Chapter I

INTRODUCTION

Background of the Study

Mathematics is the way to settle in the mind by a habit of reasoning and it is an expression of human mind that reflects the active well, the completive reasons and desire for aesthetic perfection. Mathematics is interpreted, explained and used in different ways or situation of human life. It helps to generate, logical, intuition, constructivism, analysis, formulation, generalization of judgment power.

Mathematics directly deals with the human life. It is believed that the development of mathematics and development of civilization go together. Mathematics is created to fulfill human needs. It has been development simultaneously with the development of the society. Mathematics is not only taught and practiced through the formal institution but the contemporary societies have also been practicing it with its own idea and belief. Mathematics is used throughout the world as an essential that in many fields, including natural science, engineering, medicine the social sciences (Bell, 2008).

According to New Dictionary of English Language, funk and Wagnall (2000), "Mathematics is the science that treats of quantity or magnitude and of their measurement especially by the use of symbols that investigate deductively, the spatial, serial and existing between objections of perception, in wider sense, the group of applied science concerned with the concrete application of such data".

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 methods. 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 (Bista, 2005).

To make learning more accessible to students, teacher drew upon the knowledge and skills that students had acquired in previous years. It is important to access where students were in their mathematical growth and to bring them forward in their learning.

A teacher can use different methods to teach different topics to the need and demand of situation. There are different teaching methods of teaching mathematics. Nature of subject, classroom size availability of physical materials etc. depend to obtain the goals of teaching. Different instructional approaches, strategies, methods etc. and techniques of teaching have been propounded by educational thinkers. Some of them are child-centre methods, co-operative methods, individualized methods and instruction for constructivism.

In order to apply their knowledge effectively and to continue their learning, students must have a solid conceptual foundation in mathematics. Successful classroom practice involves students in activities that require higher order thinking, with an emphasis on problem -solving. Students who have competed the elementary program should have a good grounding in the investigative approach to learn new concepts, including the inquiry model of problem-solving and the approach is still fundamental in the lower secondary program (Gallagher, 1997).

Even in the lower secondary level manipulative are necessary tools for supporting the effective learning of mathematics. These concrete learning tools motivate and invite students to explore and represent abstract mathematical idea in varied, concrete, tactile, and visual in rich ways. Manipulative are also a valuable aid to teachers. By analyzing student's concrete representation of mathematical concepts and listening carefully to their reasoning, teacher can gain useful insights into students thinking and provide support to help and enhance their thinking (Bista, 2005).

All learning, especially new learning, should be embedded in well chosen contexts for learning context that are broad enough to allow students to investigate initial understandings, identify and develop relevant supporting skills, and gain experience with varied and interesting applications of the new knowledge. Such rich context for learning opens the door for students to see "big ideas" of mathematics the major underlying principles, such as pattern or relationship. The understanding of key principle will enable and encourage students to use mathematical reasoning throughout their lives (Herreid, 2003).

Traditionally, mathematics was taught as collection of acts that were learned through drill and memorization. Lecture method for teaching mathematics was resulting in rote learning which was not meaningful. As a new mathematics program with an emphasis upon understanding of concepts were developed and implemented in schools during 1960's and discovery learning, inquiry and mathematics laboratories was more appropriate method for fostering meaningful learning. In these methods students are actively participant in teaching learning activities and find out the mathematical concepts under the guidance of teacher. Considering the needs, interest, aptitude and age of students, the nature of lesson and child psychology the teacher decides teaching

and learning strategies and approach. The instructional strategy focuses on the principle of "learning by doing". Student center approaches considered as problem-solving method, laboratory method and discussion method (Dawal, 2005).

Collaborative learning enhances students understanding of mathematics. Working co-operatively in groups reduce isolation and provides students with opportunity to share ideas and communicate their thinking in supporting environment as they work together towards a common goals. Communication and the connections among ideas that emerge as students interact with one another enhance the quality of students learning.

Problem-solving is not a process of applying rules that have been learned previously but also 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 student 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 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 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 (Dawadi, 2005).

The mathematical process can't be separated from the knowledge and skill that students acquire throughout the course. Students must solve the problem, communicate, reason, reflect and so on, as they develop the knowledge, understanding or 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 on achieving the goals 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;
- help 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 skill;
- promote the collaborative sharing of ideas and strategies, and promote talking about mathematics;
- help students to find enjoyment in mathematics;

- increases 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 had a opportunity to practice s/he can able to employ and transfer knowledge of the principle in a variety of situation (Herreid, 2003).

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 mathematic. 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 (Bista, 2005).

Statement of Problem

Mathematics is one of the important disciplines with boarder application all over the world. Each citizen need and use it in their both practical and theoretical aspects. In Nepal, the teaching and learning situation of mathematics is not satisfactory and higher numbers of students are being failed in mathematics. Besides these, there are many reasons such as mathematics teaching focus on product i.e. finding answer rather than process, teaching emphasis on bookish knowledge and exam oriented. Similarly, students focus on rote learning than understanding. Even a trained teacher cannot implement the appropriate method, techniques and procedure that had learned during the period. There are not sufficient teaching materials and appropriate teaching methods. Students have the habit of reading mathematics like other subjects and do not practice mathematics problem sufficiently.

In order to overcome these problems, the teacher should be tactful, helpful, laborious and qualified for the selection of the suitable teaching approach and provide a basic guidance for students and learning through appraisal of attitude and diagnosis of error.

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

i. Is problem-solving approach of teaching mathematics more appropriate than the traditional method of teaching mathematics at lower secondary level?

ii. Why the problem solving approach is more effective than the traditional approach on teaching mathematics?

Objectives of the Study

The objectives of the study were:

i. To compare the achievement of students taught by using problem-solving method and by using traditional teaching method in Grade VIII.

ii. To assertion the problem-solving method in teaching mathematics at lower secondary level.

Significance of the Study

Mathematics as well as mathematics education plays a very important role in the development of nation. Mathematics holds a key position in school curriculum. Within complexities of human life, there are so many problems in mathematics education which all cannot be addressed in school curriculum routine. Teaching and learning is one of the most important processes in school and campus. Mathematics educators and psychologists discovered some learning theories and teaching methods. In our country the achievement of mathematics is not satisfactory. Student's motivation, participation, co-operation, curiosity etc. play an important role to progress the mathematics achievement.

This research would help to identity the effectiveness of problem solving method in lower secondary level in mathematics achievement. It would help for the teachers, mathematics educators, curriculum planners, and researchers to follow problem -solving skills and methods. It would help to provide the concerned person and agencies to choose the appropriate technique of teaching and improve the teaching Arithmetic at lower secondary level. In addition, it might be equally useful to train the teachers with appropriate teaching pedagogies. It would establish the validity of the

method of teaching for teaching mathematics at lower secondary level. The most significant contribution of this study would be the effectiveness of problem-solving method in teaching Arithmetic at lower secondary level.

Hypothesis of the Study

Hypothesis helps researcher to find out the fact in scientific way and in testable form. So the research was prepare the following hypothesis.

Research Hypotheses

i. There is no significance difference in mathematics achievement score of control and experimental group in pre – test. Mathematics achievement in Arithmetic taught by traditional and problem-solving method of teaching in grade VIII students.

ii. There is no significance difference between control and experimental group boy's mathematics achievement in Arithmetic taught by traditional and problem-solving method of teaching in grade VIII students.

iii. There is no significance difference between control and experimental group girl's mathematics achievement in Arithmetic taught by traditional and problem solving method of teaching in grade VIII students.

iv. There is no significance difference between mathematics achievement in Arithmetic in grade VIII students in control and experimental groups.

Delimitations of the Study

The study was delimited limited under the following criteria:

i. The study was delimited in two schools of Syangja district.

ii. Only the government schools were included in this study.

iii. The experimental duration of this study was only for four weeks.

iv. The researcher taught Arithmetic (percentage, profit and loss, simple interest and unitary method) of grade VIII.

Operational Definition of Key Terms Used

Researcher has defined the related terms with much more precise and in unambiguous way, however definition must be based on theory that is generally recognized as valid. Researcher defined the following related terms:

Problem-Solving Method: It is scientific method of teaching. It is students centre teaching method. Students gain the knowledge through step to step procedure working independently in collaboration but teacher and students actively show eagerness of this method.

Traditional Method: In this method, teacher is one of the authorities of teaching learning activity and students passively accept the fact the 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 is 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 term of magnitude of score obtained by experimental and control group in mathematics achievement test and comparison in the difference between two teaching methods with their student activities, participation, daily homework, student's discipline, and also student attendance in school are analyzed and finding better one.

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 booklet 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 follows:

Empirical Literature

Quaiyum (2003) did a research work on "A study of students problem-solving behaviours in mathematics at Secondary Level of Nepal" from Institute of Advanced Studies in Education, University of Lucknow, 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.

Lamsal (2004) did an experimental research on "A study on effectiveness of problem solving approach in teaching menstruation 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 menstruation 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 (2005) did an experimental research on "A study on effectiveness problem solving method in teaching matheamtics 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.

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 were 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.

