

Chapter I

INTRODUCTION

Background of the Study

Mathematics which was created with human needs is going ahead along with human civilization. The term "mathematics" has been interpreted and explained in various ways. According to Oxford Advanced Learners Dictionary, "Mathematics is the science of number and space". Mathematics is a source as well as an effective/beautiful tool for earning the life smoothly and worthfully in a developed way. If we try to list the definitions of mathematics, the work will never be ended. It is from a way to settle in the mind a habit of reasoning to an organized body of knowledge in which each proposition follows as a logical consequence of proved propositions. Mathematics is a collective, continuous and expansionable subject so it requires previous knowledge and skills that help for further study. Students should understand the new concepts and relations in mathematical form then after they generalize and use in other situations clearly.

Actually, mathematics is the study of quantity, structure, space and change. It developed with abstraction and logical reasoning from counting calculation measurement and the study of shape and motion of the physical object. A body of related course concerned with knowledge of measurement, properties and relation quantities including theoretical or applied studies of arithmetic, algebra, geometry, trigonometry, statistics and calculus. It is the study of patterns of structure, change and space and "figures and numbers."

Mathematics education is concerned with the development, implementation of appropriate mathematics curriculum, its issues and teaching learning process of mathematics. In keeping with the concept of lifelong learning, mathematics education

cover learners of all age and at all level from early childhood to adults. Thus mathematics education is not only concerned with curricula, classroom, teacher and learners in school but also associated with issues of school mathematics curricula, teaching, learning and evaluation. It is an applied discipline deals with the wider application of mathematics in different sectors and fields. Mathematics is the base of scientific development of modern technology and fundamental study of physical and engineering of all kinds. The main objective of mathematics education is to prepare well qualified capable teachers in both content and process of teaching mathematics

Mathematics is the gate way of different fields of higher education. In order to make mathematics learning meaningful and effective in classroom, students should be interested to learn mathematics and they should find its usefulness and application in their real life situation. Various types of methods of mathematics teaching can be used to achieve the goal. Subject matter that will also help in achieving the aim of the study and select the proper method of teaching concept.

Mathematics is an important subject, which is inseparable discipline of human life because it is useful for each and every human activity. Mathematics has direct impact for the development of physical and social science. It is the base of scientific development of modern technology and very useful tool in commercial and industrial field. All scientific discoveries depend upon the mathematics because mathematics is the backbone of studying science and it supports the concentration of related study. Mathematics provides techniques in studying very useful information of figures, charts, diagrams, graphs, geometrical figures, technical drawing and so on.

Mathematics education is the dynamic side of education and important component for children. Teaching mathematics is a tool for solving practical problems. Now a day the aim of mathematics teaching isn't only to develop

mathematics competence but also it is competence on the part of learner. Mathematics education is a science that deals with mathematics from educational view, comprises different aspect of philosophical and psychological terminologies and it concerned about curriculum farming, teaching and evaluation of mathematical learning.

Mathematics is essential subject and it is included as a basic subject in school curriculum. Students learn mathematics with the help of good text-books, classroom teaching and discussion. Effective teaching and learning depends upon proper teaching method. Generally, mathematics is taken as difficult subject however; it can be made interesting and understandable to students when a qualified teacher teaches with appropriate teaching method.

Teaching mathematics can only be described as truly effective when it positively impacts student learning. We know that teaching practices can make a major difference to student outcomes, as well as what makes a difference in the classroom.

An information and technology based society requires individuals who are able to think critically about complex issues, people who can “analyze and think logically about new situations, devise unspecified solution procedures, and communicate their solution clearly and convincingly to others” (Baroody, 1998). To prepare students to function in such a society, teachers have a responsibility to promote in their classrooms the experience of problem-solving processes and the acquisition of problem-solving strategies, and to foster in students positive dispositions towards problem solving. In promoting problem solving, teachers encourage students to reason their way to a solution or to new learning. During the course of this problem solving, teachers further encourage students to make conjectures and justify solutions. The communication that occurs during and after the

process of problem solving helps all students to see the problem from different perspectives and opens the door to a multitude of strategies for getting at a solution. By seeing how others solve a problem, students can begin to think about their own thinking and the thinking of others and can consciously adjust their own strategies to make them as efficient and accurate as possible.

Statement of the Problem

Mathematics is one of the important disciplines because it has universal application. All the disciplines in the world use mathematics. Moreover, in everyday life of a common man mathematics plays a vital role. In spite of being such an important subject, educating mathematics to people has been a great issue in the present world. Traditionally, there used to be teacher oriented classes. However, in the present time classroom activities are designed to focus on students. Different problem solving methods are used. In Nepal, education data shows that result of mathematics subject is poor. There may be many reasons of poor result such as focus on answer rather than process, teaching emphasis on bookish knowledge, exam oriented classes, etc. Even trained teachers are not giving good results. So, the questions arises, are the problem solving methods appropriate and effective?

In order to ascertain the effectiveness of problem solving approach, this study intends to answer the following questions:

- i) Is problem-solving approach of teaching mathematics more appropriate than the traditional teaching method at lower secondary level?
- ii) Does the problem-solving approach of teaching affect the achievement of students in mathematics particularly in Arithmetic compare to the traditional method of teaching in lower secondary level?

Objectives of the Study

This study aims to find out the effectiveness of the problem solving methods used in learning mathematics compared to the traditional method of teaching. The specific objectives of the study are:

- To compare the achievement of students taught by using problem-solving method and by using traditional method of teaching in terms of gender.
- To explore the effectiveness of problem-solving method in teaching Arithmetic at lower secondary level.

Significance of the Study

It deals with the rationale of the study. Mathematics is an essential part of school curriculum. It has been taught for all students as compulsory subject at school level. So every student needs the fundamental knowledge of mathematics to solve his/her daily life problem. Generally, mathematics is considered as difficult subject; most of the students afraid from it and are failed in mathematics in Lower Secondary level.

This study is expected to be significant for the reason that it will help to determine the effectiveness of problem solving method in teaching Arithmetic at lower secondary level which can be useful to improve the mathematics teaching/learning process and to reduce the failure rate in mathematics. This study provides the appropriate information about the appropriateness of problem solving method of teaching learning in comparison to traditional method of teaching learning. This study also expected to open the door for further research in the field of mathematics learning methods. So this research has been more relevant and contextual. Significance of this study can be listed as follows:

- This study has explored the effectiveness of problem solving method in mathematics teaching learning process, which is valuable for teacher, researcher, curriculum designer and other stakeholders related to mathematics education.
- The study is important to identify the comparison between the problem solving and traditional method of mathematics teaching in school.
- This study would be useful for government, NGO, INGO and related committees to improve the learning process in classroom for better mathematics results.
- This study may equally be useful to train the teachers with appropriate teaching pedagogies.
- It would be helpful to decrease the rate of low achievement in mathematics.

Delimitations of the Study

The study was delimited in the following criteria:

- i) The study was limited in two government schools of Makawanpur district.
- ii) The experimental duration of this study was only for four weeks.
- iii) This research was conducted to find out the effectiveness of problem solving method in teaching mathematics at lower secondary level.

Operational Definition of the Related Terms

Researcher has defined the related terms much more précised and in unambiguous way, however definition must based on theory that is generally recognize as valid. Researcher defines the following related terms:

Problem-Solving Method

Problem solving method of teaching is the replacement of traditional method of teaching. In this method, the classroom activities are pre-programmed. Classroom learning activities are designed to be student oriented. Teachers and students equally participate in learning process. And, different teaching and instructional materials are used. Students get subject knowledge with practical examples and simple auxiliary tools step by step.

Traditional Method

In this method, teacher is one of the authority of teaching learning activity and students passively accept the fact that exposed by the teacher. The interest and exception of the students are highly understood by teacher. The teacher explain, illustrate questions but nothing done by the students. This method of teaching learning is considered as traditional method.

Method

It refers to the planned way to teaching and learning management in class. It consists of the activities reform.

Achievement

The achievement on this study defined in term of score obtained by the learner in mathematics. Achievement test was conducted by researcher.

Effectiveness

The effectiveness in this study was defined in terms of magnitude of score obtained in mathematics achievement test, regularity in mathematics class, active participation in learning process in classroom & level of motivation in learning mathematics.

Control group

Group of students taught by using traditional method of teaching.

Experimental group

Group of student taught by using problem solving method of teaching.

Chapter II

REVIEW OF THE RELATED LITERATURE

It is essential to review the related literature for the study which provides the strong knowledge about the related topic. Number of books, research reports, papers and other booklets concerned with curriculum, teaching materials, methods and so on were reviewed for the study. However, the researcher could not find an investigation on the “Effectiveness of Problem-Solving Method in Teaching Mathematics at Lower Secondary Level”. The researcher has reviewed some related literature as follow:

Empirical Literature

Quaiyum (2003), did a research work on “A study of students problem-solving behaviors in mathematics at Secondary Level of Nepal” from Institute of Advanced Studies in Education, University of Locknow, India with the aim to identify the difference between boys and girls of secondary school in applying problem-solving approach and to assess the difference between boys and girls of secondary schools with regard to attitude towards mathematical problem-solving. Multi stage stratified random sampling had been used in the selection of districts, schools and students from central development region of Nepal. 432 students (250 boys and 182 girls) of grade IX from five districts. The t-test and chi-square test was applied and concluded that there was significance difference between boys and girls regard in applying problem-solving approach to mathematics and found with regard to attitude towards mathematical problem solving. He concluded that boys seemed to be more capable in learning mathematics in comparison to girls.

Kandel (2007), did a research on “Effectiveness of problem solving approach in Arithmetic at lower secondary level” with the aim to explore the effectiveness of problem solving approach in teaching learning arithmetic at grade VII. Out of 130

students, 25 students were selected for experiment and 25 were selected for control group. Statistical tools were mean and standard deviation and t-test was used to compare the achievement. He concluded that problem solving approach of teaching was better than the traditional approach of teaching.

Yadav (2008), did a research on “Effectiveness of problem solving method in teaching Algebra at lower secondary level” with the aim of prior use of experimental verification by teaching Algebra with problem solving method. Among 56 students, 42 were randomly selected with 21 students for experimental and 21 for control group. The data obtained from final achievement test was analyzed and interpreted by using t-test and concluded that the experimental verification have significant effect on teaching Algebra.

Lamsal (2008), did an experimental research on “A study on effectiveness of problem solving approach in teaching mensuration at secondary level mathematics of grade IX students” with the aim to compare the achievement of students taught by problem-solving approach to the achievement of students taught by traditional approach. A post test equivalent group design was adopted to conduct the experiment in concept mensuration of grade IX for four weeks. Sample of 58 students (31 boys and 27 girls) were taken and developed test consisting 30 items. Statistical tools were mean standard deviation and variance. Also t- test was used and concluded that achievement of students taught by problem solving approach of teaching improved significantly resulting better achievement than the students taught by traditional approach.

