had found that her teaching was no effective in control group as much as experimental group by analysis of data, class observation, class activity and class note. The students of control group were not serious interpreted to read this topic seriously.

In the experimental group the researcher found that the teacher and student had engaged their time to interest, sharing information to each other openly by which they learn in the better way while solving their mathematical problems.

In qualitative information, the interviews were taken from the selected students and mathematics teacher to derive qualitative information. The researcher asked some question and collected the answer, which is given below:

Researcher: What type of effect did you find from the class conducted by using instructional materials?

Subject teacher: Student becomes active in teaching activities. They were interested in subject matter and much more interested in teaching learning activities.

Researcher: What type of different did you find in teaching between using instructional materials and without using instructional materials?

Student 'a': Learning mathematics using instructional materials is easy to understand and interesting class.

Student 'b': I felt that learning becomes long time obtained by using instructional materials.

Student 'c': Instructionals' material helps for all students to understand subject materials.

The answer of the above questions shows that the use of instructional materials in teaching geometry is effective than without using instructional materials.

During experimental period researcher had found that every students of experimental group were curious and interested to learn mathematics seriously and all of students that group were not making noise and also, they told me to teach regularly and called me time to time to teach. Similarly researcher had found that her teaching was not effective on control group because students of control group were not interested in learning in the same way as usual. Hence, the researcher found that there were active participation of the students in experimental group of the students and they enjoyed teaching learning activities.

Chapter – V

SUMMARY, FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

The researcher was experimental in nature. The purpose of this study was to test the effectiveness of instructional materials in teaching mathematics. The first section of this chapter presents the summary of the study, the second section presents its findings, conclusion and the last section presents recommendations based on the finding of the study.

5.1 Summary of the Study

This was concerned with the study of effectiveness of teaching mathematics by using instructional materials at lower secondary level. For this study, the researcher developed test items with the help of prescribed curriculum and the textbook of mathematics of grade 10. The researcher administrated test in Shree Nirku Bhume Secondary School Naukunda (Rasuwa) for achievement test. Test paper was the main instruments used for study.

For the study, the researcher selected Rasuwa Shree Nirku BhumeSecondary School for experimental and control group by dividing two groups. Each group had contained 16 students. At first pre-test was administrated on both groups. Then the experimental group was taught by using instructional materials. The score of 16/16 students were analyzed by using the mean, variance, standard deviation and t-test for independent simples under comparison of achievement score of experimental and control group on pre-test and comparison of achievement score of experimental and control group on post-test.

5.2 Findings

On the basis of the analysis of the scores obtained by students, the researcher found in this study that the mean achievement score of the students taught with using instructional materials is higher than the mean of the students taught without instructional materials is higher than the mean achievement score of students taught without instructional material. Statically the mean difference was significant. Thus the researcher concluded that the use of instructional materials was effective in teaching geometry at lower secondary level.

- T-test was used to compare mean scores of experimental group and control group on pre-test. The results of the test. The results of the test indicate that there was no significant difference between the groups at 0.05 level of significant.
- The mean score of the post-test results of experimental group and control group were not same. The mean score of experimental group is 23.19 and control group is 20.81.
- The study indicated that the mean scores of the students of experimental group is significantly higher than the mean score of control group.
- The achievement of grade X students who were taught mathematics using instructional teaching materials achieve better score then the students who were taught without using geometric materials.
- The mean achievement scores of students taught with using geometric materials is higher than mean achievement score of the student taught without using instructional materials on post-test.
- The students of experimental group were found curious and highly interested in teaching learning activities than that of control group.

- Student felt pleasure while teaching mathematics using geometric materials.

5.3 Conclusions of the study

From the finding of the study, it could be concluded that students taught using instructional materials performed significantly better control group. The researcher found that the mean score achievement score of pre-test was as nearly same on both group without using instructional materials but the mean achievement score of students taught with using different instructional materials was higher than the achievement score of the students taught without using instructional materials in post-test. The students of in control groups felt bored and lazy to learn mathematics without instructional materials. But the students of experimental group were so curious and interested in learning mathematics with using instructional materials. It was concluded that the instructional materials affected with the teaching and learning. This shows that the students who were taught instructional materials are more active, regular, participating in all activities of classroom than the student who were taught without using instructional materials. So the instructional materials helps the students to understand the problem in mathematics. Hence the use of instructional materials in teaching learning activities in mathematics is found effective.

5.4 Recommendations

On the basis of finding of this study some measures have been recommended for the improvement of the teaching situation at lower secondary as given below:

- This study recommends that since children taught mathematics using geometric materials perform better than those who are taught mathematics using geometric materials for the better performance in mathematics.

- Teacher should be confident that which materials to be used while teaching mathematics because all student have not their equal teaching-learning capacity.
- The mathematics teacher should try to use instructional materials in teaching mathematics.
- The teacher, students, textbook writers and methodologists can modify their view or approach in the light of the information provided.

5.5 Suggestions for Further Researchers

"Geometric materials must be at the right time and in the right way, if they are to be effective" The materials must be selected with the mathematical purpose in mind. Based on findings and the scope of the study, suggestions for further studies to be carried out the following areas:

- The large research studies must be designed and carried out in order to investigate the effectiveness of using materials in sample in various schools of different part of Nepal.
- A similar study can be carried out in other branches of school mathematics.
- Similar studies including the opinions and attitudes of parents', teachers and students should be carried out
- The present study was related to topic Geometry. Similar studies may be done with other topic

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