Ali, (2010). Did a research on "Effect of Using Problem Solving Method in Teaching Mathematics on the Achievement of Mathematics students" with the aim to explore the effectiveness of problem solving approach in the academic achievement of students in mathematics at elementary level. All students studying at elementary level in public and private elementary and high school's at 8th grade comprised the population of the study and seventy six 8th grade student's of government girls higher secondary school, Pakistan, were taken as the sample of the study. All students were divided on the basis of pre – test, into two groups as experimental and control group through random sampling technique. The number of students in the experimental and control group was 38. The difference was that controlled group was taught by traditional method while, experimental group was instructed by problem solving method. The data collected were analyzed using mean, standard deviation and t – test. It was found that there was a significant difference between the academic achievements of the student taught through traditional method and problem solving method. It was also found that the academic achievement of the students was better who were taught through problem solving method as compare to the students who were taught through traditional method.

The question is that, can problem solving method in teaching mathematics be more effective than the traditional method? Similarly, what sort of effect can be found in gender when this problem solving method is used? And what are the reasons to prove that problem solving method in teaching mathematics is more adequate than the traditional method these are the questions and this research is held to find out the reliable answers.

Most of the researcher reviewed as above shows that the problem solving method for teaching mathematics is better than traditional approach. But these researches were only concerned about the effectiveness of method and they were not concern about why the problem solving is better than traditional method. So this research intends to find the reason for problem solving method used in mathematics teaching.

On the other hand preparing module (or lesson plan) according to the theory of problem solving approach is a challenging task. Thus, for the validity of the modules; the researcher used the theory related to that method offer studying deeply and the major aspect of theory described.

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 on "Endeavors to understand and the process of solving problem, especially the mental operation typically useful in this process. Polya believed that student "should acquire as much experience of independent work as possible". The student learns nothing if too much help is given. The teacher should try to think at the level of

the student and ask key questions or make suggestions. Questions and suggestions offered should be general and proceed from common sense such that the student could have thought of them himself. They should "just indicate a general direction and level plenty for the student to do".

General questions, such as "What are the unknowns?" and "have you ever solved a problem with similar unknowns?" are applicable in many cases. With repetition, the student may learn to ask himself the appropriate questions in similar situations. The teacher should put these questions and suggestions to the student as often as can be done naturally. The researcher should also ask himself the same questions when solving problems in front of the student. Through imitation practice, "the student will eventually discover the right use of these question and suggestions, and doing so he will acquire something that is more important than the knowledge of any particular mathematical fact."

Polya collected questions and suggestion that were helpful in problem solving and grouped them under the four phases of problem solving. A brief description of Polya's 4 phases of problem solving, including some examples of the suggested questions is given below:

a. Understanding the Problem

Mathematical facts are first guessed and then proved, and almost every passage in this book endeavors to show that such the normal procedure. If the learning of mathematics has anything to so with the discovery of mathematics, the student must be given some opportunity to do problems in which first guesses and then proves some mathematical fact on an appropriate level.

This seems so obvious that it is often not even mentioned, yet students are often stymied in their efforts to solve problems simply because they do not understand it fully, or even in part. First of all, the verbal statement of the problem must be understood. The teacher can cheek this, up to a certain extent, he asks the student to repeat the statement and the student should be able to state the problem fluently. The student should also be able to point out the principal parts of the problem, the unknown, the data, and the condition. Hence, the teacher can solution affords to miss the questions: what is the unknown? The teacher should explain the problems in their words. The teacher should draw a diagram to understand the problem. After that the teacher helped to solve solution the students.

b. Making a Plan

The focus is on teaching mathematical topics through problem- solving contexts and inquiry-oriented environments to help students construct a deep understanding of mathematical ideas and processes by engaging them in doing mathematics: creating, conjecturing, exploring, testing, and verifying.

After understanding the problem teacher mentions that there are many reasonable ways to solve problems. The skill at choosing an appropriate strategy is best learned by solving many problems. Choosing a strategy increasingly easy. A partial list of strategies was included: Guess and check, look for a pattern, make an orderly list, draw a picture, solve a simpler problem, consider special cases and use a formula etc.

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 each step?", "Can you say each steps is correct?" Can you prove each step is correct or not?" etc.

d. Look back

In this steps teacher asked students questions and discussed: Teacher mentions that much can be gained by taking the time to reflect and look back at what you have done, what worked, and what didn't. Doing this will enable you to predict what strategy to use to solve future problems. Also discussed with students for this question such as: Can you check the result? Can you check the argument? Can you derive the solution differently? Can you see it at a glance? Can you use the result, or the method, for some other problem? Etc.

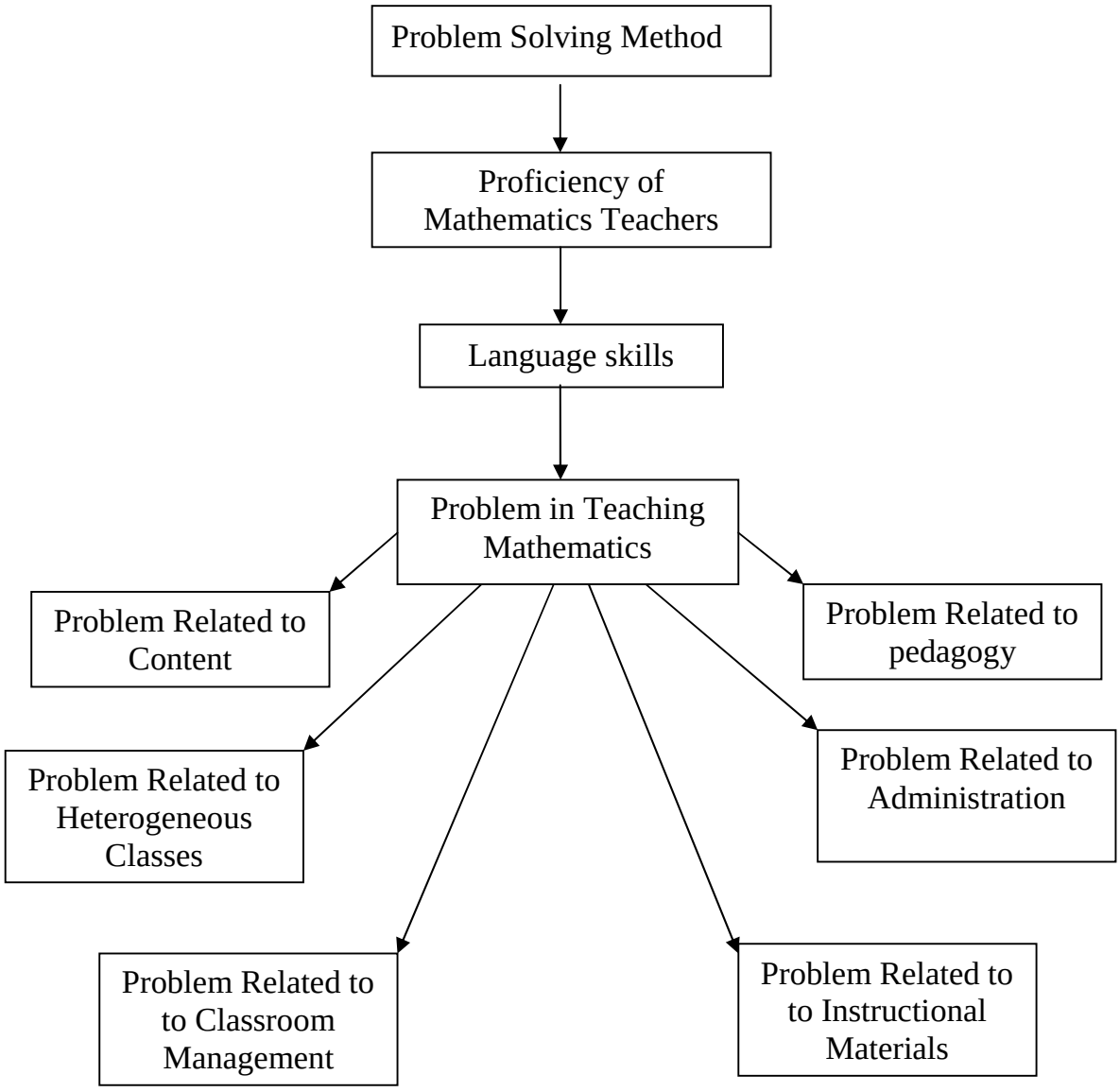
According to G. Polya, solving problem is like swimming or playing Piano. At first it is hard, unpleasant and terrifying, but after practice it can be performed automatically and enjoyable. If you wish to learn swimming you have to go into water and if you wish to solve problem, you need to find a way.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

Problem solving method aims at representations the knowledge to learn in the form of problem. It begins with problematic situation and consist of continues, meaningful and well – integrated activities. The problem must be set in student mind in natural way and it is insured that the student are genuinely interested to solve them.

Conceptual Framework

Conceptual framework has been developed on the basis of the previous researches and studies carried out in the similar topics. In this regard, the researcher has consulted researches of various writers and researched. The idea can be present in the following framework.

Fig,1 A framework for problem solving method in teaching mathematics.