Ghimire (2010), did an experimental research on “A study on effectiveness of teaching mathematics by using problem solving method at secondary level” with the aim of effect of prior use of instructional verification by teaching arithmetic with

problem solving method. A post-test equivalent group design was adopted to conduct the experiment. 60 students were randomly selected with 15 for experimental and 15 for control group. Mean, standard deviation and t-test were used as statistical tools and conducted that experimental verification has significant effect on teaching arithmetic.

The above studies find that the problem solving method is more effective than the teacher oriented traditional learning method. Further they show that the boys are more benefited than the girl students by applying problem solving method.

Theoretical Literature

Problem-solving is a method of teaching to accomplish the instructional goals of learning basic facts, concepts and procedure as well as goal for problem solving within problem context. Polya, (1945) wrote in “How to solve it” that studying modern heuristics one “Endeavors to understand and the process of solving problem, specially the mental operation typically useful in this process.” In problem solving approach there are four phases:

a) Understanding the problem

Firstly, students should identify the given problem instead of asking questions than the teacher explains. The teacher should command the students to recite the problem. To understand the problem these points should be taken in consideration: What is given in the problem? What is to prove or identify the problem? Is there any information of the solution in the problem? If the students draw the figure and put the given data in figure etc.

b) Thinking a plan

After understanding the problem clearly, students should think about the plan. The teacher could ask “Did you solve the problem like this before it?” “What did we just take about our last lesson?” which stimulate the students to think and help to see how to apply to the problem. Some of the students are capable and they can give the answer, the teacher should encourage them for the correct response. Carry the discussion along with the class until an impasse is reached. In such discussion, the teacher is indirectly teaching students that some problems require more than first attempt in order to solve.

c) Carrying out the plan

The problem may have been essentially, an outline of what to do. After a plan, the students are encouraged to find the solution. For this, students should be active and the teacher should encourage them and provide guidelines. At this stage, the teacher should ask “Can you check the each step?”, “Can you say each steps is correct?” “Can you prove each step is correct?” etc.

d) Looking back

Problem should be checked after completing its solution whether it is true or not. In many instances, there may be alternative method of solution perhaps shorter than that solution and more mathematically satisfying method exists. As a teacher, he should ask students if they see any another way to solve particular problem and is there anything special about the solution of the problem that will help to recall in future.

In classroom teaching if the teacher solves the problem through this phase, then it will become more efficient, effective and fruitful. polya defined problem

solving as “to find a way when no ways is off-land, to find a way out of difficulty, to find away among obstacles to attain the desired that is not immediately attainable appropriate means. There is no problem unless the individual has the desired to find out the solution.”

According to Polya, solving problem is like swimming or playing Piano. At first it is hard, unpleasant and terrifying, but after practice it can be performed automatically and enjoyable. If you wish to learn swimming you have to go into water and if you wish to solve problem, you need to find a way. Thus, problem-solving is the appropriate approach in teaching mathematics.

Cockcroft also advocated problem solving as a means of developing mathematical thinking as a tool to daily life living saying that problem solving abilities lies in the heart of mathematics. It can be applied into vehicle for teaching and reinforcing mathematical knowledge and hoping to meet everyday challenges and to enhance logical reason. (Cockcroft 1989:37)

Problem-solving method aims at representing the knowledge to learn in the form of problem. It begins with problematic situation and consists of continuous, meaningful and well-integrated activities. The problems are set for students be in natural way and it is insured that the students are genuinely interested to solve them.

Mathematics is the subject of problems. It's teaching and learning demands solving innumerable problems. Efficiency and ability in problem solving is guarantee for success in learning this subject. The problem-solving approach procedures involve the following steps: Recognizing or sensing a problem, interpreting, defining and delimiting the problem, gathering data in systematic manner, organizing and evaluating the data, formulating tentative solution, arriving at the true or correct solution and verifying the result.

Problem Solving

Problem-solving strategies are methods that can be used successfully to solve problem of various types. Teachers, who use relevant and meaningful problem-solving experience as the focus of their mathematics class, help students to develop and extend a repertoire of strategies and methods that they can apply when solving various kinds of problems – instructional problems, routine problems, and non-routine problems. Students develop this repertoire over time, as they become more mature in their problem-solving skills. In secondary school, students will have learned many problem-solving strategies that they can flexibly use and integrate when faced with new problem-solving situation, or to learn or reinforce mathematical concepts. Common problem-solving strategies include the following : making a model, picture, or diagram; looking for pattern; guessing and checking; making assumption; making an organized list; making a table or chart; making a simpler problem; working backward; using logical reasoning etc.

Problem-solving is not a process of applying rules that have been learned previously but also a process that yields new learning. It is the process of accepting a challenge and striving to resolve it. The teaching of problem-solving is the action by which a teacher encourages students to accept challenging questions and guide them in their resolution.

The mathematical process is interconnected. Problem-solving and communicating have strong links to all the process. A problem- solving approach encourages students to reason their way to a solution or a new understanding. As students engaged in reasoning, teacher further encourage them to make conjectures and justify solutions, orally or verbally. The communication and reflection that occur during and after the process of problem-solving help students not only to articulate

and refine their thinking but also to see the problem they are solving problem from different perspectives. This opens the door to recognizing the range of strategies that can be used to arrive at a solution. By seeing how others solve problem, students can begin to think about their own thinking (metacognition) and the thinking of others and to consciously adjust their own strategies in order to make their solution as efficient and accurate possible.

The mathematical process can't be separated from the knowledge and skills that students acquire throughout the course. Students must solve the problem, communicate, reason, reflect and so on, as they develop the knowledge, understanding of concepts and the skills required in the course.

Problem-solving is centre to learning mathematics. It forms the basis of effective mathematics programs and should be the mainstay of mathematical instruction. It considered as essential process through which students are able to achieve the expectations in mathematics, and is an integral part of mathematics teaching and learning for the following reasons. Problem-solving:

- is the primary focus and goal of mathematics in the real world;
- allow students to use the knowledge they bring to school and helps them to connect mathematics with situation outside the classroom;
- helps students to develop mathematical understanding and gives meaning to skill and concepts in all stands;
- allow students to reason, communicate ideas, make connections, and apply the knowledge and skills;
- offers excellent opportunities for assessing students understanding of concepts, ability to solve problems, ability to apply concepts and procedures, and ability to communicate the ideas;

- promote the collaborative sharing of ideas and strategies, and promote talking about mathematics;
- helps students find enjoyment in mathematics;
- increase opportunities for the use of critical-thinking skills (e.g. estimating, classifying, assuming, recognizing relationships, hypothesizing, offering opinions with reasons, evaluating results, and making judgments.)

Problem-solving is the basic mathematical activity. Most mathematics educators believed that problem-solving is an important instructional activity. Mathematical activity such as generalization, abstraction, theory building and concept formation are based on problem solving. When an individual understand a principle and had a opportunity to practice s/he can able to employ and transfer knowledge of the principle in a variety of situation.

Problem-solving approach of teaching is defined as the activities enjoyable to the learner that makes a difficult and pleasure. In this method, the teacher helps the learner to construct or generate meaning from his/her prior experience rather than the researcher receiving knowledge from the teacher. Many studies conduct in science and engineering teaching concluded that problem-solving method was regarded as effective method. This approach was also renewed as effective teaching method in mathematics .No research have been done about “Effectiveness of Problem-Solving Method in Teaching Arithmetic at Lower Secondary Level” has been realized in context of Nepal with newly implemented curriculum and textbooks. The teaching items use for this study was selected from mathematics text book of lower secondary level grade VIII. This study will conduct to find the effectiveness of problem-solving method in enhancing mathematics learning in different aspects reasoning and application at lower secondary level.

Conceptual Framework

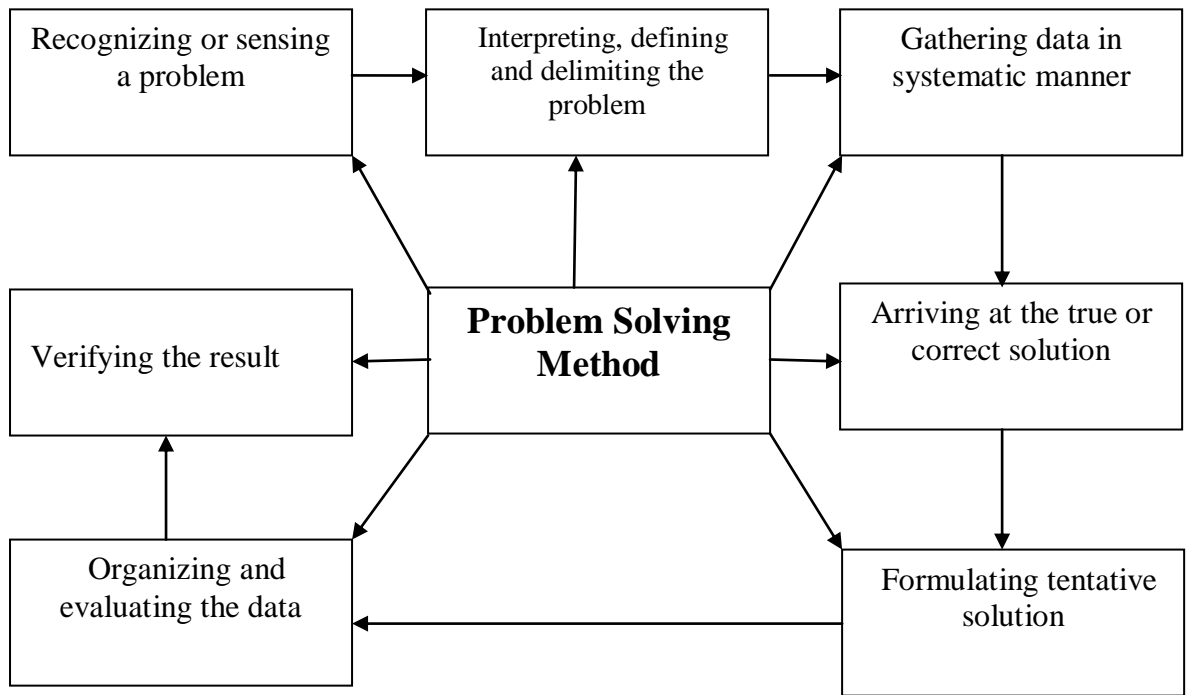
In 21st century, problem solving is given much more importance in teaching mathematics in schools. NCTM (1989-2000) has considered problem solving as one of the standard approach for teaching mathematical skills. It can be used in teaching mathematical principles with its theoretical framework.

From the theoretical literature, the researcher gained knowledge about the problem solving approach in teaching mathematics. Problem solving approach is student centered teaching approach. Students actively participate to solve the problems. At first, they feel difficulty but after completing the solution they would be interested and enjoy in learning mathematics. It helps how to present problem-solving approach in teaching mathematics in classrooms, how can we apply this approach and what are the sequential steps in teaching process. In problem-solving approach first students should understand the given statement (question) what is given. After that they would make a plan to solve a problem (what are the necessary conditions to find the solution) and they would solve the problem on the basic of understanding and planning of the problem. After completing the solution, they would look back (review) problem to verify the result.

