

# Chapter - I

## INTRODUCTION

### Background of the Study

Cooperative learning is deemed highly desirable because of its tendency to reduce peer competition and isolation, and to promote academic achievement and positive interrelationships. According to the National Council of Teachers of Mathematics (NCTM, 1991) learning environments should be created that promote active learning and teaching classroom discourse and individual, small-group and whole-group learning. Cooperative learning is one escape of an instructional arrangement that can be used to encourage the development of active student learning, which is an important dimension of mathematics learning and highly endorsed by math educators and researcher's, students can be given task to discuss, solve problem and accomplish.

Cooperative learning is a kind of learning strategy in which students study together and complete common goals. Each student contributes his/her own efforts in small groups to promote all students performance on this process, students produce interaction to involve many activities such as communication, observation and support. Yi-wen (1999), cooperative learning approach provides opportunities to the students a varied capabilities to maximally intraction for the solution of problem in conductive and democratic environment. In this approach the students are divided into small groups according to their competence level, capacity and interest and then mathematical problems are given to them for the solution. After receiving the problems the students try to understand them, discus the problem and share the ideas and information, with each other and solve the problem received in cooperative environment. If any one is weaker in a group than the other members of the group help him creativity instead of expelling him/her from the group i.e. small group of students work together to achieve a common goal. Because students are the main actors of this method, thinking, inquiring, analyzing and discovering are the main activities.

Mckeachie (1999) explains the co-operative learning on the following ways: In a cooperative learning class, students often elaborate on the concepts being taught

to achieve what is expected. Elaboration provided from one student to another is a win/win situation. Elaboration not only enhances the learning of students who receive the explanation but also depends the understanding of the students providing the explanation. Hence consistent elaboration or explanation of a topic would surely bring for the complete retention of a topic being learnt for a longer period of times.

Cooperative learning method is child centered method. It creates child friendly environment in the classroom. Conventional method has been in practice in most of our schools in Nepal. It is hardly possible to teach through traditional teaching method to fulfill students queries and necessities. Therefore it is mandatory to change this type of method. Teachers should use students oriented teaching method like co-operative learning strategy. It encourages teacher to use alternative assessment techniques and further reducing the emphasis on competitive examination. It improves student's achievement and retention, increase self esteem and intrinsic motivation and develops more positive attitude towards learning skill and social skills.

According to Johnson & Johnson and Holubec (1991) "cooperative learning is much more than simply having students work in groups. Teachers who try group work without building in the primary elements of cooperative learning usually have experiences that range somewhere between disappointment and catastrophe."

Common complaints with group work are :

- ) Students in the group rising conversations that have nothing to do with the lesson or the class;
- ) Students becoming impatient with others in the group and ceasing to work cooperatively.
- ) One bright students doing most of the work and the other students in the group putting their names on it.

These activities do not occur during true cooperative learning. True cooperative learning has five elements that prevent such problems:

## **1. Positive interdependence**

Students perceive that they need each other in order to complete the group's task "sink or swim together" Teachers may structure positive interdependence by establishing mutual goals (learn and make sure all other group member learn), joint rewards if all group members achieve above the criteria, each will receive bonus points, shared resources one paper for each group or each member receives part of the required information and assigned roles i.e. summarizer, encourage of participation, elaborator.

## **2. Face to face promotive interaction**

Students promote each other's learning by helping, sharing, and encouraging efforts to learn. Students explain, discuss and teach what they know to classmates. Teacher structures the groups so that students sit knee-to-knee and talk through each aspect of the assignment.

## **3. Individual accountability**

Each students performance is frequently assessed and the results are given to the group and the individual. Teacher may structure individual accountability by giving an individual test to each student or randomly selecting one group member to give the answer.

## **4. Interpersonal and small group skills**

Groups cannot function effectively if students do not have and use the needed social skills. Teachers teach these skills as purposefully and precisely as academic skills. Collaborative skills include leadership, decision-making, trust-building, communication and conflict managements skills.

## **5. Groups processing**

Groups need specific time to discuss how well they are achieving their goals and maintaining effective working relationship among members. Teachers structure group processing by assigning such talk as

- list at least three member action that helped the group be successful.
- list one action that could be added to make the group even more successful tomorrow.

Teacher also monitors the groups and gives feedback on how will the groups are working together to the groups and the class as a whole.

Co-operative learning method is a structural process in which team member work towards accomplishing a common goal, it is including positive interdependence, individual and group accountability, face to face active interaction and group processing. It is well documented that students retain more knowledge when actively engaged on the learning process and co-operative learning is often cited as an extremely effective instructional strategy. Co-operative learning is a generic term that is used to describe an instructional arrangement for teaching academic and collaborative skill to small heterogeneous group of students. The teacher must be an active the role of observer, mediator, advisor, guided, supports and solves the problems at the same time promoting a series of basic norms that must continue during the group interaction.

Cooperative learning method is useful and suitable in teaching mathematics, there are so many method of the cooperative learning such as students team learning, group investigation, Students Team Achievement Division (STAD), team-games tournaments, and Jiasaw are some typical methods.

In this study the researcher will select Student Team Achievement Division (STAD) method to teach experimental group. Because it is one of the simplest of all cooperative learning method and it is good model for teacher who are new to the cooperative learning approach.

Many psychologist and educational reports have given importance of co-operative learning method. This method helps students to learn mathematics with understanding in democratic environment being active. It promotes deep learning of materials, to learn social skills and civic values, promotes higher-order critical thinking skills and promotes personal growth. Such research has not been carried out in teaching mathematics in Nepal. The need of such study has been realized in the

context of Nepal with newly implemented curriculum and text books. So the researcher undertook this task to study on the effectiveness of cooperative learning strategy in teaching mathematics at primary level.

## **Statement of the Problem**

According to the history of mathematics teaching and learning activities, sometimes ago it was teacher oriented. Students must rote the content what the teacher taught in classroom. Subject matters were imposed to students to study. As that traditional method, teachers were active but students were passive. Mathematics teaching learning activities mostly guided by lecture method. Students were not encouraged to think, interpret and criticize in their own ways.

There had been observed the change in mathematics teaching method with the newly change in teaching learning strategies. It was emphasized on learning from practice rather than by rote learning. Students' oriented teaching method had been developed. It has been emphasized that subject matters and method should have been selected according to the student's capacity, interest and performance therefore student would be able to learn spontaneously.