Source: http://www.white-paper7-framework-for-teachable-problem-solving;

Teacher's role in problem based learning environment: The most important achievement of a teacher is to help his/her students along the road to independent learning. In problem based learning, teacher acts just as facilitator, rather than a primary source of information or dispenser of knowledge. Roh, (2003) argued that within problem based learning environment, teacher's instructional abilities are more critical than in the traditional teacher- centered classroom. Beyond presenting mathematical knowledge to the students, teacher in problem based learning environment must engage students in marshalling information and using their knowledge in applied sand real settings.

Student's understanding in problem based learning environment: Presenting the student with a problem, give them opportunity to take risks, to adopt new understandings, to apply knowledge, to work in context and to enjoy the thrill of being discoverers. Tick, (2007) stated that in the student- centered learning environment that is desirable for problem based learning, the central figure of the learning – teaching process is the student. The learning objective is not the reproduction, recall and learning of passively received learning material but the active and creative engagement of student in group work and individual study thus transferring the skills and knowledge. The individual, autonomous self- directed learning give the freedom to the learner to decide individually and consciously on the learning strategy and on the time scale, s/he wants to follow.

Problem based learning and mathematics: Okereke (2006) stated that mathematics is the science of things that have a pattern of regularity and logical order and finding and exploring the regularity. Mathematics is the foundation of science and technology and the functional role of mathematics to science and technology in multifarious, that no area of science, technology and business enterprise escapes it

application. Besides its importance it is observed that mathematics is one of most poorly taught, widely hated and abysmally understood subject in school level. Students particularly girls run away from the subject. He further stated attributed student's poor performance to factors such as the society view that mathematics is difficult, shortage of qualified teachers, lack of mathematics laboratory and lack of attractiveness and novelty in teaching method. Problem based learning is a model which centered on students, develops active and motivated learning, problem solving skills and broad field knowledge, and based on the deep understanding and problem solving.

Evidence of poor performance in mathematics by school level students highlights the facts that the most desired technology, scientific and business application for mathematics cannot be sustained. This makes it performance by students practically (Okigbo & Osuafor, 2008). Problem solving as a method of teaching may be used to accomplish the instructional roles of learning basic facts, concepts, and procedure, as well as goals for problem solving. Problem solving is a major part of mathematics has many applications and often those applications represent important problems in, mathematics. We include problem solving in school mathematics because it can stimulate the interest and enthusiasm of the students.

Problem solving is given much more importance in teaching mathematics in schools. National council of teaching Mathematics (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 the above conceptual framework.

Chapter III

METHODS AND PROCEDURES

This chapter included separate headings such as design of the study, population of the study, sample of the study, tools, method of data collection and data analysis procedure.

Research Design

The researcher had used pre – test, post – test and non equivalent group design for the purpose of the study which is presented in the following table.

Table 3.1

Groups	Pre-test	Treatment	Post-test
Experiment (E)	T_1	Problem solving Method (X)	T_3
Control (C)	T_2	Traditional Method (Y)	T_4

Where,

T_1 and T_3 were pre-test and post- test given to the students of experimental group and T_2 and T_4 were pre- test and post- test given to the students of control group.

This design was one of the most effective in minimizing the threats to experimental validity. Two groups were 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 was 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 was consisted of all students of grade VIII in government schools of Syangja district.

Sample of the Study

This study was experimental and carried out two school Shree Shidratha higher secondary school Phedikhola and Shree Jana Adrasha higher secondary school Arukharka – 6, Syangja. These two schools were selected by the researcher because of assess and expectation of help and co-operation need from the schools. For the selection of students, first of all pre-achievement test was taken to the whole students of grade VIII of both schools. Two groups were made homogenous as possible as on the basis of their pre achievement scores. A fair coin had tossed to determine the experimental and control group. In this process, Shree Shidratha Higher Secondary School's twenty one students (eleven girls and ten boys) out of thirty three students were selected as control group and Shree Jana Adrasha Higher Secondary School's seventeen students (ten girls and seven boys) out of twenty five students were selected as experimental group. The criteria for selection number of student obtained 20-33 marks in pre – test on both groups.

Tools for Data Collection

The researcher had developed two different teaching modules for each group every day teaching using by problem solving method and traditional method of teaching for experiment. At the end of experiment, mathematics achievement test

which was consisted subjected (very short, short and long) type of questions. These were main tools used in collecting data for the study.

For the ethnographic study researcher used the relevant tools and techniques as participant observation, in-depth interviewing and other related documents and so on in order to collect information from the respondents. Since ethnographic study seeks meaning and understanding of a phenomenon in a naturally occurring setting, it needs close involvement of researcher with the person/objects/site/activity which is relevant to the aims of study. The researcher has to observe the behavior and work closely with respondents/informants in a natural setting as much as possible in order to collect essential data. For this s/he has to select the appropriate methods of data collection. The researcher himself selected following tools and techniques to collect the information.

a. Participant Observation

Observation is a kind of tools that helps to seek knowledge through the use of sense ie, eyes, ears, nose, tongue and skin. It has great importance not only in research work but also in our daily lives. K.C(2000) writes that direct observation has the advantages of putting researchers into first hand contact with reality. Participant observation is a close and full involvement of researcher in a natural setting in order to experience and understand the behavior interaction event and so on. It helps to bridge and share the intimacy between the researcher and the setting which is under study, by immersing researcher her/himself into the subject being studied. Since the Nepalese classroom constituted by different socio-cultural forces because students from different background have their own lived reality and in the classroom they not simply conform norms and values of the school but also produce difference and these multiple realities influence the life in the classroom as well. To get required information the researcher

observed school overall as well as key respondents individually and collectively during their work at school, classroom, playing with peers, interacting with teachers about 14 days.

b. Ethnographic Interview

Interview is a two-way interaction between researcher and researched as in the form of interviewer and interviewee in which interviewer creates situations that can attract the attention of respondents for a enough period of time in asking questions and answering the questions in which interviewee puts his/her understanding and meaning. Unstructured interview also known as the open ended ethnographic (in-depth) interview. It can be regarded as informal interview and used to discover the in-depth understanding of people in the phenomenon under study. For this study all the required information was not possible to gather through the observation and documents. To go in-depth of the information researcher here carried out open ended interview along with structured question as well as observation. On the basis of objectives the researcher developed the interview theme in semi-structured form (see Appendix (HII)).

c. Researcher daily note

Researcher was note remarkable events found in the class of both groups. In experimental time student's motivation in learning, regularity in classroom, daily homework, participation in learning and students discipline in learning activities are noted on researcher daily note.

Validation of the tools

Since a tools are valid for a particular purpose and particular group. Therefore, the mathematics achievement test and teaching modules 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 the tools were developed with the help of mathematics teachers, supervisor and other educators and also consulted to measure. The teaching modules were constructed on the basis of four steps of problem solving teaching method according to G. Polya. The suggestions from experts and necessary changes were made to improve the tools for the immense of the validity. Therefore, it could be said that the tools were quite valid.

Reliability of the achievement was determined through an application of split half reliability calculation. The reliability of the teaching modules was tested on students' achievements. Those students who were taught by using problem solving method could follow and apply four steps of problem solving to solve the mathematics problem. So that teaching modules were quite valid.

Scoring the Data

Since the achievement test was questions of different levels and types. Each of types of questions varied according to difficulty level. Knowledge level question demands simple information carry 1 marks as score, the comprehensive level question demands the both information and skill, carry 2 marks each where as the application type of questions were higher level which demands knowledge as well as comprehensive level of 4 marks each.

Control of variable (Extraneous / Confounding)

Since the experiment was conducted in two different schools. In every school, grade VIII students were taught two difference methods by researcher himself.

In teaching activity there was attempted to control individual factors from which the outcome may not be separate on other factors apart from the situation of teaching method. Student was taught same book, topic and equal time. Not only that book, topic and time but also were used same teaching materials for teaching both groups. They were given same home work and class task for more than more practice of course. There wasn't any discussion between two groups of students about of teaching methods each other because they hadn't had any relation with one another group. Similarly during experimental period both groups were controlled to take extra class, tuition class and coaching class. Every group involved boys and girls but they were not selected and equal. At this process, same achievement test was taken to both group and used same scoring procedure.

In problem solving method the teacher wrote daily notes. Researcher gave homework to students daily in classroom. Students solved the every task easily. A student can think about a mathematical concept, the better that student would understand the underlying mathematical idea. For example, diagrams are given particular emphasis in the development of one step problems. Such diagrams show how to quantities in a problem are related to each other and why a particular operation or operation can be used to solve the problem.

Method of Data Collection

The researcher developed the achievement test, the teaching lesson plan and semi- structured interview schedule for the raw data collection. At first the researcher visited the school (Shree Jana Adrasha higher secondary school, Arukharka 6, Syangja) and conduct the pilot test in twenty five students.