Empirical literature provided the idea of methodology of the research study. After reviewing the empirical literature the researcher conducted his research with the population of all the lower secondary level students of Makawanpur district and two schools were selected purposively for the experiment. Experimental and control non-equivalent group were selected after conducting the basis of pre-achievement test. Those students who obtain 20-30 marks were selected for experiment. After teaching for four weeks, the mathematics achievement test was taken and the results were analyzed on the basis of mean and standard deviation. T-test was also used at 0.05

level of significance as a statistical tool to find the effectiveness of problem-solving method and a conclusion of the hypotheses was found.

Conceptual Framework



The data for the above framework were collected from the class observations conducted during experiment time. The collected data was analyzed using descriptive method. The data collected from achievement test was analyzed using quantitative method.

Chapter III

RESEARCH METHOD AND PROCEDURE

This chapter describes the design of plans and procedure of the study, which carried out to achieve the objective of this study. Method presents the logics of study because it determines how the research became complete and systematic. This chapter presents separate headings such as design of study, population of the study, sample of the study, tools, data collection procedure, and data analysis procedure.

Design of the Study

The researcher used pre-test and post-test to collect the required data. By using pre-test experimental and control groups were formed. After applying the problem solving method in mathematics classroom of the experimental group a post-test was conducted to compare the achievement of both groups. The paradigm of the study was as follow:

Table 1

Groups	Pre-test	Treatment	Post-test
Experimental Group	T ₁	Problem Solving Method	T ₂
Control Group	T ₁	Traditional Method	T ₂

Where T₁= pre-test given to the students

T₂= post-test given to the students

This design is one of the most effective designs in minimizing the threats to experimental validity. Two groups made homogeneous as nearly as possible on the basis of pre-test result with the establishment of two non-equivalent groups, experimental and control. Experimental group received the experimental treatment

where as control group did not receive it. Experimental group taught by problem-solving method and control group was taught by using traditional method of teaching.

Population of the Study

The population of the study consisted all student of grade VIII in government schools of Makawanpur district.

Stage of Experiments

The researcher collected the data for the intended research analysis from the experiment. Problem solving method of teaching was experimented in the schools where traditional approach of teaching was being used. The stages of experiment can be briefed as:

I. Pre-experimental Stage

The sampled schools were not the schools already adopted the problem solving method while teaching mathematics in the Grade VIII. The stage where the traditional approach of teaching is being used is the pre-experimental stage. A pre-achievement test was conducted to find out the achievement level of the students in this stage.

II. Experimental Stage

After pre-achievement test a four week long problem solving method applied mathematics classroom was conducted. This four week period was the experimental stage. The problem solving method applied classroom was conducted only with the experimental group of students within the experimental stage. To the control group same traditional method of teaching was continued as earlier during the experimental

stage. The objective of applying the problem solving method to only the experimental group was to identify and measure the change in them compared to the control group.

III. Post-experimental Stage

The period after completion of four week long problem solving method based mathematics classrooms were the post-experimental stage. On this stage as expected student's achievement level must be improved. For the measurement of the student's achievement level an achievement test was conducted and analyzed. For analyzing the achievement test data quantitative techniques were used. While identifying the behavioral change of control group qualitative/descriptive method was used. Behavioral change means change in the regularity in the classroom, participation in the teaching learning process and level of motivation to study mathematics.

Sample of the Study

This study was experimental study and carried out in two schools Shree Bhutan Devi Higher Secondary School, Makawanpur and Siddhartha Higher Secondary School, Makawanpur. The schools were selected purposively by the researcher because a good co-operation needed from the schools. For the selection of the students first of all pre-achievement test was taken to the whole students of grade VIII of both schools. Two groups (one from Shree Bhutan Devi Higher Secondary School, Makawanpur and another from Siddhartha Higher Secondary School, Makawanpur) were made homogenous as possible as on the basis of their pre-achievement test score. For the purpose, those students who obtain 20-30 marks were selected. The full mark was 40 marks. And, to determine the experimental and control group researcher tossed the fair coin. In Grade VIII of Shree Bhutan Devi High School there were 42 students. Out of 42 students 26 students comprising 12 girls and 14 boys were selected as experimental group on the basis of pre-test marks. In Grade

VIII of Shree Siddhartha Madhyamik Bidhalaya there were 40 students in total. Out of those 40 students 24 students comprising 11 boys and 13 girls were select as control group.

Tools

The researcher developed two different teaching modules for each group for every day teaching one by using problem-solving method and another by using traditional method of teaching. At the end of experiment, mathematics achievement test, which consisted subjective (very short, short and long) type of questions was taken. These were the main tools used in collecting data for the study.

The tests were prepared on the basis of four different skills (knowledge, understanding, skill and problem solving) from prescribed curriculum and text-book of grade VIII in arithmetic. In knowledge level questions, students had to remember and recall terms, symbols, formulae, definitions, facts and principles. In understanding level questions, students had to develop understanding of the terms, symbols, concepts and facts. In skill level questions, they had to apply knowledge and understanding of mathematics to unfamiliar situations. On scoring of the achievement test, in this questions at first student need to find pre-requisite terms and values. In problem-solving level questions, they have to apply their knowledge, understanding and skill, which occurred in new situation. Almost all problem-solving questions need to find pre-requisite terms and value.

For the construction of lesson plans, four steps of problem-solving techniques were developed according to G Plya. In this, first students shall understand the problem, information given in question, be clear about words and sentence. Then they think about the plan of the solution of the problem. After this, they solve the problem according to their pre-plan and find the solution. After solution of the problem, they

check each steps of solution and decide whether the solution is right or not. Also they search for the alternative method of solution.

Pre-experimental achievement test and post-experimental achievement test were analyzed on the basis of mean and standard deviation. T-test was used at 0.05 level of significance as statistical tool to find the effectiveness of problem-solving method and a conclusion of the hypotheses was found.

‘Non-cognitive skills’ such as motivation, perseverance, self-control, etc. were observed during pre-experimental stage and post-experimental stage of the experimental group.

Data Collection Procedure

The experimental and control groups were taught by the researcher himself 45 minutes per group every day. According to the content of arithmetic at grade VIII total teaching hour allocated to Arithmetic was 36 hours. But the certain topics percentage (3 periods), profit and loss (4 periods), simple interest (4 periods) and unitary method (3 periods) were selected for the study. At the end of the study, mathematics achievement test was administered to both group students. The test duration was an hour and 15 minutes. The answer sheets were collected and processed manually for scoring the selected students of experimental and control groups.

Validation of the Tools

Since a test is valid for a particular purpose and particular group. Therefore, the mathematics achievement test was developed for measuring the problem-solving performance as well as achievement of grade VIII students. For the estimation of the validity of this test tools were developed with the help of mathematics teachers, supervisor and other educators and also consulted with them to judge whether the test

does what intend to measure. Suggestions from experts were taken and necessary changes were made to improve the test for the immense of the validity. Therefore, it can be said that the test is quite valid.

Scoring the Data

The achievement test included questions of different levels and types. Each type of questions varied according to difficulty level. Knowledge level questions demand simple information and carried 1 mark as score, the comprehensive level questions demand the both the information and skill, carried 2 marks each whereas the application type of questions was higher level which demand knowledge as well as comprehensive level and of 4 marks each.

Data Analysis Procedure

The collected data were analyzed and interpreted using statistical tools and descriptive method. For analyzing the scores obtained by the students in achievement test, pre-test & post-test, mean, standard deviation and t-test were used. The t-test was used at 0.05 level of significance to find the difference between mean values of achievement scores; whether there is significant difference between the achievements of the groups of sample students. Qualitative data taken on changes in non-cognitive skills were analyzed and interpreted descriptively. Self-perception, motivation, perseverance, self-control, social competencies and creativity were taken as non-cognitive skills and noted by the researcher during the pre-experimental stage and experimental stage.

Chapter IV

ANALYSIS AND INTERPRETATION

The most important part of the study is analysis of the collected data. The data collected in the form of large amount of information are to be reduced into simplified form. The present study was an experimental research involving pre-test, post-test non-equivalent control group design. The main aims of this study was to compare the achievement score of students taught by problem-solving method and traditional method of teaching in addressing genders learning arithmetic at grade VIII. Also this study intended to explore the effectiveness of problem-solving method in teaching mathematics.

This chapter deals with the statistical analysis and interpretation of data obtained from the achievement score of the sample students. These data were tabulated and analyzed through mean, standard deviation and variance and used t-test for difference between two means. The data of the achievement test were analyzed under the following headings:

- Analysis of mean mathematics achievement score of control and experimental groups in pre-test result
- Analysis of mathematics achievement score of boys between control and experimental groups for post-test result
- Analysis of mathematics achievement score of girls between control and experimental group for post-test result.
- Analysis of mathematics achievement score of boys in experimental and girls in control group.
- Analysis of mathematics achievement score of girls in experimental and boys in control group.

- Analysis of effectiveness of traditional method of teaching mathematics between genders in control group.
- Analysis of effectiveness of problem-solving method of teaching mathematics between genders in experimental group.
- Analysis of mathematics achievement between control and experimental groups.

Analysis of Mean Mathematics Achievement Score of Control and Experimental Groups for Pre-test Result

The pre-test score of students of control and experimental groups are presented in Appendix B (I) and (II) and summary of statistical calculation for both groups on the pre-test result is presented in following table:

Table 4.1

Comparison of Mathematics Achievement Score between Two Groups

Groups	N	Mean	S.D	Variance	T-value
Control Group	24	25.29	3.28	10.75	Calculated value 0.382
Experimental Groups	26	25.65	3.41	11.68	

Tabulated value $t_{0.05, 48} = 1.96$

Table 4.1 present the mean, standard deviation and variance of both control and experimental groups. The table shows that both the mean and standard deviation of control and experimental groups were nearly equal. i.e. mean of control and experimental groups are 25.29 and 25.65 and standard deviation were 3.28 and 3.41 respectively in order to see whether initial difference employed, the calculated t-value is 0.362 and tabulated t-value is 1.96 at 0.05 level of significance with degree of freedom 48. This shows that mean of two groups were not found to be significant difference and therefore both groups were treated as equal.