In Nepalese context, there hasn't come any change in teaching learning activities with the change in time and necessity. There has still been continuing traditional teaching learning method. According to evolution came in teaching method, we should use students oriented method rather than traditional method. There are various types of student oriented teaching methods. For example : discussion method, problem solving method, inductive deductive method and co-operative learning method etc. The cooperative learning method is newly tested method in education field including mathematics also. The effectiveness of this method has not been tested in the primary school of Nepal. This study can make significant contribution in shifting the pedagogy of teaching learning. Therefore, the researcher has selected the topics "Effect of co-operative learning strategy in learning mathematics at primary level" to elaborate the effect of students' participation in teaching learning method. In co-operative teaching learning method students' can discuss themselves about solving the problems. There is vast difference between

traditional method and modern teaching learning strategy. When students' start to participate actively then fruitful result will come surely.

Therefore, researcher intended to explore some vital facts on the above mentioned field.

- ) Does the cooperative learning affect the achievement of the students in mathematics ?
- ) Is there any change in students behavior in classroom activities after applying cooperative learning method ?

### **Significance of the Study**

Primary education is considered as the base of lower secondary, secondary and higher education. Mathematics is an abstract subject which is very difficult to understand. If we can teach mathematics by using effective method, students were motivated towards mathematics and get success on their future study.

Co-operative learning involves students on active exchange of ideas rather than passive learning, several researcher indicate that students seems to enjoy classroom that employ cooperative technique.

The significance of this study can be stated as follows :

- I. This research would help to the mathematics teachers to improve their teaching strategies.
- II. This study would help to identify the effectiveness of cooperative learning method on achievement of mathematics.
- III. This study would be help to the educational policy maker and curriculum designer to suggest the effective teaching learning methods.

### **Objectives of the Study**

The objectives of the study were as follows :

- ) to find out the effect of cooperative learning strategy in the mathematics achievement of students.
- ) to analyze the student's behavior during experimentation.

## Hypothesis of the Study

### Research Hypothesis

There is significance difference between students' achievement in mathematics teaching using cooperative learning strategy and conventional method at primary level students.

### Statistical Hypothesis

The following statistical hypothesis is formulated;

#### I Null hypothesis

$$H_0 : \hat{\mu}_1 = \hat{\mu}_2$$

i.e. there is no significance difference between mean achievement score of experimental and control group.

#### II Alternative hypothesis

$$H_1 : \hat{\mu}_1 \neq \hat{\mu}_2$$

i.e. there is significance difference between mean achievement score of experimental and control group.

Where  $\hat{\mu}_1$  and  $\hat{\mu}_2$  are mean achievement scores of students taught by using cooperative learning and conventional method is respectively in teaching math at primary level.

## Delimitations of the Study

The delimitations of the study were given below :

- ) This study was conducted on one primary school of Humla district.
- ) This study was limited to the students of class IV.
- ) The selective topics of maths at grade IV i.e. unitary method, time, money, measurement, perimeter of a rectangle and algebra was chosen for this study.
- ) The study was conducted with the finding in experimental and control group.

## **Definition of the Related Terms**

**Cooperative learning strategy:** Teaching strategy is which students of different ability are kept in small groups that requires positive interdependence, face-to-face interaction, individual and group accountability, interpersonal and small-group skill and group processing.

**Conventional method :** The teaching methods which is practicing in teaching methodology.

**Experimental group :** A group taught by using cooperative learning strategy was considered as an experimental group.

**Control group :** A group taught by using conventional teaching method was considered as a control group.

**Pretest :** Pretest is a test, which measures the achievement before conducting the experiment.

**Posttest :** Posttest is a test, which measure the achievement after conducting the experiment.

**Achievement :** The score obtained by students in the test prepared by researcher before and after experiment.

**Independent variable :** Cooperative learning strategy, which is manipulate the researcher during experiment.

**Dependent variable :** Mathematics achievement of students, which is score in pretest-posttest in the subject of mathematics.



## Chapter - II

### REVIEW OF RELATED LITERATURE

A review of related literature is a major source of the further study of research task. It helps to conduct the research programmes and gives the better idea for the researchers to formulate research hypothesis. Among many researches conducted in this area, some studies have been reviewed in the sections.

**Shrestha (1975)** conducted his research study entitled "A study comparing the effectiveness of the discovery method and traditional method is selected in lower secondary class of Nepal." The aim of the research is to test the effectiveness of the discovery method of teaching mathematics to a selected class. He concluded that the discovery method is more effectiveness for teaching mathematical concepts than that of traditional method.

**Bhusal (2000)** did a research on "A study on the effectiveness of teaching geometry using discovery module and expository module of teaching in secondary level" with the aim to find out whether to prove geometrical theorems as well as to compare. The achievement between the groups of the students taught by using discovery and expository model of teaching. The experimental was held on three weeks and t-test was applied to draw conclusion and concluded that discovery model of teaching was better then the expository model of teaching in geometry.

**Lamsal (2004)** did an experimental research on "A study on the effectiveness of problem solving approach on menstruation at secondary level mathematics." The aim of the research was to compare the achievement scores of student taught by problem solving approach and traditional approach and to determine effective approach of suitable classroom teaching learning in secondary schools at menstruation. His research concludes that the achievement source of student taught by using problems solving approach is better then the students taught by using traditional approach.

**Poudyal (2006)** conducted his study entitled "A study of the effectiveness of activity centered teaching method on mathematics achievement of third grade students in Syangia district" with the aim to investigate the effectiveness of activity centered

teaching method in teaching mathematics at third grade to compare traditional method of teaching mathematics. He prepared achievement test as a main tool and other tools were observation form classroom. He used pre-test post test experimental design to draw conclusion. He applied ANCOVA and concluded that activity centered teaching method was effective method in teaching mathematics at third grade students.

**Sah (2008)** did a study on "Effectiveness of inductive and deductive method on student achievement in teaching geometry at secondary level" with the aim to find out whether the inductive method was better then the deductive method of teaching triangle geometry at secondary level. Researcher selected the unit triangle on class nine. The t-test was applied to draw conclusion and concluded that inductive method could be more effective than the deductive method in teaching geometry at secondary level.