The experimental and control groups were taught by researcher himself 45 minutes per group every day. According to the content of arithmetic at grade VIII total teaching hour allocated was 36 hours. But the certain topics percentage (2 periods), profit and loss (4 periods), unitary method (3 periods) and simple interest (4 periods) were selected for the study. During this period researcher noted down the student's understanding, participation, interpersonal skills, and performance accuracy in his daily note. A daily note based on the classroom reflection prepared by researcher facilitates the data analysis and interpretation. Researcher was note remarkable events found in the class of both groups. At the end of the study, the standardized achievement test was administered in both groups of the sample students. Finally interview was conducted individually to 15 students and the data obtained from post- test. Daily notes, and interview was analyzed and use in teaching conclusion about the problem.

Data Analysis Procedure

To analyze the obtained data the researcher computed the means, Standard Deviation of both groups with their secured scores in the test. Significance of difference between the mean scores of both the experimental group and control groups. The post-test scores were tested at 0.05 level of significance by applied t – test.

For the qualitative data analyze at first the data were categorized according to the category of the respondents and then different themes were given in the text of the observation and interview note. These themes were considered as a code. The similar code version of the respondents were collected together and explained in their perspectives. Cross match or triangulation was adopted to maintain the validity and reliability of the results of the study. Mainly the three sources of information were triangulated in motivation of students, regularity in the classroom and participation in the activities.

Chapter IV

ANALYSIS AND INTERPRETATION OF DATA

The most important part of the study is to analyze the collected data. The collected data in the form of large amount information are to be reduced into simplified form. The present study entitled "Effectiveness of Problem Solving Method in Teaching Arithmetic at Grade VIII" 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 grade VIII on topic arithmetic. Also this study intended to explore the effectiveness of problem solving method in teaching arithmetic at grade VIII.

This chapter deals with the statistical analysis and interpretation of data achievement score of the sample students. These data were tabulated and analyzed through mean, standard deviation and variation and analyzed for difference between two means. Since the groups were not comparable in pre -test scores, the post –test scores (scores obtained from subtracting each students pre- test score from his or her post-test score) were compute for the difference between the two average mean differences. The data of achievement test and the Non-Cognitive Effect were analyzed under the following heading:

- Analysis of Arithmetic mathematics achievement score of control and experimental group in pre – test result.
- Analysis of mathematics achievement score of boys between control and experimental groups.

- Analysis of mathematics achievement score of girls between control and experimental groups.
- Analysis of mathematics achievement score between control and experimental groups.
- Analysis of non-cognitive effect in the both Control and Experimental Groups.

Analysis of Mathematics Achievement Score of control and Experimental Groups in pre – test Result:

The pre – test score of students of control and experimental groups are presented in Appendix B(I) and B(II) and summary of statistical calculation for both group on the Pre – test result is presented in the table 4.1

Table 4.1

Comparison of Mathematics Achievement Score between Control and Experimental Groups in pre – test Result:

Groups	N	Mean	S.D	Variance	t – value
Control Group	21	25.57	3.42	11.76	Calculated value
Experimental Groups	17	26.35	3.79	14.36	2.05

Tabulated value $t_{0.05,36}$= 1.96

The above table 4.1 presents the means and variance of both experimental and control group on pre- test. The mean score of experimental group was 26.35 and the mean score of the control group was 25.57. As shows in the table, experimental group outperformed control group in terms of mean score. In order to test whether the difference in mean score was significant or not, t- test for independent sample was

used. The test was found to be no significant at 0.05 levels. Hence the null hypothesis that no difference exist between experimental and control groups was accepted.

Analysis of Mathematics Achievement Score of Boys between Control and Experimental Groups:

The mean achievement score of control and experimental groups boys were 25.1 and 33.14 respectively (Appendix D and E, Formulae Appendix F) over the full marks 40. It indicates that boys of experimental group learnt Arithmetic better in comparison of control group. It was necessary to determine the difference was significant 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 Control and Experimental Groups:

Groups	Genders	N	Mean	S.D	Variance	t- value
Control	Boys	10	25.1	2.55	6.49	Calculated value
Experimental	Boys	7	33.14	2.09	4.73	7.41

Tabulated value $t_{0.05,15}$= 2.12

The table 4.2 shows that the average of the difference scores for experimental group in found to be high that of control group. The t- test used showed that there was no significant difference between the groups. Supporting the null hypothesis: then is no significant difference between experimental and control groups. Such situation indicates that the treatment (New treatment) given to experimental group is not found to be significant in producing better result in comparison to conventional treatment given to control group.

It is to be noted that the experimental and control groups obtained 33.14 and 25.1 respectively as mean score of boys on post – test scores. The t – test adopted was found to be significant in favor of experimental group at 0.05 level of significance. The comparison of the average of difference score between the group was found insignificant at 0.05 level of significance. Such situation on the whole, indicated that the new treatment used was found significantly better assuming the control exercised in equating groups other than manipulative variables.

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

The mean achievement score of control and experimental group girls were 25 and 29.4 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 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 Score between Control and Experimental Groups:

Group	Genders	N	Mean	S.D	Variance	T- value
Control	Girls	11	25	2.83	8	Calculated value
Experimental	Girls	10	29.4	6.76	45.76	4.79

Tabulated value $t_{0.05,19}$= 2.09

The table 4.3 shows that the average of the difference scores for experimental group in found to be high that of control group. The t- test used showed that there was no significant difference between the groups. Supporting the null hypothesis: then is no significant difference between experimental and control groups. Such situation indicates that the treatment (New treatment) given to experimental group is found to be significant in producing better result in comparison to conventional treatment given to control group.

It is to be noted that the experimental and control groups obtained 29.4 and 25 respectively as mean score of girls on post – test scores. The t – test adopted was found to be significant in favor of experimental group at 0.05 level of significance. The comparison of the average of difference score between the group was found insignificant at 0.05 level of significance. Such situation on the whole, indicated that the new treatment used was found significantly better assuming the control exercised in equating groups other than manipulative variables.

Analysis of Mathematics Achievement Score between Control and Experimental Groups:

The mean achievement score of control and experimental groups were 25.09 and 30.94 respectively (Appendix C(I) and (II), Formulae Appendix F) over the full marks 40. It indicated that experimental group learnt Arithmetic better in 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 4.4

Comparison of Mathematics Achievement Score between two Groups:

Genders	N	Mean	S.D	Variance	t- value
Experimental	17	30.94	5.26	27.67	Calculated value
Control	21	25.09	2.7	7.29	13.60

Tabulated value $t_{0.05,36}$ = 1.96

The table 4.4 shows that the average of the difference scores for experimental group in found to be high than that of control group. the mean achievement score of 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 13.60 with degree of freedom 37 was greater than the tabulated value 1.96.

Therefore, the null hypothesis stating there was no significance difference between mathematics achievements in arithmetic of grade VIII students 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 students in control group.

After collection of data, the result was analyzed according as objectives mentioned in the study. In the pre- test result, both group had almost equal achievement. It means both groups test score was same. After the experiment following result was found that:

- Control and experimental group has same achievement in pre – test result.
- Control and experimental group boys had different achievement in mean score.

- Control and experimental group girls had different achievement in mean score.
- Experimental group had more mean achievement than that of the control group.

In the experiment period internal and external factors were tried to control as possible as it could. Form the above analysis, it was concluded that boys and girls had same ability to learn mathematics and problem solving method had better result than that of the traditional method of teaching.

Analysis of Non-Cognitive Effect in the Both Control and Experimental Groups:

In this section the researcher analyzed the qualitative data and interpreted the result logically. For some non – cognitive effects such as motivation of students, regularity in the classroom, participation in the activities. The method in this study was basically interpretive because this study analyzed and described the learning method in mathematics classroom. This case study was mainly related to analyzed and discuss about the different their learning style and mathematic problem solving method. The collected information were analyzed and discussed under the following heading.

Motivation

Motivation is a potential to direct behavior that is built into the system that controls emotion. This potential may be manifested in cognition and/ or behavior. Motivation is considered as a potential to direct ordering to the definition, students motivation may be manifested in cognition, emotion and/ or behavior. For example, a student motivation to get a good grade in mathematics may be manifested in studying for a test (behavior) and in new conceptual learning (cognition) when studying for the test. Needs are specified instances of the potential to direct behavior. Psychological needs that are often emphasized in educational setting are competence, relatedness (or

social belonging) and autonomy. In this study to define motivation as a potential to direct behavior and therefore the orientation of motivation becomes central.

We have developed encourage since knowing method of solving mathematics problems from last two weeks. We have developed encourage to learn mathematics problem by discussing with friends and interaction with teacher in the classrooms.

- Students in group discussion

In the classroom activates the researcher asked the students *"what did you think when you solved this problem?, What strategies did you use?"* in the written tasks we developed the students were frequently asked to explain their solutions and strategies and the students were invented to find several solution strategies to a problem the researcher tried to promote a classroom micro culture where active participation and encouragements to understand were emphasized. In some of the instructional activities the student had to develop their own ideas, apply his mathematics in realistic situations and draws their own conclusions, collaboration was important in our teaching approach. When the students were given problems they were not familiar with, we wanted the students to collaborate. The students had an opportunity to experience themselves and their peers as active participants in crating mathematics insight. Every student brought a personal contribution at his or her level. These elements of our design study were suitable for meeting the students need for competence, autonomy and relatedness.