Analysis of Mathematics Achievement score of Boys between Control and Experimental Groups

The mean achievement score of control and experimental groups boys were 24.9 and 32.5 respectively (Appendix D and E, Formulae Appendix F) over the full marks 40. It indicates that boys of experimental group learnt Arithmetic better in the comparison of boys of control group. It was necessary to determine the difference was significance or not. Therefore t-test was used to test the significance of the difference between two means

Table 4.2

Comparison of Boys Mathematics Achievement Score between Two Group

Groups	Genders	N	Mean	S.D	Variance	T-value
Control	Boys	11	24.9	3.60	12.99	Calculated
Experimental	Boys	14	32.5	3.28	10.82	value 5.547

Tabulated value $t_{0.05,23} = 2.069$

Two population variance were tested for the homogeneity and it was found that the variance were homogeneous. Mean achievement score of boys were compared statistically using two tailed test at 0.05 level of significance. The table shows that the calculated value of t-test was 5.547 with degree of freedom 23 is greater than the tabulated value 2.069.

Therefore the null hypothesis stating there is no significance difference between control and experimental group boys mathematics achievement in arithmetic taught by traditional and problem-solving method of teaching respectively in grade VIII students was rejected. In other words, the difference of means was found

significant. Thus, the researcher concluded that experimental group boys were treated better than that of the control group boys.

Analysis of Mathematics Achievement Score of Girls between Control and Experimental Groups

The mean achievement score of control and experimental groups girls were 25.53 and 31.91 respectively (Appendix D and E, Formulae Appendix F) over the full marks 40. It indicated that girls of experimental group learnt better in arithmetic in the comparison of girls of control group (who were taught by traditional method of teaching). It was necessary to determine the difference was significance or not. Therefore t-test was used to test the significance of the difference between two means.

Table 4.3

Comparison of Girls mathematics achievement between two group

Groups	Genders	N	Mean	S.D	Variance	T-value
Control	Girls	13	25.53	3.12	9.87	Calculated value 5.145
Experimental	Girls	12	31.91	3.07	9.44	

Tabulated value $t_{0.05,23} = 2.069$

Two population variance were tested for the homogeneity and it was found that the variance were homogeneous. Mean achievement score of girls were compared statistically using two tailed test at 0.05 level of significance. The table shows that the calculated value of t-test was 5.145 with degree of freedom 23 is greater than the tabulated value 2.069.

Therefore the null hypothesis stating there is no significance difference between control and experimental group girls mathematics achievement in arithmetic taught by traditional and problem-solving method of teaching respectively in grade

VIII students was rejected. In other words, the difference of means was found significant. Thus, the researcher concluded that experimental group girls were treated better than that of the control group girls.

Analysis of Mathematics Achievement Score of Boys in Experimental and Girls in Control Group

The mean achievement score of control group girls and experimental group boys were 25.53 and 32.5 respectively (Appendix D and E, Formulae Appendix F) over the full marks 40. It indicated that girls of control group did not learn better arithmetic in the comparison of boys of experimental group. It was necessary to determine the difference was significance or not. Therefore, t-test was used to test the significance of the difference between two means.

Table 4.4

Comparison of Genders Mathematics Achievement between Two Groups

Groups	Genders	N	Mean	S.D	Variance	T-value
Control	Girls	13	25.53	3.13	9.78	Calculated value 5.666
Experimental	Boys	14	32.5	3.28	10.82	

Tabulated value $t_{0.05, 25} = 2.060$

Two population variance were tested for the homogeneity and it was found that the variance were homogeneous. Mean achievement score of genders were compared statistically using two tailed test at 0.05 level of significance. The table shows that the calculated value of t-test was 5.547 with degree of freedom 25 is greater than the tabulated value 2.060

Therefore the null hypothesis that states there is no significance difference between control group girls and experimental group boys mathematics achievement in

arithmetic taught by traditional and problem-solving method of teaching respectively in grade VIII students was accepted. In other words, the difference of means was found significant difference. Thus, the researcher concluded that experimental boys were treated better than that of the control group girls.

Analysis of Mathematics Achievement Score of Girls in Experimental and Boys in Control Group

The mean achievement score of control group boys and experimental group girls were 31.91 and 24.91 respectively (Appendix D and E, Formulae Appendix F) over the full marks 40. It indicated that boys of control group did not learn adequately Arithmetic in the comparison of girls of experiment group (who were taught by problem-solving method of teaching). It was necessary to determine the difference was significance or not. Therefore t-test was used to test the significance of the difference between two means.

Table 4.5

Comparison of Genders Mathematics Achievement Score between Two Groups

Groups	Genders	N	Mean	S.D	Variance	T-value
Control	Boys	11	24.91	3.60	12.99	Calculated value 5.043
Experimental	Girls	12	31.91	3.07	9.44	

Tabulated value $t_{0.05, 21} = 2.080$

Two population variance were tested for the homogeneity and it was found that the variance were homogeneous. Mean achievement score of genders were compared statistically using two tailed test at 0.05 level of significance. The table shows that the calculated value of t-test was 5.043 with degree of freedom 21 is greater than the tabulated value 2.080

Therefore the null hypothesis stating there is no significance difference between control group boys and experimental group girls achievement in Arithmetic taught by traditional and problem-solving method of teaching respectively in grade VIII students was accepted. In other words, the difference of means was found significant. Thus, the researcher concluded that experimental group boys were treated better than that of the control group girls.

Analysis of Effectiveness of Traditional Method of Teaching Between Genders in Control Group

The mean achievement score of control group boys and girls were 24.9 and 25.53 respectively (Appendix E, Formulae Appendix F) over the full marks 40. It indicated that boys learnt Arithmetic equal as to the girls. It was necessary to determine the difference was significance or not. Therefore, t-test was used to test the significance of the difference between two means.

Table 4.6

Comparison Between Genders Mathematics Achievement Score of Control Group

Genders	N	Mean	S.D	Variance	T-value
Boys	11	24.91	3.60	12.99	Calculated value 0.470
Girls	13	25.53	3.12	9.78	

Tabulated value $t_{0.05, 22} = 2.074$

Two population variance were tested for the homogeneity and it was found that the variance were homogeneous. Mean achievement score of genders were compared statistically using two tailed test at 0.05 level of significance. The table

shows that the calculated value of t-test was 0.470 with degree of freedom 22 is less than the tabulated value 2.074

Therefore, the null hypothesis stating there was no significance difference between genders mathematics achievement in arithmetic taught by traditional method of teaching was accepted. In other words, the difference of means was not found significant. Thus the researcher concluded that boys were treated equally as girls in the control group.

Analysis of Effectiveness of Problem-solving Method of Teaching between Genders in Experimental Group

The mean achievement score of experimental groups boys and girls were 32.5 and 31.91 respectively (Appendix B, Formulae Appendix F) over the full marks 40. It indicated that boys learnt Arithmetic almost equal as girls. It was necessary to determine the difference was significance or not. Therefore t-test was used to test the significance of the difference between two means.

Table 4.7

Comparison between Genders Mathematics Achievement Score of Experimental Group

Genders	N	Mean	S.D	Variance	T-value
Boys	14	32.5	3.28	10.82	Calculated value 0.464
Girls	12	31.91	3.07	9.44	

Tabulated value $t_{0.05, 24} = 2.064$

Two population variance were tested for the homogeneity and it was found that the variance were homogeneous. Mean achievement score of genders were compared statistically using two tailed test at 0.05 level of significance. The table

shows that the calculated value of t-test was 0.470 with degree of freedom 24 is less than the tabulated value 2.064.

Therefore the null hypothesis stating there was no significance difference between genders achievement in arithmetic taught by problem-solving method of teaching was accepted. In other words, the difference of means was not found significant. Thus the researcher concluded that boys were treated equally as girls in the experimental group.

Analysis of Mathematics Achievement Score between Control and Experimental Groups

The mean achievement score of control and experimental groups were 25.25 and 32.23 respectively (Appendix C (I) and (II), Formulae Appendix F) over the full marks 40. It indicated that experimental group learnt Arithmetic better in the comparison of control group. It was necessary to determine the difference was significance or not. Therefore, t-test was used to test the significance of the difference between two means.

Table 4.8

Comparison of Mathematics Achievement Score between Two Groups

Groups	N	Mean	S.D	Variance	T-value
Experimental	26	32.23	3.19	10.17	Calculated value 7.670
Control	24	25.25	3.26	10.69	

Tabulated value $t_{0.05, 48} = 1.96$

Two population variance were tested for the homogeneity and it was found that the variance were homogeneous. Mean achievement score both groups were compared statistically using two tailed test at 0.05 level of significance. The table

shows that the calculated value of t-test was 7.670 with degree of freedom 48 was greater than the tabulated value 1.96.

Therefore, the null hypothesis stating there was no significance difference between mathematics achievements in two groups was rejected. In other words, the difference of means was found significant. Thus, the researcher concluded that experimental group students were treated better than that of the control group students.

Changes in Non-cognitive Skills

Students must have different qualities to be successful in their life apart from the high marks in the examination. Such qualities and skills are critical thinking skills, problem solving skills, social skills, persistence, creativity, and self-control that allow them to contribute meaningfully to society and to succeed in their lives. These qualities are called non-cognitive skills. During our study the researcher had observed the non-cognitive skills before and after the experiment of the experimental group.

1. Self-Perceptions

Self-perceptions are an individual's own beliefs about whether or not they can accomplish a task. During the experiment stage, while applying the problem solving method of mathematics teaching students participated more in the learning process. Their belief that mathematics is not so hard to crack if they practice regularly with practical approach was found to be more firm. Students found to be more confident on their self-efficiency.

2. Motivation

Motivation is the study of why individuals think and behave as they do. A target and achievement goal motivates students to study more. In the later stage of experiment students were found to be setting higher targets of their achievement. This was the sign of motivation of the students.

3. Perseverance

Perseverance involves steadfastness on mastering a skill or completing a task with great engagement and passion. Some students were found to be more laborious and exercise mathematics with passion. However, most of the students were seen normally interested.

4. Self-Control

Self control involves control over behaviors, feelings, and thoughts in order to conform to rules, plans, promises, ideals, and other standards. Self-control of the students was not found to be changed a lot. With the limited time of experiment it was not possible to judge the student's self-control.

5. Social Competencies

Social competencies include leadership skills and social skills. Leadership Skills means ability to influence others. Social Skills means socially acceptable behaviors that enable a person to interact effectively with others and to avoid socially unacceptable responses. During our experiment it was found that student's social competencies were being developed. Problem solving method of mathematic teaching

had the effect of better cooperation, sharing, helping, communication, encouragement, and general friendliness.

6. Creativity

Creativity is the production of novel and useful ideas. Students were found to be more creative and confident by the use of problem solving mathematics teaching method.

Finding of the Study

On the basis of analysis of the data obtained from the achievement test which have been described the following findings:

- Statistically the mean difference was not significant between genders in both experimental and control groups. So, it was found that there was no significance difference between genders in learning at grade VIII students.
- The experimental group seemed to be more successful in achievement test in comparison to control group in learning mathematics and it was found that problem-solving method of teaching was effective for the students than the traditional method of teaching.
- The experimental group boys and girls had obtained more mean achievement score than the boys and girls of control group .From this, it was found that there was no significance difference between genders.
- In the post-test result, the mean achievement score of control group was less than mean achievement score of experimental group.