**Bam (2011)** did a study on "Effectiveness of cooperative learning in teaching circle at secondary level" with the aim to find out the effectiveness of cooperative learning method over conventional method in teaching circle geometry at secondary level. Research the unit circle in class ten. The achievement test was the tool for this study. In this study used mean, standard deviation, variance and t-test at 0.05 level of significance of data analysis. The t-test was applied to draw conclusion and concluded that cooperative method could be more effective then the conventional method on teaching circle geometry at secondary level.

**Paudel (2013)** did a study on "Effectiveness of cooperative learning method at lower secondary level" with the aim to find the achievement of cooperative learning and to analyzed the students behaviour over the conventional teaching method. The design of the study was posttest non-equivalent group design. Researcher selected the samples by purposive sampling method the achievement test, observation and unstructured interview are the data collection tools of this study. In this study mean, variance, standard deviation and t-test at 0.05 level of significance are used for quantitative data analysis and analytical method used in qualitative data analysis. To draw the conclusion that cooperative learning method was more effective then traditional method. He also concluded cooperative learning is more fruitful and benefited then traditional lecture method.

According to above mentioned literature review, various methods in mathematics teaching learning activities have helped to improve students' achievement rate. It is observed that co-operative learning strategy also improves student's achievement rate in lower secondary and secondary level. But there is not mentioned the impact of co-operative learning strategy in primary level. Therefore the researcher conducted the test to find out the impact of co-operative learning strategy in primary level.

In above study, the researcher found that, the use of teaching methods is very essential for teaching learning mathematics. All of those studies shown that the teaching methods helped the students to understand the concrete concept of the abstract subject matter. All the researcher shown that, using effective method in mathematics class, which improved the students achievement. Also students' centered teaching method encourage to the students for deep study of subject matter. It makes the students very curious, active and creative in mathematics class.

## **Theoretical Literature**

Cooperative learning has its roots in the theories of social independence, cognitive development, and behavioral learning. So the researcher under took this task to study on effectiveness of cooperative learning method in teaching mathematics at primary level.

Johnson, Johnson & Holubec (1998), gives three theoretical perspectives that guided research on cooperative learning. They are ;

1. Social interdependence theory : This theory views cooperative as resulting from positive links of individuals to accomplish a common goal. Interaction with other people is essential for human survival. In an education setting, social interdependence refers to students' efforts to achieve, develop positive relationship, adjust psychologically, and show social competence. The Gestalt psychologist Kurt Koffka proposed in the early 1900's that although groups are dynamic wholes the interdependence among members is variable. Kurt Lewin (1948) stated that interdependence developed from common goals provides the essential essence of a group. This interdependence creates groups that are dynamic wholes. The power of

the group is such that a change in any member or subgroup directly changes any other member or subgroup.

2. Cognitive development theory : This theory is grounded in the work of Jean Piaget and Lev Vygotsky. Piagetian perspective suggest that when individuals work together, socio-cognitive conflict occurs and creates cognitive disequilibrium that stimulates perspective taking ability and reasoning. Vygotsky's theories present knowledge as a societal conduct. Social development theory argues that social interaction precedes development. Consciousness and cognition are end product of socialization and social behavior. Vygotsky claimed that infants are born with basic abilities for intellectual development. Both Piaget and Vygotsky saw cooperative development and intellectual growth.

3. Behavioral learning theory : The assumption of behavioral learning theory is that students who work hard on task will get a reward and the students who fail to work or tasks will get no reward or punishment. This theory perspective presupposes that cooperative effort are fueled by extrinsic motivation to achieve group rewards. Cooperative learning is one strategy that rewards individuals for participation in the group's effort.

These literature helped me to conduct my research. Instead of the above related literature the following literature helped to conduct this research (Salvin 1935). Student Teams Achievement Division (STAD), one of a set of instructional techniques, collectively known as student team learning is a very adaptable teaching method among all cooperative learning techniques. Those techniques are based on the idea of having students work in cooperative learning teams to learn academic objectives.

In STAD, students are assigned to four or five member teams reflecting a heterogeneous grouping of high, average and low achieving students of diverse ethnic background and different genders. Each week teacher introduce new material through lecture, class discussion or some form of a class presentation. Team members then collaborate on worksheet designed to expand and reinforce the material taught by the teacher. Team members may

- work on the worksheet plains
- take turns quizzing each other,
- discuss problems as a group
- use whatever strategies to learn the assigned materials.

Each team will then receive answer sheet, making clear to the students that their task is to learn concept not simply fill out worksheets. Team members are instructed that their task is not complete until all team members understand the assigned materials.

Teammates are not permitted to help one another on these quizzes. The quizzes are graded and the teacher then calculates individual scores into team scores. Each student contributes to the team score is related to a comparison between the students prior average and base score. If students quiz score is higher than the base score, then that student will contribute positively to the team score. This scoring method rewards students for improvement. It is most appropriate for teaching well-defined objectives with single right answers, such as mathematical computations and applications. However, it can easily be adopted for use with less well-defined objectives by incorporating more open-ended assessments, such essays or performances.

The main idea of STAD is to motivate students to encourage and help each other master skill presented by the teacher. If students want their team to earn them rewards, they must help their teammates to do their best, expressing norms that learning is important, variable, and fun. The students are allowed to work together after the teacher lesson, but may not help each other with quizzes. So every student must know the material. At last, STAD is a generic method of organizing the classroom rather than comprehensive method of teaching any particular subject. STAD has four major components (Slavin, 1995) which was the basic guideline of the classroom approach in this study.

### **1. Class presentation**

The class presentation is a teacher-directed presentation of the material, concepts, skills and processes that the students are to learn, carefully written and

planned objectives should be stated and used to determine the nature of the class presentation. Several lessons would be devoted to class presentations, and the team study to follow.

## **2. Team study**

In STAD teams are composed of four to five students who represent a balance in term of academic ability, gender, and ethnicity. The team is the most important feature of STAD, and it is important for the teacher to take the land in identifying the members of each team. Slavin recommends rank ordering your students in terms of performance. Each team would be composed of high and low ranking student and two near the average. The goal is to attempt to achieve parity among the teams in the class. Teams should also be formed with sex and ethnicity in mind. Each team should be more or less an average composite of the class.

## **3. Test**

After the team study is completed, the teacher administers a test to measure the knowledge that students have gained. Students take the individual tests and are not permitted to help each other.

## **4. Team Recognition**

Recognition of the work of each team can occur by means of a question answer sheet handout board that reports the ranking each team within the class. It is important to realize that praising students academically from low status groups is an integral part of the effectiveness of cooperative learning. After teams study, they were certified as superior team, super team great team, very good team, good team and poor team respectively reward them.

This theory was very helpful to the researcher to conduct this study. This is basic guide of the classroom presentation in this study.

## Conceptual Framework of the Study

The conceptual framework (figure 1) of this study was based on the teaching learning process of Slavin STAD (1995) model. That portrayed the teaching learning process of dynamic with input and out put. Wachanga & Mwangi (2004)

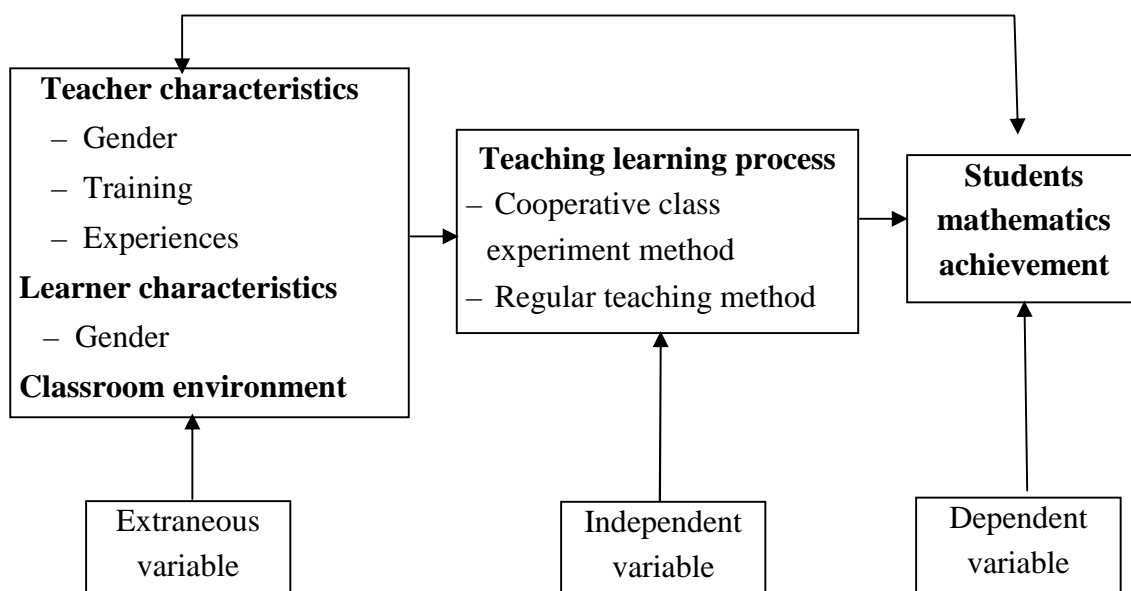


Figure 1

The above figure shows that teacher characteristics (gender, training, experiences), learner characteristics (gender), classroom environment are extraneous variable. Teaching learning process i.e. cooperative learning strategy and conventional regular teaching method are independent variables and students' achievement is dependent variable. The researcher controlled the extraneous variable and used cooperative learning for the test, the effect of independent variable over the dependent variables.

## Chapter - III

### METHODS AND PROCEDURES

This chapter was designed for describing the methodology it describes the design of the study, population, sampling, data collection procedure and data analysis procedure.

#### Design of the Study

This study was conducted with the help of pretest-posttest non equivalent experimental group design which is presented below :

Table 1

Groups	Pretest	Treatment	Post test
Exp. (E)	T <sub>1</sub>	with cooperative learning	T <sub>2</sub>
Ctrl (C)	T <sub>3</sub>	with conventional method	T <sub>4</sub>

Where,

T<sub>1</sub> & T<sub>3</sub> means scores of pretest result of experimental & control group.

T<sub>2</sub> & T<sub>4</sub> mean scores of posttest result of experimental & control group

Researcher made two non equivalent group of student experimental and control group. Researcher taught the experimental group by applying the cooperative learning method and control group by using conventional method.

In this study, two groups were made nearly equivalent by looking at the obtained marks of students in final examination of grade III. The study was conducted only 25 days. The researcher prepared the achievement test paper then pre and post-mathematical achievement test were employed to assess students achievement. Then the mean, variance and SD of both groups were calculated. The difference in mean scores was tested by t-test at 0.05 level of significance to determine statistical difference between them.



## **Sample of the Study**

The researcher has chosen one school purposively which was Shree Kalasilta Primary School Simikot Humla. Then the researcher divided the two groups of the whole students of grade IV. The groups were made homogenous as far as possible by their pre-achievement scores of grade III in final examination. There were 15 students in experimental group and 15 students in control group for the experiment and control groups by using lottery method to divide the group. These groups were assigned to separate by even and odd serial numbers.

## **Tools**

For the research study, researcher had included different source of data. For this, several methods were used to collect information. The researcher had used achievement tests, unstructured interview and classroom observation note as the tools of the study.

### **Achievement tests**

The researcher developed an achievement test on the basis of prescribed curriculum and text book of grade IV including unitary method, time, money, measurement, perimeter of rectangular and algebra chapters. It was mandatory to evaluate the effect of co-operative learning method in the mathematics achievement in students. The achievement test consisted the 14 objective and 8 subjective types of questions (See Appendix- A). It was the main tool for the data collection in research. The researcher used the same test paper in pre and post achievement test in both experimental and control groups during experimental period. The test was developed by consulting with the school teacher and subject expert.

### **Reliability**

Reliability is the degree to which a test consistency measures whatever it measures. So, the reliability refers to consistency of the results. To ensure the good quality of the test, the validity and reliability should be checked. In present study the test was piloted involving 10 students in Bhemsan Lower Secondary School Simikot Humla. By applying the split-half method, reliability by the test was determined (See

Appendix B). The reliability of the test was found to be 0.94. It indicates that the mathematics achievement test is reliable.

### **Validity**

Validity is a general term referring to a judge regarding how well a test or other measurement tools measure what it purposes to measure. This judgment has important implications regarding the appropriateness of inferences made and actions taken on the measurement. For the estimation of validity of this test, it had already been mentioned the school teacher and mathematics educators earlier. Therefore, it can be said that the test is valid.

### **Observation Note**

Observation is one of the techniques to collect information in any research. The researcher found many important aspects of study by observation. Observation conducted in natural setting gave more reliable data for the studies, pre-determined frame of observation from was used to collect the information. Here the researcher observed the classroom activities of students in both group. Researcher note that the participation of students, interaction, performance, homework, regularity, interest in the subject matter and appearance of face in the classroom by means of observation tool which reflects the effect of cooperative learning in teaching mathematics at primary level. The sample of class observation diary note is showing the Appendix-G. This tool was administrated to find out the qualitative information of the students.

### **Interview Schedule**

An interview is a conversation between two or more people where questions are asked to obtain information about the interview. Interview is also one means of data collection. A formal face-to-face meeting in which the interviewer asked some questions with clients and replied by them. There were many types of interview, especially direct interview was conducted with the clients in this study. In this technique the researcher not only asked the questions but also observed all behaviour and answering ways of the respondents. Here the researcher wanted to obtain information from the interviewee by unstructured interview.

## **Teaching Episode**

The researcher developed the teaching episodes for experimental group containing the unitary method, time, measurement, parameter of rectangular and algebra chapters. The teaching episode developed by the help of mathematics in context lesson plan (See Appendix - F). In which researcher taught the students' by using cooperative learning strategy. In every teaching learning activities including four steps i.e. class presentation, team study, test and team recognition. First the researcher present the subject matter in the classroom. Then the researcher given team work in each team. Each team would be composed of high ranking, near the average and low ranking students. After that team study is completed, the researcher administered test to measure the knowledge that students' have gained. Students take the individual tests. Then the researcher recognition of the work of each team can occur by means of a question answer sheet handout board that report the ranking each team within the class. Then there were certified as very superior team, super team and poor team respectively. For the reliability and validity, it was checked by the math teacher and subject expert.

## **Pre-experimental stage**

At first the sample school was Shree Kalasilta primary school selected then the tools of the study were selected. The teaching episode was developed within the course as recommended by the ministry of education. Then researcher developed the different forms to record student performance such as home/class/team work, attendance, learning attitude, creativity work in mathematics. The selection of experimental and control group was made randomly by random sampling method. The experimental group was subdivided into 3 groups including high ranking, low ranking and near the average.

## **Experimental stage**

Researcher conducted actual experimental study in this stage. Both groups were engaged in learning process. The researcher taught the experimental group at fifth period of that school and that school teacher taught the control group at the same time. Then in the sixth period the researcher taught the control group and the teacher went the experimental group. This system was conducted in 25 days. In this stage experimental group was taught by using cooperative learning strategy. Every students

took part in actively interaction with each other and also in different other small groups. But the controlled group was taught by using conventional teaching methods. In the teaching period, the researcher observed students' behaviors by using different forms. At last, post test was administered as formal exam on both groups.

### **Manipulation and control exercise in the experiment**

In this study, researcher used cooperative learning strategy for the test to find out the effect of independent variable over the dependent variables. The researcher tried to analyze the effect of independent variable cooperative learning strategy over the dependent variables achievement.

In this study, some extraneous variables such as teacher variable, teaching aids, length of experiment, examination system, evaluation system to students, environment and group formation were controlled in order to minimize the effect on dependent variables. The researcher conducted an experiment into two different groups by applying two different methods by the researcher himself in this study. The group formation of students was four or five members in each team reflecting a heterogeneous group of achieving students' diverse ethnic background and different gender. Then the experimental and control groups were selected randomly by random sampling method. Students were taught the same book, same topic and equal time. They were given same teaching materials, homework and class work on both the groups.

### **Variables controlled**

Some variable were controlled in the following way during experimental period.

- ) **Teacher variable** : Researcher himself taught both the experimental and control group.
- ) **Subject matter** : Same contents were taught to both the experimental and control group.
- ) **Length of experiment** : Equal time duration were attributed to both the group.
- ) **Equating the group** : The achievement test paper-1 was the same for all student. After pre test the researcher arranged their achievement score of

pretest in descending order. The researcher determined two groups by their even and odd serial number of pretest marks. Then, both the groups were nearly homogenous. Finally, the researcher determined the experimental and control group by lottery method.

- ) **Variable uncontrolled** : Some of the extraneous variable like I.Q. of the student, socio-status, interest, student home environment were not controlled.

The possible threats on the internal validity in the current study were location, maturation, regression, researchers characteristics, and his bias the location and history threats were controlled by administering the pretest-posttest at the same time.

### **Data Collection Procedure**

At first the researcher separated the two groups (control and experimental) for the purpose of research. Then researcher assigned the pre test two both groups and listed the obtained marks of the students. Then the researcher taught himself both the experimental and control group from 2071-3-5 to 2071-3-29, altogether 25 days. The experimental group was taught by using cooperative learning strategy using teaching episode in the fifth period of school day. The control group was taught the same topic by conventional teaching method, using the textbook of grade IV in sixth period. During the experimental period, the researcher observed students' behavior and noted it. At the end of the experimental period, the standardized test was administered to both the groups. The time duration of the examination was 45 minutes which was determined with the help of pilot test. After the examination answer sheets were collected and scored by the researcher be prepared daily classroom observation notes which reflected the daily classroom activities of the students.

### **Data Analysis Procedure**

Mean, standard deviation and variance was calculated for both groups with their secured mark in test. t-test for independent sample at 0.05 level of significance to compare the achievement of both the group.

Qualitative data obtained from observation was analyzed descriptively. And the data obtained from the observation dairy were analyzed descriptively.

## Chapter - IV

### DATA ANALYSIS AND INTERPRETATION

This chapter deals with statistical analysis and interpretation of data obtained from the achievement test of the sample students, these data were tabulated and analyzed by using mean, variance, standard deviation and t-test for difference between two means. The data of the achievement test scores were analyzed under the following way. Qualitative data obtained from observation were analyzed descriptively based on different headings.

#### Comparison of the Achievement between Experimental and Control Group for Pretest Data

The pretest scores of students is presented in appendix C and the summary of statistical calculation for both groups on the pretest is presented in table (2).

Table 2  
Mean, Variance and SD of Pretest result

Group	Number	Mean	Variance	S.D.	Cal. t-value	tabu. t-value	level of significance
E	15	19.20	49.93	7.60	0.188	2.048	0.05
C	15	18.73	45.75	6.76			

By the table (2) mean, variance and standard deviation of the two experimental and control groups on the pretest. In the other words, the mean of experimental was 19.20 and the mean score of control group was 18.73. The variance of experimental and control group was 49.93 and 45.75 and the standard deviation of experimental and control group was 7.06 and 6.76 respectively. The calculated t-value in test was 0.188 which was less then corresponding tabulated value 2.048 at 0.05 level of significance with degree of freedom 28. Therefore null hypothesis  $\hat{\mu}_1 = \hat{\mu}_2$  was accepted. Hence there is no significance difference between students achievement of experimental and control groups in maths at primary level. So the experimental and control group are nearly equivalent.

## Comparison of the Achievement between Experimental and Control groups of Posttest Data

The posttest score of students of experimental and control groups are presented in appendix D and the summary of statistical calculation for both groups on the posttest were presented in table (3).

Table 3  
Mean, Variance and SD of Posttest Result

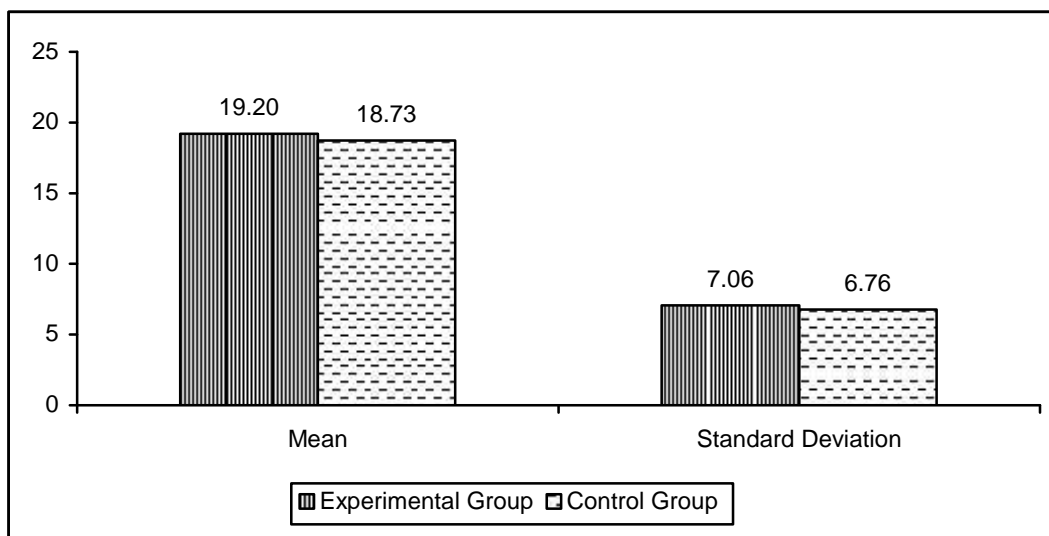
Group	Number	Mean	Variance	S.D.	Cal. t-value	tabu. t-value	level of significance
E	15	22.26	9.80	3.13	2.67	0.048	0.05
C	15	19.80	3.36	1.83			

The table (3) reports mean, variance, standard deviation of two experimental and control groups on the posttest. The mean of experimental group was 22.26 and the mean of control group was 19.80. The standard deviation of experimental group and control group was 3.13 and 1.83 respectively. The calculated t-value in posttest was 2.67 which was greater than the corresponding tabulated value 2.048 at 0.05 level of significance with 28 degree of freedom. Therefore the null hypothesis,  $\hat{\mu}_1 = \hat{\mu}_2$  was rejected hence the alternative hypothesis accepted. It shows that there is a significance difference in the achievements between the experimental and control groups. Further it can be concluded that cooperative learning method is more effective than conventional regular teaching method in mathematics.

### Comparative Bar Graphs of Mean Achievement scores of Experimental and Control group pretest-posttest

Bar graphs provides a visual of the pretest-posttest results for comparison and to understand this results more beneficially. So the researcher presented the data diagrammatically through bar graph. The graph indicates the scores of the students which is given below :

**Figure 2**  
**Mean Score and Standard Deviation Score Distribution of Pretest**  
**Result in Bar Diagram**



The figure 2 shows the mean and standard deviation scores on pretest of experimental and control both group. The mean score of experimental group is 19.20 and control group is 18.73. The standard deviation of experimental group is 7.06 and control group is 6.76. This shows that the mean score of experimental and control group is nearly equivalent in the pre experimental situation.

**Figure 3**  
**Mean Score and Standard Deviation Score Distribution of Pretest**  
**Result in Bar Diagram**

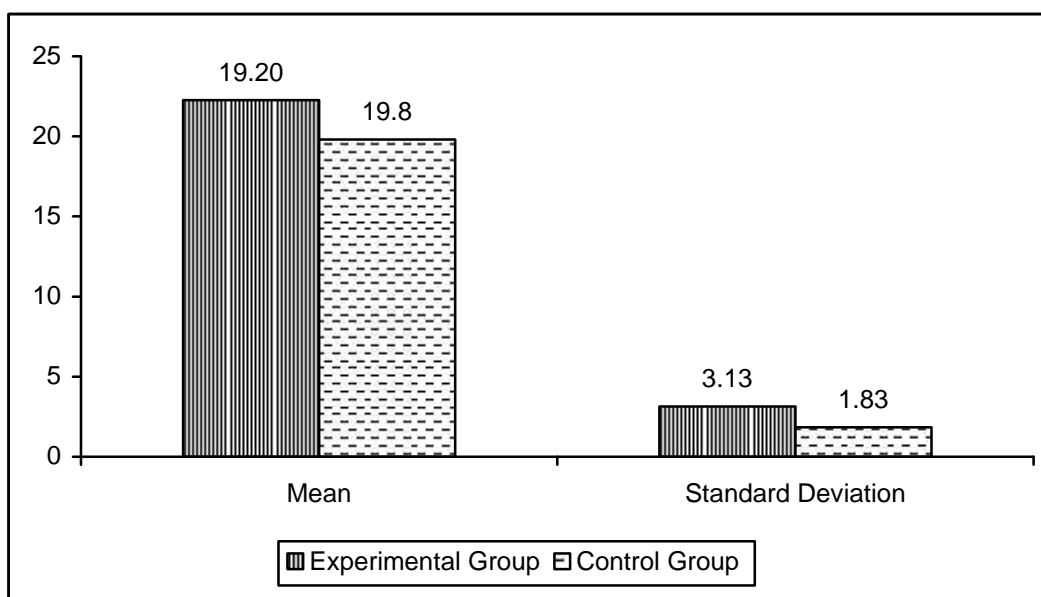




Figure 3 shows that the mean and standard deviation scores obtained by the students of experimental and control group in the posttest. The mean score of experimental group is 22.26 and control group is 19.80. The standard deviation of experimental group is 3.13 and control groups is 1.83. The mean score of experimental group is greater than the control groups and the standard deviation of experimental groups is also greater than the control group. This result indicates that the experimental group has better result than the control group. Hence the achievements of the students taught by using cooperative learning method is better than the achievement of the students taught by conventional teaching methods.

### **Analysis of the Qualitative Data**

Qualitative analysis was done with the help of the information collected through daily classroom observation of the both experimental and control groups. Behaviour of students after the completion of co-operative learning activities were noted. Participation, learning interaction, attendance rate, motivational behaviours, homework, class work etc. of the students in both groups were recorded regularly during the experimental period.

#### **Participation**

The term participation is defined as a procedure in which a student takes part academically in an activity or event on the classroom activity. It is degree of involvement of students' in the sector where they contribute their time further study. Students stay interested and learn more from class when teacher use many different techniques to involve them in the learning process. This range from very short and simple technique like telling the story, to more involvement activities like small student work, groups doing collaborating learning strategy.

*During the lesson of time table, teaching, one student was allowed to play Chungi and another student observed time taken. All the student participated in this activity and they were interested in the game.*

*Students became excited knowing that they could also learn from game. Participation in all teaching activity increased and students started to work in groups.*

There is low participation of students in traditional teaching learning method. But there is maximum participation of students' in student oriented teaching learning activity. In this type of activities, students' are accustomed to learning spontaneously. When observing class at experimental period, it was found that there was more participation of students in experimental group than in control group. It was also seen that the students of experimental group learnt fast. In experimental group, the researcher observed students activities in the classroom with the help of regular diary notes. After analyzing the diary notes it was found that the students were active, more interested in learning. the students in experimental group assigned their class work well. The students worked actively in a group by interacting to each other. They shared their ideas during their learning.

Most of the students in control group were passive. They were not eager for active participation. In control group it was found that only the high achiever students participated for seeking the right answer. Only a few students performed better in class and homework. Some bright students participated in teaching learning activities average and low ranking students did not seem to be well motivated in participating in teaching learning activities. From this, it can be concluded that cooperative learning method is more useful to participate student in teaching learning activities.

### **Learning Interaction**

Learning interaction is one of the most important elements of student centered teaching learning approach. In cooperative learning strategy most of the students interact face to face in each heterogeneous groups. So there is a sharing of own ideas and easily accomplish a common goals. Interaction done by students during teaching learning activity is called learning interaction.

*During teaching unitary rule, in teaching learning method the question given were write a table of any ten things available in shop. Write a table of any five things you need in a week. These questions were found solved by interaction. Students solved this problem by discussion with each other and the rate of interaction increased in class room. Students concentrated in their work due to learning through interaction method.*

By observing class it was found that there was more interaction in experimental group. In control group, students did not seem to be busy in interaction. They seemed to be only passive learners, did not show much interest with their teacher because of their fearfulness and shyness-students were found non-cooperative to learn and solve the problems. They were not found sharing their ideas to each other. But in experimental group students were found responsible for group work. Students got ready for the examination and did not have fear of failure. They shared their ideas during their learning. They worked actively in a group by interacting to each other while in control group. There was lack of interaction. From above notation and explanation it can be said that method can play important role to increase interaction in classroom. Cooperative (students centered) method is useful and interactive than conventional.

### **Attendance Rate**

The presence of students in class room during experimental period in both experimental and control groups is called attendance rate. Students are expected to attend classes regularly. Classroom attendance is often one of the most necessary and important means of learning and in many classes, is essential to the educational objectives of the course. Attendance rate is calculated by number of days that a pupil attends the class is divided by total number of days that the classes hold then multiply by hundred.

*Due to the inclusion of new, innovative and interesting activities in teaching learning activity. Students used to attend class every day and in this way attendance rate increased.*

It was found that there was increasing of the students attendance rate in control group but not more than experimental group. The reason of this increasement is discussion, interaction, co-operative, practical teaching activities in experimental group. In control group, it was found that there was low rate of attendance surely it was due to lack of participation and interaction in classroom. In experimental group the students were interested in new innovate teaching learning activity. Their enthusiasm increased in classroom. They used to attend class punctually. Students did not feel bore in experimental group. Students used to attend class because they felt interesting excitement in classroom with new teaching learning activity.

According to the school records, the attendance rate of the students before the research study was 66 percent but the attendance rate of the students' during research period 82 percent was found. Also the attendance rate of control and experimental groups were 76 percent and 87 percent respectively. Hence the researcher concluded that the attendance rate of experimental group was greater than the control group because the effect of cooperative learning strategy.

### **Motivational Behaviour**

The process of paying attention of students during teaching learning activity is called motivational behaviour. The concept of motivation is linked closely to other construct in education and psychology such as constructs of attention, need, goals and interest which are all contributing to stimulating students' interest in learning and their intention to engage in particular activities and achieve goals (Krause, K.L., Bochner, S & Duchesne, S.,2003). There are two types of motivation, these are: extrinsic and intrinsic motivation.

*For example: children play game for no other reward than the fun they get from the game itself or students who are intrinsically motivated may study hard for a test because he/she enjoys the content of the course.*

*Students were allowed to perform activities related with subject matter. Therefore they were more motivated to teaching learning activity. For example : Showing calendar during the teaching of week and months, exhibiting coins, notes during the teaching of monetary. Along with these activities students start discuss with each other enthusiastically.*

By observing classroom, it was found that the students of experimental group were more motivated than the students of control group. Average students did not seem to be well motivated in participating in teaching learning activities in control group. The students in control group, were passive participants. After observing class it was found that the students were lazy, making noise and involved in other activities like taking some other students in control group. But the students were found eager, enthusiastic, paying their attention to the subject matter in experimental group. In experimental group, the teaching strategy is student oriented. They were involved in activities related to subject matter. When student is actively involved in learning the rate of motivation increase. The researcher found that the students in experimental

group were active participants and they paid their attention fully to the subject matter. From this we can conclude that cooperative learning strategy is more motivative and enthusiastic students in teaching learning activities.

### **Home/class work**

Class works are daily written works done in the classroom. The teacher uses them to reinforce information just explained before. Class works may occur daily, the teacher grades the students according to their performance on the class works.

Homework is a powerful tool of the internal assessment for school education. It is the school assignment to be completed out of regular school hours at the residence of the pupils. Therefore any assignment given by the teacher to their students to be done at home is the homework.

*Every student completed their class work/homework to maintain individual and group accountability well. Students solved the problem easily because of simple and practical presentation of subject matter.*

By observing class, it was found that students of experimental group did their class work and homework punctually but the students of control group did less class work and homework than the students of experimental group. It was found that only a few students completed their homework and class work in control group. When the students cannot understand the lesson well then he/she becomes relevant to do homework/class work. In control group, students were not involved in practical activities. They were like the audience of tape recorder. But in experimental group the teacher included the student oriented method. The researcher found that the students were engaged in class work/homework in experimental group. They took their teacher as co-operator not as strict instructor. They did not frighten with error in their class work/homework. It was found that the understanding of students about class work/homework changed in experimental group.

From the above discussion, it can be concluded that the students in experimental group were found more active, motivated, learner centred, excited, enthusiastic, doing class/homework than the students in control group. So we conclude that cooperative learning method is more effective than conventional regular teaching methods.

The researcher conducted unstructured interview to collect the feeling of students towards the teaching methods. The researcher asked some questions, how and what they felt about the cooperative learning teaching methods. Their views are as follows:

*It was said that they enjoyed learning mathematics by cooperative learning method and enjoyed in sharing their ideas to each other. It was said that they felt active effective and funny classroom activities that made their friendship strong.*

*Cooperative learning methods improved the learning environment in the classroom and school. It reduces to the math anxiety in classroom and focused the students one subject matter. It helped the students to connect ideas and integrate their knowledge. So that they gained deep understanding and deep mathematical concept.*

*It was said that they didn't complete the homework before using cooperative learning method but after using they started to do their home work regularly and used to read mathematics and solve problems in house also. They enjoyed doing given problem after their teacher introduce the method.*

From the above responses, the researcher found that every student of experimental group was curious and interested to learn mathematics. The researcher found that the students were active, participated in learning activities and the students felt suitable and adoptable classroom environment that facilitated them for learning and solving the mathematical problems, therefore it is concluded that cooperative learning method is better than conventional regular teaching methods.

## Chapter - V

### SUMMARY, FINDING, CONCLUSION AND RECOMMENDATION

This chapter deals with summary, finding, conclusion and recommendation.

#### Summary

This study was concerned with the study of effectiveness of cooperative learning in learning mathematics at primary level. This study was pretest-posttest non-equivalent experimental group design. The objective of this study was to find out the effect of cooperative learning strategy in teaching mathematics at primary level and to analyze the student's behaviour during experimentation. The researcher developed test-items with the help of prescribed curriculum and text book of mathematics of grade IV. He administrated the test in Shree Kalasilta Primary School of Humla District.

For this study the researcher selected Shree Kalasilta primary school purposively. Control and experimental group were determined by lottery methods after administration the test. Each group had contained 15 students. The researcher developed the achievement test including the topics unitary method, time, money, measurement, perimeter of rectangle and algebra. Then the control group was taught using conventional regular teaching method and the experimental group was taught by using cooperative learning strategy. Also the researcher have taken the pre and post-mathematical achievement test to assess students' achievement. The pretest-posttest score were analyzed by using mean, variance, standard deviation and t-test for 0.05 level of significance after administrating the test. The difference in mean score between experimental and control group were found significant. The qualitative data obtained from observation note were analyzed descriptively based on different heading. i.e. participation, learning interaction, attendance rate, motivational behaviour and class/homework.

## **Finding**

On the basis of the analysis and interpretation of the data the major finding of the study were as follows :

- ) The mean achievement score of students taught by using cooperative learning method was significantly better than the student taught by conventional regular teaching method in mathematics.
- ) Students were more interested and enjoyed to learn mathematics found from the class observation.
- ) The opinion of students were that cooperative learning strategy was more effective than conventional method of teaching mathematics.
- ) By the class observation, all type of students (high, near the average and low ranking) were engaged to learn mathematics.
- ) By the observation note, the researcher found that cooperative learning strategy was useful for participate students in teaching learning mathematics.

## **Conclusion**

From the result of this study the researcher found that the mean achievement score of pretest was as nearly equal in both groups before the experiment. But the mean achievement score of students taught with using cooperative learning strategy was higher than the achievement score of students taught using conventional regular teaching method. The researcher selected experimental and control groups by the lottery method. The researcher taught the same topic to both groups. The achievement test was constructed by researcher than the pretest was administrated before the experiment. After completing the experiment an achievement test was administered on both the groups than mean, variance and standard deviation scores was calculated. Used the statistical t-test at the 0.05 level of significance. Also the researcher analysis behaviour of the students' while teaching by cooperative learning method which was done qualitatively with the help of the information collected through daily classroom observation. During experimental period teaching by cooperative method, the researcher observed that the attendance rate of the students became high. The



participation rate of the student's in experimental group were higher than the control group. It found from the observation of class work, group participation and interaction performance. Hence the cooperative learning strategy is more effective than conventional regular teaching method.

## **Recommendations**

According to the results of the current research study which revealed that there was an efficiency of using cooperative learning in improving students achievements in mathematics, the following can be recommended :

- ) The mathematics teacher should be encouraged to use cooperative learning in teaching mathematics.
- ) Students should be encouraged to involving in active participation in learning mathematics at classroom activities.
- ) Different cooperative learning strategies should be carried out in all branch of school mathematics.
- ) It is recommended that to do the similar study on the other level of school and other subject as well.
- ) Further study should be done in different district of Nepal using different design different samples.
- ) It is recommended that more research be carried out in different field of study to concentrate on improving the quality of learning and enhancing problem solving skill.