Table 4.5

Teaching Episode
The researcher entered the class room with daily uses materials chalk, duster and textbook. All the students stand up and said good morning sir then researcher replied good morning and sits down. Researcher writes the topic ' percentage' in the top part of

black board. Then researcher raised a question that "what is percentage?" to whole the class. One student replied the answer and other towards his together. After that researcher own self define percentage and gave some examples related to it such as find 20% of 1000? And asked question to be students what is given? Also what is to find in the problem? The student can't response appropriately the researcher gave them time to consider and make them aware by question and researcher himself solved an example of finding percentage. And researcher asked to students that do have any trouble to understand in any step of solution? One student raised question then researcher again explain the above solution. After that researcher gave a problem to students. Also researcher was giving hints at solving the problem. Similarly more two problems gave to students. When students make mistake researcher correct it in his copy in class room. Researcher looked not all students had solve that questions. When bell was ranged, researcher gave assignment to students and went out.

From the above discussed classroom episode, it can be said that researcher has beliefs that students can learn from forced exposition and adequate drill and practices with the help of problem solving method. But the students have different beliefs they usually said to the researcher that teacher should give them to practice as much as possible. In this class teacher had tried to promote student participation and the teaching style and method of presenting task was problem centered so student take interest in mathematics learning.

Participation

Observation is a kind of tools that helps to seek knowledge through the use of sense ie, eyes, ears, nose, tongue and skin. It has great importance not only in research work but also in our daily lives. K.C(2000) writes that direct observation has the advantages of putting researchers into first hand contact with reality. Participant

observation is a close and full involvement of researcher in a natural setting in order to experience and understand the behavior interaction event and so on. It helps to bridge and share the intimacy between the researcher and the setting which is under study, by immersing researcher her/himself into the subject being studied.

Before the teacher used to solve the mathematical problem on the blackboard and we used to copy. So we have to remember all the problem. But now we know to understand the mathematics problem and to solve the principal and definition to solve mathematics problem step by step so we have developed encourage learning mathematics. - Student's view

The activities of student's participant in classroom.

Researcher: Yesterday, we know about how to solve percentage problem?

Student: All students replies, Yes Sir.

Researchers: How much 120 of 10%?

Student: Student replied 12 one by one

Researcher: He asked one student how it would answer 12

Student: Sir, I studied the previous problem after that what was give to know example and what I had to find out that I researched. After that I multiplied 120 with percentage number and divided by 100. At last, I found that the answer was correct.

Researcher: We learn to solve percentage problem today, researcher writes problem in the blackboard, that in any exam there are 30 students gather and 40% students failed in this exam than how much percentage students are passed in this exam. Read the question in your language.

Student: We read sir.

Researcher: What are the knowing things in the question and what are the things to find out?

Student: There are given gathered student number and failed student percentage. That is to find out pass student percentage.

Researcher: Now, how can solve this problem?

Student: Some student replied that there are 40% students failed there 60% student passed. Some student I calculate the problem 30 of 40% that would come failed student and subtract 30 from them it would come pass student. If we divide 30 with passed student and multiplied with 100, after that the answer would come correct.

From the above narration we can say that experimental group student took participate in learning, the activates of student participant with teacher were well. It has been playing the key role to produce such a extraordinary results.

Regularity

In this study, regularity means to students always come to study in school. In experimental group students always comes school to study. The researcher always writes daily notes, daily attendance and checked daily homework of students.

Student attendance and daily homework

Shree Jana adrasha Higher Secondary School, Arukharka – 6, Syangja.

Class: - 8, Date: - 2070 – 4 – 13, up to 2070 – 4 – 28

Table 4.7

Roll.no	2	3	4	5	8	9	11	12	13	16	17	18	21	22	23	24	24
Attendance	14	14	13	13	14	12	12	14	14	12	14	13	14	14	12	11	14
Homework	14	14	13	13	14	11	11	13	14	10	14	12	14	14	12	10	14

Anuraj's Case

Anuraj subedi entered in this school from Nursery. His father was Nepal Polic. His economic condition was little good but the educational background of the family was not well. His father was under SLC and mother was fully illiterate. Home

environment for learning was not so effective. He completed his home assignment and other study work without the help of other.

Before all students did not know to solve the mathematics problem and the teacher used to teach another chapter. We did not do homework. There were many mistake in homework. So we did not always learn to go school. But now, we learned to solve mathematics problem and we learn new method. We learn to solve mathematics problem first of all we understanding the problem and make a plane to solve by discussing with friends and interaction with teacher. So, we felt easy to solve mathematics problem and we come always to study in school. - Anuraj subedi

Anuraj's attitude towards mathematics was good. He said, "I like mathematics more because it provides us opportunities for practice with the method of solving. It makes us to be a laborious people".

His learning style was drills and practice. He had the beliefs if we have a system/ method to solve that we can get more and more knowledge from practice.

Sarmila's Case

Sarmila paudel was the student of class eight. She entered in this school from Nursery. Her father worked in private organization. The economic condition of her family was not so good. Her father was uneducated and did not provide any support her intellectually. She must work all house hold work and she had to care her younger brother also. In classroom she used to sit with Prabina friend who was first girl of the class. During observation she seemed more active and serious for her learning. She liked math but she did not like very complicated computation,

"I feel more difficulty in solving indirect problem. She used to give most of the time in mathematics at home and school". I liked problem solving when it was easy but

sometimes when it was too hard, I liked being with somebody to help me, she said. She did her homework on her own must and she sometime took help from her friends. To improve in mathematics learning she focused on the equality to practice in classroom. In classroom teacher should give equal emphasis to the weak students as that of talented students. Teacher should give us problem not only from text book but also from other different practice book also. - Sarmila's View

About learning opportunity in school she said,

In school the behavior of teacher and head teacher is good. They all have experienced educational proficiency. But the teaching method is always teacher centered. Some teachers give us to practice however teacher should engage and encourage us to do practice self. Before we feel the mathematics as a difficulty subject because the teacher did not to care the all the student. He used to care only the talent students in the classroom. But now the teacher equally cares all the students in the classroom. We learned to solve mathematics problem by discussing with friends and the teacher. Now we feel easy to solve mathematics problem. So we came daily to study in school.

From the above evidence related student's attendance that they have come daily in school. The classroom environment is peaceful in learning time. So, the students come daily in the school. The researcher writes daily note and daily students attendance and the researcher always check homework also student understanding the mathematical problem step by step with the method of problem solving, so the student take interest in learning.

Chapter V

SUMMARY, FINDINGS, CONCLUSION AND RECOMMENDATIONS

This Chapter is basically concentrated in deriving some findings from the discussion of previous chapter. Besides finding and conclusion it has some recommendations which will be useful for further studies and educational implications.

Summary

This 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 at grade VIII, the researcher had developed modules and taught himself in both control and experimental group of the students. 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.

The main objective of this study was to find the effectiveness of problem solving method in teaching mathematics in lower secondary level. An experiment was conducted for the study. Experimental group was taught by problem solving method using teaching module and control group was taught by traditional method for four weeks.

For the achievement of the objective of the study, the researcher developed achievement test. To obtain the objectives of the study following tool had been used. Mean and variance of t – test was used to compare the mathematics achievement between genders, Standard deviation and variance were used to test the homogeneity of the test and analyzed qualitative data, the researcher Daily note, students motivation,

regularity in the classroom and participation in the activities by the help of subject teacher other educator and himself.

Finding of the study

On the basis of analysis and interpretation of the obtain data following findings were drawn:

- The study indicated that the mean score of the students of experimental group is higher than that of control group. It shows that the mean score of the students taught by using problem solving method was significantly better than that of traditional method.
- 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 mathematics.
- The experimental group students had developed encourages to learn mathematics problem than that of students in control group.
- The classroom environment was effective as well as enjoyable in experimental group than that of control group.
- The participation and regularity in school of the students in experimental group is higher than that of control group.

Conclusion

Form the above finding of the study. It is concluded that the ability of boy and girl is similar in learning mathematics and problem solving method is more effective than traditional method of teaching. From the result of the study, it is concluded that problem solving method help students to understand mathematics and consequently perform better result in achievement test over traditional method. Also problem solving method develop student encourage to learn mathematics problem by discussing with friends and interaction with teacher is good. If we apply this method properly, then students understand and achieve better result in learning mathematics. Additionally, problem solving method helps student to motivate and apply the mathematical knowledge and concept in unfamiliar conditions. Further it provides something that can't be expected without it.

Recommendations for the Better Learning

On the basis of the finding the researcher recommended some measure have been recommended for the betterment of the teaching mathematics in lower secondary level this is listed as follows:

- Student should be encouraged to get involved in active participation in classroom activities.
- The teacher training institutions should emphasize on problem solving method of teaching mathematics.
- 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 will be equipped with skill to solve the problem they are likely to encounter.

Suggestion for Further Study

From the wide ranging reviews, reflections included in this study and the result of this study, the following suggestions were made for the further study:

- 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.
- The lager research must be designed and carried out in order to investigate the effectiveness of problem solving method of teaching in large sample and various schools of different regions of Nepal.