- The non-cognitive skills of experimental group better than the control group after the experiment.

Chapter V

SUMMARY, CONCLUSION AND RECOMMENDATIONS

The experiment in which the researcher developed modules on two types of teaching activities implemented in sample students. An achievement test was administered on each group. The score obtained in test by students was the data for the study. The researcher analyzed the data and obtained findings. So, this chapter deals with summary, findings, conclusions and recommendations for the further study.

Summary

The study was experimental in nature. In addition to conduct the experiment for comparison, the mathematics achievement in Arithmetic between genders and to explore the effectiveness of problem-solving method in teaching mathematics, the researcher had developed modules and taught himself in both control and experimental groups of the students. The experiment group was taught using by problem-solving method and control group was taught using by traditional method of teaching mathematics. At the end of the teaching, a mathematics achievement test was taken to both groups. The score obtained in the test in each group was analyzed and obtained the findings.

For the achievement of the objectives of the study, the researcher developed achievement test. To obtain the objectives of the study following statistical tools have been used: Average mean was used to compare the mathematics achievement between genders and the effectiveness of teaching methods. Standard deviation and variance were used to test the homogeneity of the test. T-test was used to compare the mathematics achievement between genders and effectiveness of teaching methods.

Conclusion

In conclusion, this study reveals that there is no gender difference in the ability of learning mathematics. Boys and girls are equally capable to learn mathematics. Methods and opportunities can improve the learning of boys and girls without significant difference. Problem-solving method is more effective than traditional method of teaching. From the result of the study, it was concluded that problem-solving method helps students to understand mathematics and consequently achieve better result in achievement test over traditional method. If we apply this method properly, students will understand and achieve better result in learning mathematics. Additionally problem-solving method helps students to motivate and apply the mathematical knowledge and concept in unfamiliar conditions. Further, problem solving method is also highly effective to improve non-cognitive skills like self-perceptions, motivation, self-control, social competencies and creativity.

Recommendations

On the basis of findings of the study some measures have been recommended for the improvement of teaching and learning mathematics at lower secondary level classes: Problem-solving method is recommended in teaching mathematics at lower secondary level. Teachers should be encouraged to use problem-solving method in teaching mathematics. The writer of teacher guides should be emphasized on problem-solving in giving samples, activities in particular area in teaching. The teacher training institutes should focus their attention on problem-solving method for teaching mathematics in pedagogy course. Curriculum designer, text-book writer should emphasize on problem-solving method. In preparation of mathematics text-book, emphasis should be given in problem-solving method and strategies throughout

the school mathematics so that further generations was equipped with skill to solve the problem they are likely to encounter.

Study on using different teaching and learning modules should be carried out so that these modules can be effective, used in classroom teaching and easiest way to introduce reforms in mathematics teaching. This study was confined only on the Makawanpur district. Therefore, further study could be done in different districts and the result of study can be generalized. It would be worthwhile to study the opinions and attitudes of teachers and pupils towards the use of problem-solving method with teaching modules. Similar studies may be carried out at each grade level of school in order to have wider view of problem-solving in school level mathematics.

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APPENDIX: A (I)

Shree Bhutan Devi Higher Secondary School,

Makawanpur

Mark obtained in pre-test and post-test Achievement Test

Roll No	Obtained Mark		Roll No	Obtained Mark	
	Pre-test	Post-test		Pre-test	Post-test
1	34	35	22	21	20
2	32	32	23	19	24
3	33	33	24	20	24
4	28	29	25	21	20
5	29	30	26	23	23
6	29	29	27	18	24
7	30	30	28	17	21
8	27	28	29	19	20
9	23	24	30	17	18
10	25	25	31	15	18
11	26	26	32	8	14
12	23	23	33	18	20
13	28	26	34	22	28
14	25	27	35	17	17
15	24	24	36	17	19
16	21	21	37	19	19
17	27	28	38	11	16
18	25	21	39	16	20
19	20	22	40	5	10
20	22	23	41	15	17
21	20	20	42	17	19

Number of students obtained 20-32 marks = 24 (criteria for selection)

Roll No of selected students were: 2, 4, 5, 6, 7, 8, 9, 10, 11, 11, 12, 13, 14, 15, 16, 17,
18, 19, 20, 21, 22, 24, 25, 26 and 34

Roll No of selected boy: 2, 5, 8, 10, 12, 13, 15, 18, 19, 21 and 25

Roll No of selected girl: 4, 6, 7, 9, 11, 14, 16, 17, 20, 22, 24, 26 and 34

APPENDIX A (II)

Shree Siddhartha Higher Secondary School
Makawanpur
Mark obtained in pre-test and post-test Achievement Test

Roll No	Obtained Mark		Roll No	Obtained Mark	
	Pre-test	Post-test		Pre-test	Post-test
1	36	38	21	25	33
2	32	37	22	27	33
3	34	36	23	23	31
4	33	38	24	21	28
5	30	37	25	19	25
6	29	38	26	23	29
7	31	36	27	26	34
8	30	36	28	28	32
9	28	35	29	24	29
10	26	34	30	14	21
11	27	35	31	14	21
12	29	32	32	16	23
13	28	33	33	20	27
14	24	32	34	18	25
15	25	31	35	17	21
16	19	26	36	14	18
17	25	31	37	15	21
18	22	30	38	12	19
19	20	26	39	20	28
20	24	31	40	18	23

Number of students obtained 20-32 marks = 26 (criteria for selection).

Roll No of selected students were: 2, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 17, 18, 19, 20, 21, 22, 23, 24, 26, 27, 28, 29, 33 and 39.

Roll No of selected boy: 5, 6, 8, 9, 10, 13, 14, 17, 19, 21, 23, 26, 28 and 39.

Roll No of selected girl: 2, 7, 11, 12, 15, 18, 20, 22, 24, 27, 29 and 33.

Appendix: B (I)

Achievement score of Pre-test Result (Control Group)

Control Group				
S.N	Roll	Marks(X)	$(X - \bar{X})$	$(X - \bar{X})^2$
1	2	32	7.38	54.46
2	4	28	3.38	11.42
3	5	29	4.38	19.18
4	6	29	4.38	19.18
5	7	30	5.38	28.94
6	8	27	2.38	5.66
7	9	23	-1.62	2.62
8	10	25	0.38	0.14
9	11	26	1.38	1.90
10	12	23	-1.62	2.62
11	13	28	3.38	11.42
12	14	25	0.38	0.14
13	15	24	-0.62	0.38
14	1	21	-3.62	13.10
15	17	27	2.38	5.66
16	18	25	0.38	0.14
17	19	20	-4.62	21.34
18	20	22	-2.62	6.86
19	21	20	-4.62	21.64
20	22	21	-3.62	13.10
21	24	20	-4.62	21.64
22	25	21	-3.62	13.10
23	26	23	-1.62	2.62
24	34	22	-2.62	6.86
	N=24	$\Sigma X=591$		$\Sigma(X - \bar{X})^2=284.12$

Mean (M) = 24.62 Standard Deviation (σ) = 3.43 Variance (σ^2) = 11.76

Appendix B(II)

Achievement score of Pre-test Result (Experimental Group)

Experimental Group				
S.N	Roll No	Marks(X)	(X-\bar{X})	(X-\bar{X})²
1	2	32	6.35	40.32
2	5	30	4.35	18.92
3	6	29	3.35	11.22
4	7	31	5.35	28.62
5	8	30	4.35	18.92
6	9	28	2.35	5.52
7	10	26	0.35	0.72
8	11	27	1.35	1.82
9	12	29	3.35	11.22
10	13	28	2.35	5.52
11	14	24	-1.65	2.72
12	15	25	-0.65	0.42
13	17	25	-0.65	0.42
14	18	22	-3.65	13.32
15	19	20	-5.65	31.92
16	20	24	-1.65	2.72
17	21	25	-0.65	0.42
18	22	27	1.35	1.82
19	23	23	-2.65	7.02
20	24	21	-4.65	21.62
21	26	23	-2.65	7.02
22	27	26	0.35	0.12
23	28	28	2.35	5.52
24	29	24	-1.65	2.72
25	33	20	-5.65	31.92
26	39	20	-5.65	31.92
	N=26	$\Sigma X=667$		$\Sigma(X-\bar{X})^2=304.42$

Mean (M) = 25.65 Standard Deviation (σ) = 3.41 Variance (σ^2) = 11.68

Appendix: C (I)

Achievement score of Post-test Result (Control Group)

Control Group				
S.N	Roll No	Marks(X)	$(X - \bar{X})$	$(X - \bar{X})^2$
1	2	32	6.75	45.56
2	4	29	3.75	14.06
3	5	30	4.75	22.26
4	6	29	3.75	14.06
5	7	30	4.75	22.26
6	8	28	2.75	7.56
7	9	24	-1.25	1.56
8	10	25	-0.25	0.06
9	11	26	0.75	0.56
10	12	23	-2.25	5.06
11	13	26	0.75	0.56
12	14	27	1.75	3.06
13	15	24	-1.25	1.56
14	16	21	-4.25	18.06
15	17	28	2.75	7.56
16	18	21	-4.25	18.06
17	19	22	-3.25	10.56
18	20	23	-2.25	5.06
19	21	23	-2.25	5.06
20	22	20	-5.25	27.56
21	24	24	-1.25	1.56
22	25	20	-5.25	27.56
23	26	23	-2.25	5.06
24	34	28	2.75	7.56
	N=24	$\Sigma X=606$		$\Sigma(X - \bar{X})^2=271.84$

Mean (M) = 25.25 Standard Deviation (σ) = 3.26 Variance (σ^2) = 10.69

Appendix: C (II)

Achievement score of post-test result (Experimental Group)

Experimental Group				
S.N	Roll No	Marks(X)	$(X - \bar{X})$	$(X - \bar{X})^2$
1	2	37	4.77	22.75
2	5	37	4.77	22.75
3	6	38	5.77	33.29
4	7	36	3.77	14.21
5	8	36	3.77	14.21
6	9	35	2.77	7.67
7	10	34	1.77	3.13
8	11	35	2.77	7.67
9	12	32	-0.23	0.05
10	13	33	0.77	0.59
11	14	32	-0.23	0.05
12	15	31	-1.23	1.51
13	17	31	-1.23	1.51
14	18	30	-2.23	4.97
15	19	26	-6.23	38.81
16	20	31	-1.23	1.51
17	21	33	0.77	0.59
18	22	33	0.77	0.59
19	23	31	-1.23	1.51
20	24	28	-4.23	17.89
21	26	29	-3.23	10.43
22	27	34	1.77	3.13
23	28	32	-0.23	0.05
24	29	29	-3.23	10.43
25	33	27	-5.23	27.35
26	39	28	-4.23	17.89
	N=26	$\Sigma X=838$		$\Sigma(X - \bar{X})^2=264.54$

Mean (M) = 32.23 Standard Deviation (σ) = 3.19 Variance (σ^2) = 10.17

Appendix: D

Achievement score of Boys and Girls of Experimental Group
(Post-test Result)

Experimental Group (Boys)				
S.N	Roll	Marks(X)	$(X - \bar{X})$	$(X - \bar{X})^2$
1	5	37	4.5	20.25
2	6	38	5.5	30.25
3	8	36	3.5	12.25
4	9	35	2.5	6.25
5	10	34	1.5	2.25
6	13	33	0.5	0.25
7	14	32	-0.5	0.25
8	17	31	-1.5	2.25
9	19	26	-6.5	42.25
10	21	33	0.5	0.25
11	23	31	-1.5	2.25
12	26	29	-3.5	12.25
13	28	32	-0.5	0.25
14	29	28	-4.5	20.25
	N=14	$\Sigma X=455$		$\Sigma(X - \bar{X})^2=151.5$

Mean (M) = 32.5 Standard Deviation (σ) = 3.28 Variance (σ^2) = 10.82

Experimental Group (Girls)				
S.N	Roll No	Marks(X)	$(X - \bar{X})$	$(X - \bar{X})^2$
1	2	37	5.09	25.90
2	7	36	4.09	16.72
3	11	35	3.09	9.54
4	12	32	0.09	0.08
5	15	31	-0.91	0.82
6	18	30	-1.91	3.64
7	20	31	-0.91	0.82
8	22	33	1.09	3.64
9	24	28	-3.91	15.28
10	27	34	2.09	4.36
11	29	29	-2.91	8.46
12	33	27	-4.91	24.10
	N=14	$\Sigma X=383$		$\Sigma(X - \bar{X})^2=113.36$

Mean (M) = 31.91 Standard Deviation (σ) = 3.07 Variance (σ^2) = 9.44

Appendix: E

Achievement score of Boys and Girls of Control Group

(Post-test Result)

Control Group (Boys)				
S.N	Roll No	Marks(X)	$(X - \bar{X})$	$(X - \bar{X})^2$
1	2	32	7.1	50.41
2	5	30	5.1	26.01
3	8	28	3.1	9.61
4	10	25	0.1	0.01
5	12	23	-1.9	3.61
6	13	26	1.1	1.21
7	15	24	-0.9	0.81
8	18	21	-3.9	15.21
9	19	22	-2.9	8.41
10	21	23	-1.9	3.61
11	25	20	-4.9	24.01
	N=11	$\Sigma X=274$		$\Sigma(X - \bar{X})^2=142.91$

Mean (M) = 24.90 Standard Deviation (σ) = 3.60 Variance (σ^2) = 12.99

Control Group (Girls)				
S.N	Roll No	Marks(X)	$(X - \bar{X})$	$(X - \bar{X})^2$
1	4	29	3.47	12.04
2	6	29	3.47	12.04
3	7	30	4.47	19.98
4	9	24	-1.53	2.34
5	11	26	0.47	0.22
6	14	27	1.47	2.16
7	16	21	-4.53	20.52
8	17	28	2.47	6.10
9	20	23	-2.53	6.40
10	22	20	-5.53	30.58
11	24	24	-1.53	2.34
12	26	23	-2.53	6.40
13	34	28	2.47	6.10
	N=13	$\Sigma X=332$		$\Sigma(X - \bar{X})^2=127.22$

Mean (M) = 25.53 Standard Deviation (σ) = 3.12 Variance (σ^2) = 9.78

APPENDIX: F

Formulae

$$\text{Mean } \bar{X} = \frac{\sum x}{N}$$

$$\text{Standard Deviation } (\sigma) = \frac{\sqrt{\sum(X - \bar{X})^2}}{N}$$

$$\text{Pooled variance (SP)} = \sqrt{\frac{(N_1 - 1)S_1^2 + (N_2 - 1)S_2^2}{N_1 + N_2 - 2}}$$

$$\text{Standard Deviation difference } (\sigma_D) = SP \sqrt{\frac{1}{N_1} + \frac{1}{N_2}}$$

and t - scale,

$$t_{0.05, N_1 + N_2 + 2} = \frac{\bar{X}_1 - \bar{X}_2}{SP \sqrt{\frac{1}{N_1} + \frac{1}{N_2}}}$$

Where,

X = Mark obtained by student in achievement test

N = Number of students

\bar{X} = Mean score of sample population

\bar{X}_1 = Mean score of first sample population

\bar{X}_2 = Mean score of second sample population

N_1 and N_2 = Number of students of first and second sample population

S_1 = Standard Deviation of first population

S_2 = Standard Deviation of second population

T- Scale = $t_{0.05, v}$ (at 0.05 level of significant and $v = N_1 + N_2 - 2$ degree of freedom)

APPENDIX: G

Test Items

Pre-Test

कक्षा: ८

विषय : गणित

सबै प्रश्न अनिवार्य छन् ।

मिति:

पूर्णाङ्क : ४०

उत्तीर्णाङ्क : १६

Group: A

(1+1)x4 = 8

1.(i) 1200 को 8% कति हुन्छ ?

(ii) एउटा विद्यालयमा 545 जना विद्यार्थी छन् यदि केटाको संख्या 218 छ भने कति प्रतिशत केटा रहेछन् ?

2. (i) एउटा स्याउको मूल्य रु. 7 वर्ष भने 15 वटा स्याउको मूल्य कति पर्छ ?

(ii) 12 लि पेट्रोलले एउटा मोटरसाइकल 900 km दौडन्छ भने 1 लि पेट्रोलले कति कि.मि. दौडन्छ ?

3. (i) यदि P मुलधन, R व्याजदर, N समय (वर्षमा) र I वार्षिक व्याज भए व्याज पत्ता लगाउने सूत्र लेख ।

(ii) रु 10,000 को दुई वर्षमा मिश्रधन रु 12,500 हुन्छ भने व्याज कति हुन्छ ?

4. (i) रामले एउटा रेफ्रिजेरेटर रु 18,200 मा किनेर रु 20,000 मा बेच्छ भने उसको नाफा पत्ता लगाऊ ।

(ii) यदि C.P. क्रयमूल्य, S.P. विक्रम मूल्य र L नोक्सान भए नोक्सान प्रतिशत पत्ता लगाउने सूत्र लेख ।

Group : B

(2+2)x4 = 16

5.(i) कुनै सहरको जनसंख्या 157500 छ। यदि वर्षमा जनसंख्या 15% ले वृद्धि हुन्छ भने अर्को वर्षको जनसंख्या कति होला ?

(ii). 50 र 75 पूर्णाङ्क भएको कुनै परीक्षामा A र B ले क्रमशः 30 र 39 प्राप्त गरे भने कसले कति प्रतिशत बढी प्राप्त गर्‍यो ?

6. (i) दिएको अवस्थमा x को मान पत्ता लगाउ

सुकी	रु
4	1
175	x

(ii) कुनै काम 19 ज्यामीले 28 दिनमा गर्न सक्छन् भने 57 जना ज्यामीले सो काम कति दिनमा गर्न सक्छन्?

7. (i) वार्षिक 5% का दरले रु.650 को 6 वर्षमा साधारण व्याजले हुने मिश्रधन पत्ता लगाउ ।

(ii) रु 10,000 को 5 वर्षमा मिश्रधन रु 15,000 हुन्छ भने वार्षिक व्याजदर कति हुन्छ ?

8. (i) कुनै पसलेले 12 दर्जन कलम रु 480 मा मिनेर प्रति दर्जन रु 50 मा बेच्दा उसको नाफा प्रतिशत कति होला ?

(ii) एउटा साइकल रु 6600 मा बेच्दा 10% नाफा हुन्छ भने साइकलको क्रय मूल्य कति होला ?

Group:C

4x4 = 16

9. कुनै परीक्षामा 30% विद्यार्थी फेल र 280 जना विद्यार्थी पास भएछन् भने जम्मा विद्यार्थी र पास हुने विद्यार्थीको संख्या कति कति होला ?

10. कुनै काम P र Q ले क्रमशः 20 र 30 दिनमा गर्न सक्छन् भने दुवै जना सँगै मिलेर सो काम कति दिनमा गर्न सक्छन् ?

11. पहिलो भागको 7% व्याजदरमा 6 वर्षको साधारण व्याज दोस्रो भागको 5% व्याजदरमा 2 वर्षको साधारण व्याजसँग बराबर हुने गरी रु 8,100 लाई दुई भागमा वर्गीकरण गर ।

12. एक जना फलफूल पसलेले 210 वटा सुन्तला किन्यो जसमा 10 वटा बिग्रेका रहेछन । यदि उसले बाँकी सुन्तला रु 3 प्रतिगोटाका दरले बेच्दा रु 75 नाफा गर्छ भने उसले ती सुन्तला कतिमा किनेको रहेछ ?

Post-Test

कक्षा: ८

विषय : गणित

सबै प्रश्न अनिवार्य छन् ।

मिति:

पूर्णाङ्क : ४०

उत्तीर्णाङ्क : १६

Group: A

(1+1)x4 = 8

1. (i) 700 को 420 कति प्रतिशत हुन्छ ?
(ii) कक्षा 8 का 40 जना विद्यार्थीमध्ये 45 % केटीहरू छन् भने कति जना केटी रहेछन् ?
2. (i) एक दर्जन कपीको मूल्य रु 144 पर्छ भने एउटा कपीको मूल्य कति रुपैया पर्दछ ?
(ii) 5 जना मानिसले 4 घण्टामा गर्न सक्ने काम 1 जना मानिसले कति घण्टामा गर्न सक्छ ?
- 3 (i) रु 4200 को $4\frac{1}{2}\%$ व्याजदरले 4 वर्षको साधारण व्याज कति हुन्छ ?
(ii) कुनै धनको दुई वर्षमा मिश्रधन रु 25250 र व्याज रु 4750 हुन्छ भने साँवा कति रहेछ ?
4. (i) एउटा कम्प्युटर 20,000 मा किनेर 18,500 मा बेचिन्छ भने कति प्रतिशत घाटा हुन्छ ?
(ii) यदि C.P क्रय मूल्य , S. P विक्रयमूल्य र P नाफा भए नाफा कसरी पत्ता लगाइन्छ ?