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APPENDIX: A (I)

Shree Shidrata Higher Secondary School,

Phedikhola, syangja.

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	37	18	22	23
2	34	35	19	20	20
3	35	35	20	27	25
4	32	29	21	25	23
6	28	26	22	24	26
7	31	26	23	18	21
8	30	25	24	21	22
9	28	28	26	23	24
10	26	27	27	22	20
11	27	26	29	24	24
12	29	31	30	14	16
13	27	27	31	12	10
14	27	26	32	16	18

15	24	26	33	20	22
16	19	21			

Number of student obtained 20-33 marks = 21 (criteria for selection)

Roll No. of selection students: 4,6,7,8,9,10,11,12,13,14,15,18,19, 20, 21, 22, 24, 26, 27, 29 and 33

Roll No. of selected boys: 4, 8, 10, 11, 13, 14, 21, 22, 27 and 33

Roll No. of selected girls: 6, 7, 9, 12, 15, 18, 19, 20, 24, 26 and 29

APPENDIX: A (II)

Shree Jana adrasha Higher Secondary School,

Arukharka – 6 Syangja.

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	35	38	15	18	31
2	31	37	16	21	22
3	33	36	17	24	30
4	32	37	18	21	24
5	29	37	20	19	22

7	10	16	21	24	30
8	29	35	22	26	31
9	27	35	23	22	25
11	27	35	24	20	22
12	28	32	25	27	25
13	27	33			

Number of student obtained 20-33 marks = 17 (criteria for selection)

Roll No. of selection students: 2, 3, 4, 5, 8, 9, 11, 12,13, 16, 17, 18, 21, 22, 23, 24, and 25

Roll No. of selected boys: 3, 8, 11, 12, 13, 17 and 22

Roll No. of selected girls: 2, 4, 5, 9, 16, 18, 21, 23, 24, and 25

Appendix: B (I)

Achievement score of Pre – test Result (Control Group)

Control Group				
S.N.	Roll No.	Marks (X)	(X-$\bar{X}$)	$(X-\bar{X})^2$
1	4	32	6.43	41.34
2	6	28	2.43	5.90
3	7	31	5.43	29.48
4	8	30	4.43	19.62
5	9	28	2.43	5.90
6	10	26	0.43	0.18
7	11	27	1.43	2.04
8	12	29	3.43	11.76
9	13	27	1.43	2.04
10	14	27	1.43	2.04
11	15	24	-1.57	2.46
12	18	22	-3.57	12.74
13	19	20	-5.57	31.02

14	20	27	1.43	2.04
15	21	25	-0.57	0.32
16	22	24	-1.57	2.46
17	24	21	-4.57	20.88
18	26	23	-2.57	6.60
19	27	22	-3.57	12.74
20	29	24	-1.57	2.46
21	33	20	-5.57	31.02
	$\sum$ X = 537			$\sum(X-\bar{X})^2$=245.14

Mean ($\bar{X}$) = 25.57 Standard Deviation (σ) = 3.42 Variance(S^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	31	4.65	21.62
2	3	33	6.65	44.22
3	4	32	5.65	31.92
4	5	29	2.65	7.02
5	8	29	2.65	7.02
6	9	27	0.65	0.42
7	11	27	0.65	0.42
8	12	28	1.65	2.72
9	13	27	0.65	0.42
10	16	21	-5.35	28.62
11	17	24	-2.35	5.52
12	18	21	-5.35	28.62
13	21	24	-	5.52

			2.35	
14	22	26	-0.35	0.12
15	23	22	-4.35	18.92
16	24	20	-6.35	40.32
17	25	27	0.65	0.42
		$\sum$ X = 448		$\sum(X-\bar{X})^2$=243.84

Mean ($\bar{X}$) = 26.35 Standard Deviation (σ) = 3.79 Variance(S^2) = 14.36

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	4	29	3.91	15.29
2	6	26	0.91	0.83
3	7	26	0.91	0.83
4	8	26	0.91	0.83
5	9	28	2.91	8.47
6	10	27	1.91	3.65
7	11	26	0.91	0.83
8	12	31	5.91	34.93
9	13	27	1.91	3.65
10	14	26	0.91	0.83
11	15	26	0.91	0.83
12	18	23	-2.09	4.37
13	19	20	-5.09	25.91
14	20	25	-0.09	0.0081

15	21	23	-2.09	4.37
16	22	26	0.91	0.83
17	24	22	-3.09	9.55
18	26	24	-1.09	1.19
19	27	20	-5.09	25.91
20	29	24	-1.09	1.19
21	33	22	-3.09	9.55
	$\sum$ X = 527			$\sum(X-\bar{X})^2$=153.85

Mean ($\bar{X}$) = 25.09 Standard Deviation (σ) = 2.70 Variance(S^2) = 7.29

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	6.06	36.72
2	3	36	5.06	25.60
3	4	37	6.06	36.72
4	5	37	6.06	36.72
5	8	35	4.06	16.48
6	9	35	4.06	16.48
7	11	35	4.06	16.48
8	12	32	1.06	1.12
9	13	33	2.06	4.24
10	16	22	-8.94	79.92
11	17	30	-0.94	0.88
12	18	24	-6.94	48.16
13	21	30	-0.94	0.88
14	22	31	0.06	0.0036
15	23	25	-5.94	35.28
16	24	22	-8.94	79.92

17	25	25	-5.94	35.28
		∑ X = 526		$\sum(X-\bar{X})^2$=470.88

Mean ($\bar{X}$) = 30.94 Standard Deviation (σ) = 5.26 Variance(S^2) = 27.67

Appendix: D

Achievement score of Boys and Girls of Experimental Group

(Post – test Result)

Experimental Group (Boys)				
S.N.	Roll No.	Marks (X)	(X-$\bar{X}$)	$(X-\bar{X})^2$
1	3	36	2.86	8.18
2	8	35	1.86	3.46
3	11	35	1.86	3.46
4	12	32	-1.14	1.29
5	13	33	-0.14	0.019
6	17	30	-3.14	9.86
7	22	31	-2.14	4.58
		$\sum X$ = 232		$\sum(X-\bar{X})^2$= 30.85

Mean ($\bar{X}$) = 33.14 Standard Deviation (σ) = 2.09 Variance(S^2) = 4.37

Experimental Group (Girls)				
S.N.	Roll No.	Marks (X)	(X-$\bar{X}$)	$(X-\bar{X})^2$
1	2	37	7.6	57.76
2	4	37	7.6	57.76

3	5	37	7.6	57.76
4	9	35	5.6	31.36
5	16	22	-7.4	54.76
6	18	24	-5.4	29.16
7	21	30	0.6	0.36
8	23	25	-4.4	19.36
9	24	22	-7.4	54.76
10	25	25	-4.4	19.36
		$\sum$ X = 294		$\sum(X-\bar{X})^2$= 457.64

Mean ($\bar{X}$) = 29.4 Standard Deviation (σ) = 6.18 Variance(S^2) = 38.42

APPENDIX: F

Formulae

Mean ($\bar{X}$) $= \frac{\sum X}{N}$

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

Pooled variance (SP) = $\sqrt{\frac{(N_1-1)\,S1^2+(N_2-1)\,S2^2}{N_1+N_2-2}}$

And t – scale, $t_{0.05,N1+N2} = \frac{(\bar{X}1-\bar{X}2)}{SP\sqrt{\frac{1}{N_1}+\frac{1}{N_2}}}$

Where,

X = Mark obtained by student in achievement test;

N = Number of students;

$\overline{X_1}$ = Mean score of first sample Population;

$\overline{X_2}$ = Mean score of second sample Population;

N_1 and N_2 = Number of student of first and second sample Population respectively,

σ = Standard Deviation

S_1 And S_2 = variance of first and second sample Population respectively,

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

APPENDIX: G (I)

Test Items

Pre – Test

कक्षा : ८ मिति : २०७० / /

बिषय : गणित पूर्णाङ्क : ४०

सबै प्रश्न अनिवार्य छन् । उत्तीर्णाङ्क : १६

Group: A **4x (1+1) = 8**

1.(a) 1200 को 8% कति हुन्छ ?

(b) एउटा विद्यालयमा 600 जना विद्यार्थी छन् यदि केटीको संख्या 225 छ भने कति प्रतिशत केटी रहेछन् ?

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

(b) 12 *L* पेट्रोलले एउटा मोटरसाइकल 1200 km दौडन्छ भने 1 L पेट्रोलले कति km दौडन्छ ?

3. (a) रामले एउटा रेफ्रिजेनेटर रु 182000 मा किनेर रु. 20,000 मा बेच्छ भने उसलाई नाफा कति भएछ?

(b) यदि C.P क्रयमूल्य S.P विक्रय मूल्य र L नोक्सान भए नोक्सान प्रतिशत पत्ता लगाउने सूत्र लेख्नुहोस ?

4. (a) यदि P मुलधन, R व्याजदर, N समय (वर्षमा) र I वार्षिक व्याज भए व्याज पत्ता लागउने सूत्र लेख्नुहास ?