Group:B

(2+2)x4 = 16

5. (i). कुनै गाउँको जनसंख्या प्रत्येक वर्ष 15% ले वृद्धि भइरहेको छ । यदि हालको जनसंख्या 1,81,125 छ भने गतवर्षको जनसंख्या कति थियो ?
(ii) कृष्णले 700 पूर्णाङ्कको परीक्षामा 448 मोहनले 800 पूर्णाङ्कको परीक्षामा 500 अङ्क प्राप्त गरेछन् भने कसले कति प्रतिशत बढी प्राप्त गरेछन् ?
6. (i) कुनै गाडीले 240 कि.मि. पार गर्न 6 लिटर पेट्रोल आवश्यक पर्छ भने 360 कि.मि.पार गर्न कति लिटर पेट्रोल आवश्यक पर्छ ।
(ii) कुनै कामको $\frac{1}{7}$ भाग काम गर्न 45 जना मानिस चाहिन्छ भने सोही कामको $\frac{1}{9}$ भाग काम गर्न कति जना मानिस आवश्यक पर्छ ?
- 7.(i) वार्षिक 7% का दरले रु 18,000 को $6\frac{1}{7}$ वर्षमा साधारण व्याजले हुने मिश्रधन कति हुन्छ ?
(ii) कति वर्षमा रु 5000 को 5 % वार्षिक व्याजदरले मिश्रधन रु 5875 हुन्छ ?
- 8.(i) कुनै पसलेले प्रति दर्जन रु 300 मा बेच्दा 12 दर्जनमा रु 1800 नाफा गर्दछ भने एक दर्जन कपीको क्रय मूल्य कति होला ?

- (ii) सोभितले मोवाइल सेट रु 6,225 मा र रु 1,135 मा सिमकार्ड किन्यो । यदि उसले 7 महिनापछि सो मोवाइल सिमसहित, रु 7,176 मा बेच्यो भने उसको नाफा वा नोक्सान प्रतिशत पत्ता लगाऊ ।

Group : C

4x4 = 16

9. राजेन्द्रले आफ्नो मासिक आम्दानीबाट रु 7800 खर्च गर्छ र 35% बचाउँछ भने उसको आम्दानी कति रहेछ साथै उसले एक वर्षमा कति बचाउँछ ?
10. पहिलो र दोस्रो नलीले कुनै ट्याङ्की 40 मिनेटमा भर्न सक्छन् । यदि पहिलो नलीले मात्र सो ट्याङ्की $1\frac{1}{2}$ घण्टामा भर्छ भने दोस्रो नलीले मात्र सो ट्याङ्की कति समयमा भर्न सक्छ ?
11. पहिलो भागका $4\frac{1}{2}\%$ व्याजदरमा 6 वर्षको साधारण व्याज दोस्रो भागको 5 % व्याज दरमा 2 वर्षको साधारण व्याजदरसँग बराबर हुने गरी रु 8,125 लाई दुई भागमा विभाजन गर ।
12. कुनै व्यापारीले 300 वटा कागती खरिद गर्दा 20 वटा थप पायो । यदि उसले 180 वटा रु 2 का दरले र बाँकी सबै रु.1.50 का दरले विक्री गर्दा रु 195 नाफा हुन्छ भने उसले खरिद गरेको प्रतिदानाको क्रय मूल्य पत्ता लगाऊ ।

Lesson Plans
Teaching Episode I

Class: 8

Date:

Sub: Mathematics

Teaching Unit: **Percentage**

Time: 45 minutes

Objectives: Students will be able to find the percentage of given numbers and number of percentage of given number.

Teaching Materials: Daily Teaching Materials

Teaching Activities:

On the basis of previous class the teacher and students will be discuss to define percentage by taking an example.

To find the number of given percentage number takes an example:

E.g.: Find 10% of 1200.

-For this ask students what is given and what is to find?

-Response the correct answers.

Ask them how can it solve? What should we do to find the solution?

Then, they will answer discuss or answer:

i.e. 10% of 1200

$$=10/100 \times 1200 =120. \text{ (Ask why?)}$$

And help them to check the answer is right or not.

-Again ask them is there alternative method of solution and discussed with them about alternative method if it is has.

Similarly teach as above process about how to convert given number in to percentage.

Homework: Exercise 5 Question No.1 and 2.

Teaching Episode: II

Class: 8

Date:

Sub: Mathematics

Teaching Unit: **Percentage**

Time: 45 minutes

Objectives: Students will be able to find the percentage of passed students if the total number and failed student's percentage is given.

Teaching Materials: Daily Teaching Materials

Teaching Activities:

During the class period the teacher would do the following activities:

At first teacher writes the problem on the blackboard and ask:

- Do you understand all the words on the problem?
- Command them to state in their language.
- What is given? What is to find in the problem?
- While asking questions if they do not response correctly then make them aware of wrong answer and can ask questions related with it.

After understanding the problem command them to solve problem or give some clues to find the answer. For this ask them:

- What is the percentage of passed students?

How do find the number of passed students? Guide them to find the solution.

After solution, ask them:-

- Can you examine each steps of the problem?
- Are these steps are correct? -Can you prove each step by appropriate reasons? etc.

The answer inferred by students give them to examine whether it has been solved by right method or not. It can be solved by another means or not, which method is most appropriate among them to identify? , By which way it become reliable for generalization commands them to consider the things.

Homework: Exercise 5, question No: 2-7.

Teaching Episode: III

Class: 8

Date:

Sub: Mathematics

Teaching Unit: **Percentage**

Time: 45 minute

Objectives: Students will be able to find the total number if the certain percentage is increase or decrease in the given number.

Teaching Materials: Daily Teaching Materials

Teaching Activities:

During the class period the teacher would do the following activities:

At first teacher writes the problem on the blackboard and ask:

- Do you understand all the words on the problem?
- Command them to read problem and state it in their own words.
- What is given? What is to find in the problem? What is denoted by number?

If the students can't response appropriately the teacher will give time to consider it and make them aware by asking related questions.

After understanding the problem stimulate them to seek the way of solving problem.

For this command them to:

-Find increase number by using given percentage and total number.

Similarly discuss how to solve if the number decreases.

Likewise in the solution every step should be checked up.

-Are all steps of solutions correct? And can you verify each step by giving reason?

-Can you solve this problem by another method?

Homework: Solve the similar problems on exercise 5

Teaching Episode: IV

Class: 8

Date:

Sub: Mathematics Teaching Unit: **Unitary Method** Time: 45 minutes

Objective: At the end of this lesson students will be able to find the solution of problems related direct variance (only two case problems)

Teaching Materials: Daily using materials

Teaching Activities:

During the class period the teacher would do the following activities:

-Recall the previous lesson by giving the question and help them to find answer if it is necessary.

After this write an example on blackboard related to topic.

By taking examples clear the concept about direct variance

Take an example and do the following activities:

-Eg: A man gets Rs12000 in a month how much will he gets in 1 year?

-Ask students to restate the problem and state it in their own words. What is given? - What is to find out? -What type of variation is it? etc.

If the students can't response appropriately then give them time to consider and make them aware by asking questions.

After understanding the problem stimulate them to seek the way of solving problem.

For solution: salary in 1 month is Rs12000.

„ „, 12 months is $Rs12000 \times 12 = 144000$ (ask why?)

If students can't do it, teacher will give clues.

-Also ask them is there alternate method to find the solution.

-Can you say this answer is correct?

In this way the teacher can teach the same types of problems.

Homework: Solve the similar problems exercise of text-book.

Teaching Episode: V

Class: 8

Date:

Sub: Mathematics Teaching Unit: **Unitary Method** Time: 45 minutes

Objective: At the end of this lesson students will be able to find the solution of problems related indirect variance (only two case problems)

Teaching Materials: Daily teaching Materials

Teaching Activities:

During the class period the teacher would do the following activities:

Recall the previous lesson by giving the question and help them to find answer if it is necessary.

After this write an example on blackboard related to topic.

By taking examples made them the concept about indirect variance.

Take an example and does the following activities:

Eg: : If 12 men can do a piece of work in 12 days, how many days can 15 men do that work? Ask students for restate the problem and state it in their own words and ask: - What is to find out? -What type of variation is it? etc.

If the students can't response appropriately then give them time to consider and make them aware by asking questions.

After understanding the problem stimulate them to seek the way of solving problem.

For solution ask them:

-In how many days 1 man can do 1 (whole) work and why?

-In how many days 15 men can do the whole work and why?

-If students can't do it, teacher will give clue.

Also ask them is there alternate method to find the solution.

- Can you check every step with appropriate reason?

Homework: Solve the similar problems exercise of text-book.

Teaching Episode: VI

Class: 8

Date:

Sub: Mathematics Teaching Unit: **Unitary Method** Time: 45 minutes

Objective: At the end of this lesson students will be able to find the amount work together if the separate amounts are given for two objectives.

Teaching Materials: Daily teaching materials

Teaching Activities:

During the class period the teacher would do the following activities:

-Recall the previous lesson by taking an example and help them to find answer related to direct and indirect variance

Now write a question related to the above objective

E.g.: If Shyam can do a piece of work in 60 days Hari can do it in 45 days, in how many days did they complete it if they work together?

For the activity teacher ask students to restate the problem. Ask them:

-Do you understand all the words of question?

-Command them to state their own language.

-What is given and what is to find out?

While asking if student's response incorrect then the teacher made them aware of wrong answer and can ask questions related with it.

After understanding question command them to solve problem or make an idea about solving problem.

The students are commended likewise:

- In how many days Hari can do 1 work?

-How much work will Hari do in 1 day?

-How much work will Shyam and Hari do in 1 day?

-In how many days will Shyam and Hari complete the whole work?

Ask following questions:

-Have you examine each step of problem?

-Are these steps are right?

-Can you prove each step by giving reason?

-And ask them is there alternate method to find solution.

In this way teacher can teach same types of word problems for practice.

Homework: Solve the similar problems in exercise of text-book.

Teaching Episode VII

Teaching Unit: **Profit and Loss**

Date:

Class: 8

Sub: Mathematics

Time: 45 minutes

Objectives: During ongoing lesson students will be able to define profit and loss and find profit and loss from given C.P and S.P

Teaching Materials: Daily using Teaching Materials

Teaching Activities: During the class period the teacher will do following activities:

First of all, discuss about C.P and S.P

From this, teacher will give the concept about selling price and cost price.

After this, the teacher and students will be discussed about profit and loss and define the terms.

While discussion the teacher will write an example and ask them what is selling price and cost price. Which one is greater? Etc.

-What type of condition is to be profit and to be loss?

i.e. from the above discuss, conclude that if $S.P > C.P$ then there is a profit and if $S.P < C.P$ than there is loss.

Now write a problem: If Hari brought a computer for Rs.24500 and sold for Rs.25475 and

Ask them:- What is given and what is to find out?

-Is there a profit or loss and how is it?

-Why there is profit?

For practice give them some questions sand check their answer.

In this way teacher can teach some problems related with it.

Homework: Exercise 6, Question No. 1 and 2.

Teaching Episode: VIII

Class: 8

Date:

Sub: Mathematics

Teaching Unit: **Profit and Loss** Time: 45 minutes

Objective: At the end of this lesson students will be able to find profit and loss percentage from given S.P and C.P

Teaching Materials: Daily Using Materials

Teaching Activities: During the class period the teacher will do the following activities:

Recall the following formulae:

Actual profit = $S.P - C.P$ and Actual = $C.P - S.P$

i.e. one make profit if $S.P > C.P$ and loss if $C.P < S.P$.

With the help of previous lesson percentage, find the process of finding profit percentage.

i.e. if the actual profit or loss are expressed in the percentage of C.P they are profit or loss percentage.

Thus, profit or loss percentage means the profit or loss which is calculated as: Profit percent = profit x 100%/C.P.

Ask them what will be formula to find loss percent.

Now take an example: Krishna buys a cycle on Rs.2550 and sell it in Rs.2780 find his profit percent.

Ask them: what is given and what is to find?

Command them to restate the problem in their own word.

After understanding the problem ask them the process of solving problem: what is first step? Which formula is to use? How to calculate the answer? The teacher will encourage and help them to solve the problem.

After solution ask them: Is the solution correct? Can you check each step with an appropriate reason? Is there an alternative method for the solution?

For practice give a problem and check their solution and encourage them to find right solution if they have wrong solution with suggestions.

Home work: Exercise 6, question No. 3 and 4.

Teaching Episode: IX

Class: 8

Date:

Sub: Mathematics

Teaching Unit: **Profit and Loss** Time: 45 minutes

Objective: At the end of this lesson students will be able to find S.P when C.P and profit or loss percent are given.

Teaching Materials: Daily using teaching Materials

Teaching Activities:

Recall the previous lesson using by group discussion method which were: profit and loss percent and formulae to find them

i.e Actual profit = profit percent x C.P / 100% and

Actual loss = loss percent x C.P / 100%.

Then, we calculate S.P i.e. $S.P = C.P + \text{profit percent}$ or $S.P = C.P - \text{loss percent}$.

Take an example: If C.P = Rs.120 and profit is 20%, find S.P.

For this ask them: what are given information and what is to find?

Are you clear about question? Etc

After understanding the problem ask them how to find solution or what is the process to find the solution? -Command them to seek the solution.

If they make mistakes in calculation, aware and suggest them for the solution.

After solution ask them: Is the solution process is right? Are all steps correct? Can you prove each step by giving appropriate reason?

Ask them about the alternative shorter method to find the solution?

For practice give them a problem, check their answer and suggest them on wrong steps.

Home work: Solve the similar problem of exercise 6 of text-book.

Teaching Episode: X

Class: 8

Date:

Sub: Mathematics Teaching Unit: **Profit and Loss** Time: 45 minutes

Objective: At the end of this lesson students will be able to calculate C.P when S.P profit or loss percent are given.

Teaching Materials: Daily Teaching Materials

Teaching Activities:

First of all discuss about formulae which we used for different purpose.

In this case, the unknown value of C.P is considered as variable because we can calculate S.P with the help C.P and profit or loss percent.

Recall profit or loss percent is always out of C.P so actual profit or loss is always calculate with C.P.

Take an example: If S.P of a book is Rs.420 and loss percent is 20%, find the C.P of the book.

Ask them: what is given and what is to find out?

Are you clear about the problem?

After understand the problem, ask them: how to find the solution? What are the processes to find the problem? Why should we assume C.P as x? Etc

Now encourage them to find the solution. If they can't solve, help them or guide them to find the solution.

After solution, discuss about:

Is the solution process correct? Can you verify each step with reason? Are all steps and signs are correct? Is there an alternative method shorter than this? Etc.

For practice give them a similar question, check their solution and suggest/advise them for right solution if the solution is wrong.

Homework: Solve the similar problems in exercise 6 of text-book.

Teaching Episode XI

Class: 8

Date:

Sub: Mathematics Teaching Unit: **Simple Interest** Time: 45 minutes

Objective: At the end of this lesson students will be able to define principle, rate of interest, and amount and find the interest when principle and amount are given.

Teaching Materials: Daily Teaching Materials

Teaching Activities:

For the concept of principle, rate of interest and amount the teacher will take an example like:

Krishna brought Rs.20000 from Ramesh for certain interval of time then he returned him some additional amount of money under the certain condition. -Can you say why did he pay additional money? For this students will say different reasons. After this collect the response from students and define Principle, Rate of interest and Amount.

After this take an example: Hari brought Rs.12000 from a bank after 3 years he returned Rs.15000, find the interest.

Now discuss the following questions: what is given and what is to find?

-Which is principle and which is amount? How do you find the interest?

After this encourage them to find the solution by using formula $I = A - P$.

Take another similar type of example and check their answer.

Home work: What do you mean by principle, rate of interest, amount and interest?

Exercise 8 Question No 1

Teaching Episode XII

Class: 8

Date:

Sub: Mathematics Teaching Unit: **Simple Interest** Time: 45 minutes

Objective: At the end of this lesson students will be able to find simple interest using P, N and R.

Teaching Materials: Daily Teaching Materials

Teaching Activities:

Recall previous lesson and discuss about principle, amount, rate of interest and interest.

Aware them about the units of principle, interest, time, amount and rate of interest.

Ask the process of finding interest and if they response incorrectly correct it.

i.e $I = P \times N \times R / 100$ where P,N and R as usual meaning.

Now take an example: Mahesh brought a sum of Rs.15250 from a bank at the rate of 5% per year. Find the interest and amount he had to pay at the end of 4 years.

Ask them: -what is given and what is to find?

After understanding the problem ask them about the process of solution.

Encourage them to find the solution and give them clue or suggestion if they made mistake.

After completing the solution discuss:

Is the solution process is right? Are the signs are correctly used?

After this give them some problem and checked their solution. Give them clues if they made mistakes.

Home work: Exercise 8 Question No.2.

Teaching Episode: XIII

Class: 8

Date:

Sub: Mathematics

Teaching Unit: **Simple Interest**

Time: 45 minutes

Objective: At the end of this lesson students will be able to find the unknown variable problem related to simple interest.

Teaching Materials: Daily Teaching Materials

Teaching Activities:

Recall the previous lesson and write the formula to find simple interest

i.e. $I = P \times N \times R / 100$, where P,N and R have their usual meaning.

-Ask students if they can make another relation from the above relation (formula)?

Command them to make another relation and help them to find the relation.

i.e. -when R is to find the then relation is $R\% = I \times 100 / N \times P$.

-when P is to find then the relation is $P = I \times 100 / N \times R$.

-when N is to find then the relation is $N = I \times 100 / P \times R$.

Now take an example: Find the time in which Rs.3000 will give Rs.450 as a simple interest at 5% per year.

Ask them: -What information is provided and what is to find?

- Are you clear about problem?

After understanding the problem ask them about the process of finding solution. How can we solve this?

During process of solution help them to use correct formula if they use wrong formula, encourage them to find the solution.

After finding solution, discuss on the questions:

-Why do you use this formula? Is there alternative solution of this problem?

For practice give them some questions and help them to find the answer if they are in wrong way.

Home work: Exercise 8 question No 3, 4 and 5.

Teaching Episode: XIV

Class: 8

Date:

Sub: Mathematics Teaching Unit: **Simple Interest** Time: 45 minutes

Objective: At the end of this lesson students will be able to solve the word problems of simple interest.

Teaching Materials: Daily Teaching Materials

Teaching Activities:

Recall the previous formulae and revise some problems if necessary.

Now write a problem on blackboard:

E.g.: Find the simple interest on Rs.2160 for 3 years at the rate of 10% per year. In how many years will Rs.1800 produce the same amount of interest at the rate of 12%?

Now discuss the following questions:

-Command them to restate the problem in their own word.

-How many parts are there in the given problem?

-What is given in the first part and what is to find?

-What is given in the second part and what is to find?

After understand the problem clearly, discuss the process of solution of the problem.

For this encourage them to solve the problem, provide them some clues when they feel difficult and help them to use appropriate formula.

After completing first part ask how they solved the second part.

-What are given and what is to find in it?

- Can you solve this part before first part if not why?

Similar as above find the solution of the problem.

After completing the solution discuss about:

The process of solution is correct or not.

Can you verify each step with appropriate reason? And is there a alternative method of solution.

For practice give them a similar question and help them to find the solution of the problem.

Homework: Solve the similar problems of exercise 8.

ABSTRACT

This is an experimental research related to the mathematics achievement of grade VIII students. The study was done in Makawanpur district to compare the mathematics achievement between genders and to explore the effectiveness of problem solving method in teaching mathematics at lower secondary level. Two government schools were selected by using convenience sampling and pre-test, post-test non-equivalent control group design was used to conduct this study. There were 42 students in Siddhartha Higher Secondary School and 40 students in Bhutan Devi Higher Secondary School. On the basis of pre-achievement test score two groups were made homogeneous as nearly as possible. 26 students (14 boys and 12 girls) of Siddhartha Higher Secondary Schools were selected as experimental group and 24 students of Bhutan Devi Higher Secondary School were selected as control group on the fair coin toss. Two groups were taught same topics percentage, unitary method, simple interest and profit and loss but experimental group was taught by using problem-solving method and control group was taught using traditional method of teaching and 14 lesson plans were developed during the experiment. After completing the experiment both groups were administered a mathematics achievement test.

Achievement tests and observational notes were the main tools of study. For analysis of data collected from achievement test mean, standard deviation, variance and t-test (at 0.05 level of significant) were used. A descriptive analysis was presented for the changes in non cognitive skills. It was concluded that there was no significant mathematics learning and achievement difference in terms of gender. And problem-solving method of teaching gives better result than the traditional method of teaching. Non-cognitive skills of the students also be developed by the problem solving method teaching.

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**EFFECTIVENESS OF PROBLEM-SOLVING METHOD IN TEACHING
MATHEMATICS AT LOWER SECONDARY LEVEL**

**A
THESIS
BY
PAWAN DHAKAL**

**IN THE PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE
DEGREE OF MASTER OF EDUCATION**

SUBMITTED

TO

DEPARTMENT OF MATHEMATICS EDUCATION

CENTRAL DEPARTMENT OF EDUCATION

UNIVERSITY CAMPUS

TRIBHUVAN UNIVERSITY

KIRTIPUR, KATHMANDU

2015

LETTER OF APPROVAL

A

Thesis

By

Pawan Dhakal

Entitled

Effectiveness Of Problem-Solving Method In Teaching Mathematics At Lower Secondary Level has been approved in partial fulfillments of the requirements for the Degree of Master of Mathematics Education.

Committee for the Viva-Voce

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Pawan Dhakal

2015

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CERTIFICATE

This is to certify that **Mr Pawan Dhakal** is a student of academic year 2067/068 with campus Roll no....., Thesis no.1027 exam Roll no.2282671 and T.U. Registration no.9-2-243-67-2004 has completed this thesis under my supervision for the period prescribed by the rules and regulation of Tribhuvan University Nepal. The thesis entitled "**Effectiveness of problem solving method in teaching mathematic**" embodies the results of his investigation in the Department of Mathematics Education, Central Department of Education University Campus Kirtipur Kathmandu. I recommend and forward that his thesis be submitted for the evaluation as the partial requirements to award the degree of Master of Education.

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