(b) रु. 80000 को दुई वर्षमा मिश्रधन रु.120000 हुन्छ भने व्याज कति हुन्छ ?

Group: B **4x(2+2) = 16**

5. (a) स्याङ्गजा बजारको जनसंख्या 250000 छ । यदि वर्षको 15% ले जनसंख्या वृद्वि हुन्छ भने अर्को वर्षको जनसंख्या कति होला ?

(b) कुनै परिक्षामा सुर्यले पूर्णाङ्क 50 मा 30 र रोहणीरमणले पूर्णाङ्क 75 मा 39 प्राप्त गरे भने यी मध्ये कुनले कति प्रतिशत बढि प्राप्त गरेछन् ?

6. (a) कुनै पसलेले 12 दर्जन कलम रु. 480 मा किनेर प्रति दर्जन रु. 50 मा बेच्दा उसलाई कति प्रतिशत नाफा होला ?

(b) एउटा साइकललाई रु. 5500 मा बेच्दा 10% नाफा हुन्छ भने साइकलको क्रय मूल्य कति होला ?

7. (a) दिइएको अवस्थामा x को मान काति होला ?

सुका	रु.
4	2
200	x

(b) कुनै काम 19 ज्यामीले 28 दिनमा गर्न सक्दछन् भने 57 जना ज्यामीलाई सो काम गर्न कति दिन लाग्ला?

8. (a) वार्षिक 5% का दरले रु. 750 को 6 वर्षमा साधारण व्याजले हुने मिश्रधन पत्ता लगाउनुहोस ?

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

Group: C **4x4 = 16**

9. कुनै परीक्षामा 30% विद्यार्थी फेल र 280 जना विद्यार्थी पास भएछन् भने जम्मा विद्यार्थी र पास हुने विद्यार्थी संख्या पत्ता लगाउनुहोस ?

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

11. पहिलो भागको 7% व्याजदरमा 6 वर्षको साधारण व्याज दोस्रो भागको 5% व्याजदरमा 2 वर्षको साधारण व्याजसँग बराबर हुने गरी रु. 8,200 लाई दुई भाग लगाउनुहोस ?

12. एक जना फलफुल 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?

The end.

APPENDIX: G (II)

Test Items

Post – Test

कक्षा : ८ मिति : २०७० / /

बिषय : गणित पूर्णाङ्क : ४०

सबै प्रश्न अनिवार्य छन् । उत्तीर्णाङ्क : १६

Group: A **4x (1+1) = 8**

1.(a) 450 को 200 कति प्रतिशत हुन्छ ?

(b) एउटा कक्षामा 60 जना विद्यार्थी छन् यदि 75% केटा छन् भने कति जना केटी रहेछन् ?

2. (a) 20 वटा स्याउको मूल्य रु. 480 पर्छ भने 1 वटा स्याउको मूल्य कति पर्छ ?

(b) 12 *L* पेट्रोलले एउटा मोटरसाइकल 1 km दौडन्छ भने 1200 km दौडन कति L पेट्रोल लाग्ला?

3. (a) रामले एउटा रेफ्रिजेनेटर रु. 20,000 मा बेच्दा रु. 450 नाफा हुन्छ भन कति प्रतिशत नाफा भएछ?

(b) यदि C.P क्रयमूल्य S.P विक्रय मूल्य र P नाफा भए नाफा प्रतिशत पत्ता लगाउने सूत्र लेख्नुहोस?

4. (a) यदि P मुलधन, R व्याजदर, N समय (वर्षमा) र I वार्षिक व्याज भए व्याज पत्ता लागउने सूत्र लेख्नुहास ?

(b) कुनै धनको दुई वर्षमा मिश्रधन रु.120000 र व्याज रु. 1600 हुन्छ भने साँवा कति रहेछ ?

Group: B **4x(2+2) = 16**

5. (a) आरुखर्कको गा.बि.स.को जनसंख्या 8000 छ। यदि वर्षको 7% ले जनसंख्या वृद्वि हुन्छ भने अर्को वर्षको जनसंख्या कति होला ?

(b) कुनै परिक्षामा अनुषले पूर्णाङ्क 50 मा 37 र सुभमले पूर्णाङ्क 75 मा 40 प्राप्त गरे भने यी मध्ये कुनले कति प्रतिशत बढि प्राप्त गरेछन् ?

6. (a) कुनै पसलेले एक दर्जन कलम रु. 60 मा किनेर प्रति दर्जन रु. 50 मा बेच्दा उसलाई नाफा वा घाटा कति % होला ?

(b) एउटा साइकललाई रु. 5500 मा किनेर रु 5000 मा बेच्दा कति % घाटा होला ?

7. (a) कुनै कामको 1/7 भाग काम गर्न 20 जना मानिस चाहिन्छन भने सो काम पूरा गर्न कति मानिसको आवश्यक पर्ला ?

(b) कुनै काम 7 ज्यामीले 28 दिनमा गर्न सक्दछन् भने 20 दिनमा सक्न कति जना ज्यामी लाग्ला ?

8. (a) वार्षिक 5% का दरले रु.2,000 को 2 वर्षमा साधारण व्याजले हुने मिश्रधन पत्ता लगाउनुहोस ?

(b) कति वर्षमा रु. 10,000 को 5% वार्षिक व्याजदरले मिश्रधन रु. 15,000 हुन्छ ?

Group: C **4x4 = 16**

9. कुनै परीक्षामा 30% विद्यार्थी पास र 280 जना विद्यार्थी फेल भएछन् भने जम्मा विद्यार्थी र पास हुने विद्यार्थी संख्या पत्ता लगाउनुहोस ?

10. पहिलो र दोस्रो नलीले कुनै ट्याङ्की छछ मिनेटमा भर्न सक्छन्। यदि दोस्रो नलीले मात्र सो ट्याङ्की $1\frac{1}{2}$ घण्टामा भर्न सक्छ भने पहिलो नलीले मात्र सो ट्याङ्की भर्न कति समय लाग्ला ?

11. पहिलो भागको $4\frac{1}{2}$ % व्याजदरमा 6 वर्षको साधारण व्याज दोस्रो भागको 5% व्याजदरमा 2 वर्षको साधारण व्याजसँग बराबर हुने गरी रु. 8,200 लाई दुई भाग लगाउनुहोस ?

12. एक जना फलफुल पसलेले 210 वटा सुन्तला किन्यो जसमा 200 वटा मात्र सध्य रहेछन । यदि उसले सध्य सुन्तला रु. 3 प्रतिगोटाका दरले बेच्दा रु 40 नाफा गर्छ भने उसले ती सुन्तला कतिमा किनेको रहेछ ?

The end.

APPENDIX: H(I)

Lesson plan: I

Class: 8 Date: 2070/ /

Subject: Mathematics Time: 45 minutes

Teaching Unit: **Percentage**

Objectives: - Student will be able to find the percentage of given number and number of percentage of given number.

Teaching materials: - Daily teaching materials.

Teaching activities: - During the class period the teacher would do the following activates:

Recall the pervious 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.

- Do you understanding 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?
- Is there enough information to enable you to find a solution?

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

After understanding the problem for this commands them to:

- Find 20% of 1000?
- How do find the solution? How can it solve?

Then, they will discuss or answer. i.e. 20% of 1000

$= \frac{20}{100} X100$

= 200 (ask why?)

After solution, ask them:

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

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 3, Questions No. 2-7

Lesson plan: II

Class: 8 Date: 2070/ /

Subject: Mathematics Time: 45 minutes

Teaching Unit: percentage

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

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. 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?

If the students can't response appropriately the teacher will give them time to consider and make them aware by questions. After understanding the problem stimulate them to seek the way of solving problem for this command them to: What is the percentage of passed student? How do find the number of passed student? Guide, to find the solution.

After solution ask them: can you examine each steps of the problem? Are these steps correct? Can you prove each step by appropriate reason?

The answer inferred by student 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:- solve the problem on exercise 5.

Lesson plan: III

Class: 8 Date: 2070/ /

Subject: Mathematics Time: 45 minutes

Teaching Unit: **Unitary Method**

Objectivities: - student will be able to find the solution of problem related direct variance (only two case problems)

Activities: - During the class period the teaching 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 the example on blackboard relate to topic and ask:

- Do you understanding all the words on the problem?
- Can you restate the problem in your own words?
- Is there enough information to enable you to find a solution?
- What is to find out?
- What type of variation is it? Etc

If the students can't response appropriately them 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. If students can't do it, teacher will give some clues.

Also ask them is there alternative method to find the solution? Are these steps correct?

The answer inferred by students give them to examine whether it can be solved by right method 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: - Solve the Problem of Exercise no. 5

Lesson plan: IV

Class: 8 Date: 2070/ /

Subject: Mathematics Time: 45 minutes

Teaching Unit: unitary method

Objectives: - students will be able to find the solution of problem related indirect variance (only two case problems)

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 example made them the concept about indirect variance. 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 the problem?

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

After understanding the problem stimulate them to seek the way of solving problem for this command them to: eg, if 6 men can do a piece of work in 6 days how many days can 15 man do that work?

For solution ask them, in how many days 1 man can do whole work and why? In how many days 15 man can do the whole work and why? Guide them to find the solution. After solution ask them; can you examine each steps of the problem? Are these steps correct?

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:- solve the problems on exercise 3.

Lesson plan: V

Class: 8 Date: 2070/ /

Subject: Mathematics Time: 45 minutes

Teaching Unit: Unitary method

Objectivities: - Student will be able to find the amount work together. If the separate amount are given for two objectives.

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 and example on blackboard relate to topic.

Eg. If shusant can do a piece of work in 60 days. Anurag 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.

- Do you understand all the words of question?
- Command them to state their own words.
- What is given and what is to find out?
- What are you asked to find or show?
- Is there enough information to enable you to find a solution?

If the student can't response appropriately the teacher will give them time to consider and make them aware by questions:

After understanding the problem stimulate them to seek the way of solving problem for this command them to:

- In how many days shusant can do 1 work?
- How much work will anurag do in 1 day?
- How much work will shusant and anurag do in 1 day?
- In how many days will shusant and anurag complete the whole work?

Guide them to find the solution. After solution ask them:

- Can you examine each steps of the problem?
- Are these steps correct?

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: - solve the similar problem in exercise of text – book.

Lesson plan: VI

Class: 8 Date: 2070/ /

Subject: Mathematics Time: 45 minutes

Teaching Unit: profit and loss

Objectives: - students will be able to define profit and loss and find profit and loss from C.P and S.P.

Activities:- during the class period the teacher would do the following activities.

Recall the precious lesson by giving the questions and help them to find answer. If it is necessary. After this write an example on blackboard related to topic.

What is selling price and cost price? What type of condition is to be profit and to be loss? Eg, if Krishna broughat a computer for Rs. 24,00 and sold for Rs. 25,00 and ask them. Do you understand all the words on the problem? What is given? What is to find in the problem? Is there a profit or loss and how is it?

If the students can't response appropriately the teacher will give them time to consider and make them aware by question. After understanding the problem stimulate them to seek the way of solving problem for this command them to: can you examine each steps of the problem? Are these steps correct?

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, problem No 1 and 2.

Lesson plan: VII

Class: 8 Date: 2070/ /

Subject: Mathematics Time: 45 minutes

Teaching Unit: Profit and Loss

Objective: - student will be able to find profit and loss percentage from given S.P and C.P.

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 lf it is necessary.

After this write an example on blackboard related to topic.

i.e. Actual profit = S.P – C.P and Actual Loss = C.P – S.P

i.e. One make Profit if S.P > C.P and Loss if S.P < C.P. with the help of previous lesson Percentage find the process of finding profit percentage.

Profit percent = Profit X 100% / C.P

Ask them what will be formula to find loss percent. Now take an example;

Suvam buys a cycle on Rs. 2600 and sell it in Rs. 2720 finds his profit percent?

Teacher asks those students; what is given and what is to find? Do you understand all the words used in stating the problem? Etc, if the students can't response

appropriately the teacher will give them time to consider and make them aware by some question.

After understanding the problem stimulate them to seek the way of solving problem for this command them to; what is the first step? Which formula is to use? How to calculate the answer? Guide them to find the solution. After solution ask them:

- Can you examine each steps of the problem?
- Are these steps correct?

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 6, Question No. 3 & 4.

Lesson plan: VIII

Class: 8 Date: 2070/ /

Subject: Mathematics Time: 45 minutes

Teaching Unit: profit and loss

Objectives: - students will be able to find S.P when C.P and profit or loss percent are given.

Activities:- during the class period the teacher would do the following activates.

Recall the previous lesson by giving the question and help them to find answer if is necessary. After this write and example on blackboard related to topic. Profit and loss percent and formula to find them ie, actual profit = profit percent × C.P /100% Actual loss = loss percent × C.P / 100% then we calculate S.P ie, C.P + Profit percent or S.P = C.P – loss percent.

Eg, if C.P = Rs 120 and profit is 10%, find S.P for this ask them; what are given information and what is to find? Are you clear about the question? Do you understand all the words on the problem?

If the students can't response appropriately the teacher will give them time to consider and make them aware by question. After understanding the problem stimulate them to seek the way of solving problem for this command them to; is the solution process right? Are all steps correct? Can you prove each steps by giving appropriate reason?

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

Homework:- solve the similar problem of exercise 6 on text book.

Lesson plan: IX

Class: 8 Date: 2070/ /

Subject: Mathematics Time: 45 minutes

Teaching Unit: Profit and Loss

Objective: - Student will be able to calculate C.P when S.P and Profit or Loss percent are given.

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.

E.g. if S.P of book is Rs. 420 and Loss percent is 20%, find the C.P of this book?

Teacher asks those students; what is given? What is to find out? Do you understand all the words on the problem? Are you clear about the problem?

If the student cannot any response the teacher give them time to consider and make them aware by some question.

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

If student can't do it, teacher will give some clues. Also teacher ask them student is there alternate method to find the solution? Are these steps correct?

The answer inferred by students give them to examine whether it can be solved by right method 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: - solve the problem in exercise – 6.

Lesson plan: X

Class: 8 Date: 2070/ /

Subject: Mathematics Time: 45 minutes

Teaching Unit:- Simple interest

Objectives: - at the end of this lesson students will be able to define principal rate of interest and amount and find the interest when principal and amount are given.

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. Madhav brought Rs 20,000 form surya for certain interval of time then he returned his some additional amount of money under the certain condition. Can you say why did he pay additional money? Do you understand all the words on the problem? What is given? What is to find in the problem?

If the student can't response appropriately the teacher will give them time to consider and make them aware by questions. After understanding the problem stimulate them to seek the way of solving problem for this command them to: which is principle and which is amount? How do you find the interest? Guide them to find the solution. After solution, ask them can you examine each steps of the problem? Are these steps correct? Can you prove each step by appropriate reasons?

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

Homework: - what do you mean by principle rate of interest, amount and interest?

Lesson plan: XI

Class: 8 Date: 2070/ /

Subject: Mathematics Time: 45 minutes

Teaching Unit: Simple interest

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

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.

i.e. simple interest (I) = P X N X R / 100 where P,N and R as usual meaning.

After this write an example on blackboard related to topic.

e.g. Gayanu maya brought a sum of Rs. 15,000 from a bank at the rate of 5% per year. Find the interest and amount she had to pay at the end of 4 years.

Teacher asks those students; what is given and what is to find? Do you understand all the words used in stating the problem? Is there enough information to enable you to find a solution?

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

After understanding the problem stimulate them to seek the way of solving problem for this command them to;

Is the solution process right? Can you see clearly that the step is correct? Can you examine each steps of the problem?

The answer inferred by student 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 -8, Questions No. 2

Lesson plan: XII

Class: 8 Date: 2070/ /

Subject: Mathematics Time: 45 minutes

Teaching Unit: Simple interest

Objectives: - at the end of this lesson student will be able to find the unknown variable problem related to simple interest.

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 and example on blackboard related to topic,

- When R is to find then the relation is $R = I \times 100 / N \times P$.
- When P is to find them the relation is $P = I \times 100 / N \times R$.
- When N is to find them 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? What is given? What is to find in the problem? Do you understand all the words on the problem? If the students can't response appropriately the teacher will give them time to consider and make them aware by question.

After understanding the problem stimulates them to seek the way of solving problem of finding solution, how can we solve this? Guide them to find the solution after finding solution, discuss about, can you examine each steps of the problem? Are these steps correct? Can you prove each step by appropriate reasons?

The answer inferred by students give them to examine whether it has been solved by right method or not. It can be solved 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 8 question No. 3, 4.

Lesson plan: XIII

Class: 8 Date: 2070/ /

Subject: Mathematics Time: 45 minutes

Teaching Unit: Simple interest

Objective: - At the end of this lesson students will be able to solve the words problem of simple interest.

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

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

After this write an example on blackboard related to topic;

Eg. Find the simple interest on Rs. 2,160 for 3 years at the rate of 20% per year. In how many years will Rs. 1,500 produce the same amount of interest at the rate of 12%?

Teacher command them student to read problem and state it in their own words also discuss the following questions;

- Do you understand all the words on the 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?
- Is there enough information to enable you to find a solution?

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

After understanding the problem stimulate them to seek the way of solving problem for this command them to:

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. Ask them; what are given and what is to find in it? Can you solve this part before first part if not why discussed. Similar as above find the solution of the problem. Guide them to find the solution. After solution, ask them; can you examine each steps of the problem?

Are these steps correct? 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, 8 Questions No. 7, 9 & 10.

APPENDIX: H (II)

Interview Format for Key Informants

Name of Student: ……

Permanent Address: …….

Temporary Address: …….

Age: …… Sex: ……

Roll No: ……. Religion: ……

The interview with the key respondents was taken in the basis of following main points:

- Personal history.
- Family backgrounds.
- Reading opportunity at home.
- Views about mathematics.
- Views about school environment and teacher's behaviors.
- Mathematics learning style.
- Teaching method.
- Homework and class work.

Interviewer: ……. Date: