

**EFFECTIVENESS OF CONSTRUCTIVIST APPROACH IN TEACHING
MATHEMATICS**

A

THESIS

BY

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

SUBMITTED

TO

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Letter of Certificate

This is certify that Mr. Niranjana Gupta, a student of the academic year 2072/73 B.S. with the Exam Roll No. 7228340, Campus Roll No. 03, Thesis No. 1484. and T.U. Registration No.9-2-0238-0076-2011 .has completed his thesis under supervision of Mrs. Sarala Luitel, during the period prescribed by the rules and regulation of Tribhuvan University, Nepal. The thesis entitled “**Effectiveness of Constructivist Approach in Teaching Mathematics**” embodies the result of his investigation, conducted during the period 2020 in the Department of Mathematics Education, Tribhuvan University, Kirtipur, Kathmandu. I recommended and forward that this thesis be submitted for the evaluation to awarding the Master degree in Mathematics Education.

Date: December, 2020

Prof. Dr. Bed Raj Acharya

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Letter of Approval

This thesis entitled “**Effectiveness of Constructivist Approach in Teaching Mathematics**” submitted by Mr. Niranjan Gupta in partial fulfillment of the requirements for the Master Degree in Mathematics Education has been approved.

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Date: January, 2021

Recommendation for Acceptance

This is to certify that Mrs. Sarala Luitel has completed his M. Ed. Thesis entitled **“Effectiveness of Constructivist Approach in Teaching Mathematics”** under my supervision during the period prescribed the rules and regulations of Tribhuvan University, Kirtipur, Kathmandu, Nepal. I recommend and forward his thesis to the Department of Mathematics Education to organize the final viva-voice.

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Date: December, 2020

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Declaration

I hereby declare that this thesis is my original work. It contains no material which has been accepted for the award of other degree in any institution. To the best of my knowledge and belief, this thesis contains no material previously published by any authors due acknowledgement has been made.

Date: January, 2021

.....

Niranjan Gupta

Dedication

I wish to express my love and gratitude to my beloved family members; my father **Mr. Motilal prasad Shah**, mother **Sumintra Devi Shah**, brother **Shatrudhan prasad Gupta** and **Man Mohan Gupta** especially to my beloved wife **Ms. Sunita Gupta** for her understanding and endless love, throughout the duration of my study.

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I would like to express my thanks to all the teachers and students of Shree Kankali Higher Secondary School, Simraungadh (Bara) and Shree Janta Secondary School, Kachorwa (Bara) for their active participation and co-operation extended to the researcher during the phase of data collection for this study.

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.....
Niranjan Gupta

Abstract

The present study entitled “Effectiveness of Constructivist Approach in Teaching Mathematics” was an experimental research. This was based on two research questions as; i. Does constructivist method improve the Students achievement score in mathematics?

ii. Does constructivist approach prove to be more powerful approach than traditional approach in Students achievement?

A pre-test and post-test non equivalent group design was adopted for the purpose of the study. The population of this study was 8th grade students of Bara District in the academic year 2076. Researcher selects two schools i.e. Shree Kankali Higher Secondary School, Simraungadh (Bara) and Shree Janta Secondary School, Kachorwa (Bara). Grade VIII all the student of Kankali School and Grade VIII all the student of Janta School are the sample of this study. One school of above school was experimental and control group was carried out by simple random sampling method (Lottery Method). In this study, Kankali School is experimental group and Janta School is control group. Thus, researcher was use constructivist approach in Kankali School and tradition approach use in Janta School. The instrument adopted in this research was an achievement test in topic of airthematic. The items for achievement test were developed by the researcher himself. Experimental and control groups of students were made homogeneous as nearly as possible. Experimental and control group were taught the same topic airthematic (Profit and loss, Simple interest, Unitary method, Co-ordinate and Mensuration.) by using constructivist approach and tradition approach respectively.

For the collection of data, the researcher developed ten objective type question and ten subjective type questions. Researcher was also noted daily students behaviour and developed the observation note for the purpose of looking student’s behaviour change.

At the end of instruction period, both groups were post-test with the same set of test items in each school. The result of the pre-test and post-test of both groups were analyzed using statistical devices such as mean, S.D, Variance and Z –test. Then Qualitative data were analyzed by using following steps Data, Coding, Memo-writing, Theoretical sample and interpretation. Finally, researcher concluded that the achievement of students taught by constructivist approach of teaching improved significantly better than the achievement of taught by tradition approach, moreover, Constructivist approach was able to encourage the habit of self-learning and self-correcting.

TABLE OF CONTENTS

	Page No:
Letter of Certificate	i
Letter of Approval	ii
Recommendation for Acceptance	iii
Copy Right	iv
Declaration	v
Dedication	vi
Acknowledgement	vii
Abstract	viii
I. INTRODUCTION	1- 6
Background of the Study	1
Statement of the Problem	3
Objectives of the Study	4
Research Question	4
Significance of the Study	4
Delimitation of the Study	6
Definition of the Key Terms	6
II. REVIEW OF RELATED LITERATURE AND THEORETICAL FRAMEWORK	7- 14
Empirical Literature	7
Theoretical Literature	11
Social Constructivism	11
Conceptual Framework	12
III. METHODS AND PROCEDURE	15- 22
Design of the Study	15

Study Site	15
Sample of the Study	15
Tools for the Study	18
Data Collection Procedure	21
Data Analysis Approach	21
IV. DATA ANALYSIS AND INTERPRETATION	23-33
Comparison of the Achievement Score of the Control Group and Experimental Group from the pre-test Data	23
Comparison of the Achievement Score of the Control and Experimental Group from the post-test Data	25
Qualitative Part of the Study	28
V. SUMMARY, FINDING, CONCLUSION AND RECOMMENDATION	34-37
Summary	34
Finding of the Stud	34
Conclusion of the Study	35
Recommendation for Educational Implication	36
Recommendation for Further Study	36
REFERENCE	38-39

Chapter: I

INTRODUCTION

Background of the Study

Development in mathematics education is informed by multiple learning theories, illustrations of mathematical understanding, improvements in curriculum or educational policies, and promising results from research on improvements to mathematics education (Skemp2006, Franke 2007 & Boaler 2008). This advanced or new knowledge of mathematical education has fuelled the chances of educational improvement with regards to research on mathematics teaching and learning (Cobb, 2007).

In today's educational environment, many countries have and continue to pass through improvements; however the pendulum of educational improvement movements keeps changing in different directions (Chung, 2005; Lambdin& Walcott, 2007; Sfard, 2003). Further examination of the educational practices revealed (make visible) that instruction at the lower secondary level did not truly reflect this paradigm shift (a change in the basic assumptions). In fact, most Nepalese lower secondary school teachers were still using the traditional direct of teaching approach with the teaching method of 'chalk and talk' combining a great amount of lecturing in lessons. In this context, it is observed the necessity of new approaches while teaching and learning mathematics.

In general, it was perceived that the public was satisfied with the outcomes of using traditional direct teaching (Chou, 2003a). Methods of instruction place an emphasis on the transmission of facts and knowledge (Boaler & Greeno, 2000; Even & Tirosh, 2008). In this educational environment, Nepalese students may still spend most of their mathematics classroom time on practising skills or developing procedural understanding.

There are different methods used in teaching mathematics in our classroom. Mostly traditional mathematics instruction and curriculum are based on the transmission or absorption, view of teaching and learning. The teaching practices in Nepal did not necessarily change to match the mathematics educational improvement focus. According to researchers, many teachers did not embrace this change, or saw the need to be change agents; they did not use the teaching approaches that were aligned with constructivism. Hence, it was easier for these teachers to revert (turn back) to the traditional direct teaching approach. However, when compared to using a constructivist teaching approach, the use of the traditional direct teaching appears to be limited in scope. For example, the traditional direct teaching approach focuses mainly on the end product and little or no requirement is made for developing communication skills. Since students' mathematical power includes not only of end-products, but includes both conceptual and procedural knowledge, advanced abilities such as criticizing, generalizing, making connections, and positive mathematics values using only a traditional approach will, to some extent, limit students' ability to achieve mathematical competency. According to Lampert (2001, p.330), "mathematical competence is complex and multidimensional", therefore it stands to reason that using constructivist approaches to the teaching and learning of mathematics would better meet the needs of students than that of using traditional direct teaching approaches.

This study sought to explore ways in which using a constructivist approach can successfully build up students' mathematical thinking and understanding compared to using the traditional direct teaching approach, especially given that students in Nepal face the highly competitive nature of tests and a very full mathematics curriculum. This study also explored the nature of the developing constructivist pedagogy.

Statement of the Problem

Most of the people consider mathematics as a very difficult subject. It can be shown through their failure in mathematics. In the context of Nepal, According to SLC result of 2072 BS, most of the students were failed in Mathematics. Almost 77% of students had failed in that result. Students of lower classes also have not got better achievement on mathematics. Due to this failure rate of students, teachers as well as guardians feel it is very difficult subject. It has seen as burning problem of the learning mathematics.

In the context of Nepal, Mathematics in Nepal was basically taught by the traditional teacher-centred method of instruction or by direct instruction. In this method, the role of the student is like that of a follower. Students, rather than developing understanding through exploration, investigations or using problem solving strategies, mostly learn by copying the teacher's problem solving methods. With regards to this, Boaler (2001, p.121) cautioned that: ... considerations of competency need to examine the ways in which students engage in different practices. Thus, it becomes important to engage students in opportunities to use and apply knowledge, not only because such opportunities may afford the development of deeper knowledge, but because students engage in practices that they will need to use elsewhere.

Besides the high achievement of Nepalese students, The Nepalese teachers mainly focused on developing procedural understanding (by traditional method). This means that they taught rules/procedures but ignored conceptual understanding in problem solving. As a result, students lacked creativity, and experienced problems such as a heavy study load and difficult content. So, there is a need to bring radical change in its teaching methods. Constructivism is often used to refer to a teaching method, in which students construct their own knowledge.

This study will therefore focus on the characteristics and influence of using two contrasting teaching approaches on student learning. Further, this study responds to calls for research evidence from Nepalese classrooms on the strength of using a teaching approach based on the implications of constructivism as it applies to learning and teaching mathematics as well as students' competence, especially in a high school mathematics environment. It is therefore anticipated that the findings of this research may inspire all stakeholders about the value of using a constructivist approach to teaching.

Objectives of the Study

The general objectives of this study are as follows;

- To compare the achievement scores of the students while using constructivist approach and traditional approach.
- To analyze the experiences of students while using constructivist approach.

Research Question

The study mainly concerns about the use of constructivist approach of teaching over traditional method of teaching mathematics at the lower secondary level.

Especially this study focused the answer to the following research questions:

- Does constructivist method improve the students' achievement score in mathematics?
- Does constructivist approach prove to be more powerful approach than traditional approach in students' achievement?

Significance of the study

Mathematics is an essential part of school curriculum, so every student should study. It has been taught for a compulsory subject at school level as well as optional subject. Teaching mathematics is a difficult and challenging because it's nature, course content social

need, student interest and explosion of new field of knowledge. Constructivism is a theory about acquisition of knowledge and learning process, not only a teaching technique. Students need to construct their own understanding of each mathematical concept, so that the primary role of teaching is not lecture, explain, to transfer mathematical knowledge, but to create situation for the students that will foster their making the necessary mental constructions. This study would be helpful to get information about the '*Effectiveness of constructivist approach in teaching mathematics*'.

- It was helpful to build of knowledge about constructivism education.
- It was also help to the teacher, parents and other common people to create better environment and awareness to provide positive attitude towards teaching.
- This study was also help to know the effect of individual difference in mathematics achievement.

Hypothesis of the study

Null Hypothesis (H₀)

There is no significant difference between mean scores of the students in mathematics achievements taught by using constructivist method and traditional method, (H₀: $\mu_1 = \mu_2$)

Alternative Hypothesis (H₁)

There is significant difference between mean scores of the students in mathematics achievements taught by using constructivist method and traditional method, (H₁: $\mu_1 > \mu_2$)

Where, μ_1 and μ_2 are the mean achievement scores of the students taught by constructivist approach and traditional approach respectively.

Delimitation of the study

The limitation of the study would as follows:

- This study was limited in a sample of Grade VIII at Shree Kankali higher secondary school, Simraungadh of Bara district.
- The study was related with two teaching methods. They are traditional method and constructivist method.
- This study was an experiment of two week of duration.

Definition of the Related Terms

Achievement:- In this study, student's achievement means the score obtained by the students on the test which is prepared by the researcher.

Lower Secondary level:- The level of the school in which taught class 6 to 8.

Constructivism:- It is the term used by social learning theory by which students create/construct their knowledge through interaction

Effectiveness:- Achieving the better result using constructivist approach in teaching.

Experimental Group:- The group of students which is taught by using constructivist method of teaching.

Control Group:- Group of students which is taught by using traditional method of teaching.

Traditional Method:- Traditional method of teaching is when a teacher directs students to learn through memorization and recitation techniques there by not developing their critical thinking, problem solving, and decision making skills.

Constructivist Method:- Constructivist method to teaching involves a more interacting, student- based of teaching, students learn through group participation.

Chapter II

REVIEW OF THE RELATED LITERATURE

The main purpose of review of related literature is to find out what work have been done and what work has not been done in the area of study being undertaken . During the past decade a lot of researcher studied and did research about the constructivism on mathematics. Teaching and learning are two way process. It is an art and complete process and is an interaction between teachers and students. The related literature of this study is given in different sub-topic as below:

Empirical Literature

The review of the Empirical literature pertains the systematic summary of scientific researches and true investigation including their topics, the reasons why this study has to have conducted, methods of study, data collection tools and methods of ensuring their validity and reliability, and key findings in the related field. In this study regards; the following research findings are supportive for my study;

Upadhyay (2001), study Entitled “The Effect of Constructivism on Mathematics Achievement of Grade V students’ in Nepal” from Panjab University. The researcher mainly targeted to explore the fact whether constructivist approach procedures better result than the traditional approach in student’s achievement in term of immediate learning, relation and net gain. He further aimed if constructivism encourages the habit of self learning and self correlation and constructivism in mathematics be applied in Nepalese school situation.

The researcher was conducted experimentally with the three key words action; research was to adopt and advocate constructivism in mathematics teaching in Nepalese classroom. From this research the researcher has to conclude that the possibility of

constructivism in Nepalese school with significant difference in achievement than conventional method of teaching.

Briars & Resnick,(2000) researched three years of primary school students' achievements, and revealed that students performed better in strong reform approaches than weak reform approaches e.g. in problem solving and conceptual understanding (Schoenfeld,2002).

Another short term investigative study conducted by Pesek and Kirshner (2000), operated for several weeks in six fifthgrade mathematical classrooms where they compared two contrasting teaching approaches: pure conceptual instructions (3 days) vs. a mixed instructions (procedural development first 5 days, then conceptual instructions (3 days). The pure conceptual instruction classes outperformed the mixed instruction classes (Pesek& Kirshner 2000). These findings are important to this study since they provide further insight into possible teaching approaches that may be used to enhance the mathematical competence of students.

Basnet (2004), in his study entitled "The effect of constructivism on the achievement on grade IV students in mathematics". The objective of this research was to compare the achievement score of the students taught by the constructivist method and traditional method. The researcher concluded that constructivist produce the better result than traditional method also concluded that constructivist method is the effective for teaching mathematics

Raikhola (2007), did his research entitled "Effect of Constructivist Approach in Teaching Mathematics at Lower Secondary Level in Darchula District" was intended to determine effect of constructivist method of teaching compared to the traditional method of mathematics teaching based on the objectives to compare the difference of the achievement score of the students of experimental and control group and to advocate the constructivist as a better method in teaching mathematics.

Meurig Beynon, Chris Roe (2002) writes “the benefits of constructivism as a learning paradigm are widely recognized. Though the constructionist philosophy can be seen as applying to activities that are not necessarily computer – based (such as bricolage and concept mapping), its modern application in educational technology has been closely linked with computer use. In particular, paper’s work on LOGO programming in schools has both informed the original concept of constructivism and been a major influence over subsequent computer – based constructionist developments. Traditional computer programming is well – suited for the constructionist educational agenda. It argues that other approaches to computer model building, such as those based on spreadsheet principles, are in fact much better aligned to the based objectives of constructivism. Building on this basis, it proposes that more effective computer support for the constructionist perspective is offered by Empirical Modelling (EM) within a conceptual experiential framework for learning”
(wmb,croe@dcs.warwick.ac.uk).

Pokhrel (2004), did a research entitled ‘‘Effectiveness of teaching mathematics with and without use of constructivism’’. He concluded that the performance of students taught by the constructivist method of teaching improved significantly when compared to the performance of students taught by the traditional method.

Guthrie (2004), compared three instructional methods for third – grade reading: a traditional approach, a strategies instruction only approach, and an approach with strategies instruction only approach and constructivist motivation techniques including student choices, collaboration, and hands – on activities. The constructivist approach, called CORI (Concept-Oriented Reading instruction), resulted in better student reading comprehension, cognitive Strategies and motivation. Dagru and Kalender compared science classroom using traditional teacher-centered approaches to those using students centered, constructivist methods. In their initial test of students performance immediately following the lessons, they found no

significant differences between traditional and constructivist methods .However, in the follow – up assessment 15 days later, students who learned through constructivist methods showed better retention of knowledge than who learned through tradition methods.

Kayastha (2005), his study entitled “The effect of constructivism in teaching mathematics at grade V students at geometry” has chosen pre-test, post-test, equivalent control group design of grade V in Kaski district. The researcher concluded that constructivist technique is better effective than traditional method to get better achievement in mathematics. All of the above mentioned studies reported that the effect of constructivism method , compares with other method ,relationship but effect of constructivism in particular in particular area of grade VIII mathematics not have been adequately explored . So the present study will attempt to find the effect of constructivism in mathematics of grade VIII.

Upretee (2006), concluded in his research that direct involvement of the students in teaching learning process , role play method ,freedom for speaking ,encouragement for them have shown consequences where as offensive words ,negligence of their language , cultural belief caused negative attitude towards the teacher . Lack of the resources in multi language, misunderstanding of teacher - student relationship directly affects the goal of the teacher.

From the above study, Researcher have taken the following themes:

- For the cognitive aspect, Constructivist approach is better approach than other.
- Experimental group and control group were constructed by the help of above literature.
- Researcher get encourage to find the effect of constructivist approach.
- Each and every literature has rejected the traditional method and has advocated for constructivist method.

Theoretical Literature

Learning and knowing are not solely rational or logical activities. These concepts involve more than social renegotiation and reconstruction of meaning (Bell & Gilbert, 1996; Ford & Forman, 2006; Wood et al., 2006). Therefore, the theoretical concerns of learning in this study do not only address cognitive theory but also include social and situated perspectives. Sfard (1998) also supported the combining use of several learning theories, as is utilized in this study.

Currently, there are several views about learning which influence upon the learning of mathematics. These views include behaviourism, cognitive theory, constructivism, social learning and situated learning. The discussion that follows situates this research in a body of knowledge, incorporating different views that may be applied or used to inform teaching, curriculum and student learning. This section focuses on the following theoretical views of learning:

Social constructivism

This study is based on Vygotsky's social constructivist perspective because social constructivism claims that knowledge is actively constructed by students not only passively receiver. While they are making construction and analyzing figures instead of knowledge being passively receiver and accepted.

Every knowledge in socially constructed and children learn when we got interest with outer environment either verbally or observantly Vygotsky theory is one of them that regard social interaction between peers and adults an important aspect in creating meaning making sense and conveying culture within the context knowledge in being unconstructed in social situation of negotiation rather than bring the reflection of the objective reality which is termed as social constructivism. Social construction believes on the multiple constructions of

the world. In social constructivist theory each human being makes sense of the world in a unique way Vygotsky argue that the child's development cannot be understood by studying the individual that it need to examine the external world.

According to social constructivist Vygotsky knowledge is constructed in two ways in the social context, firstly, social interaction influences the nature of knowledge that is constructed and process of individual use to un-construct. Thus, the constructing of knowledge on the children to gain of knowledge is process of observing reflection of thinking performing, practicing and creation.

The research will be based on social constructivism a branch of constructivism. According to social constructivism people gained knowledge with their environment. So, students also gains knowledge from their interaction among social, cultural and environment. They have to fulfil their needs and expectation.

Conceptual Framework

Conceptual framework for the study is the way that organized the all the process of the research from initial stage to final stage. From the above discussion of related literature prepared a concept for the study, which will play the important role in guiding the research to achieve the determined goal.

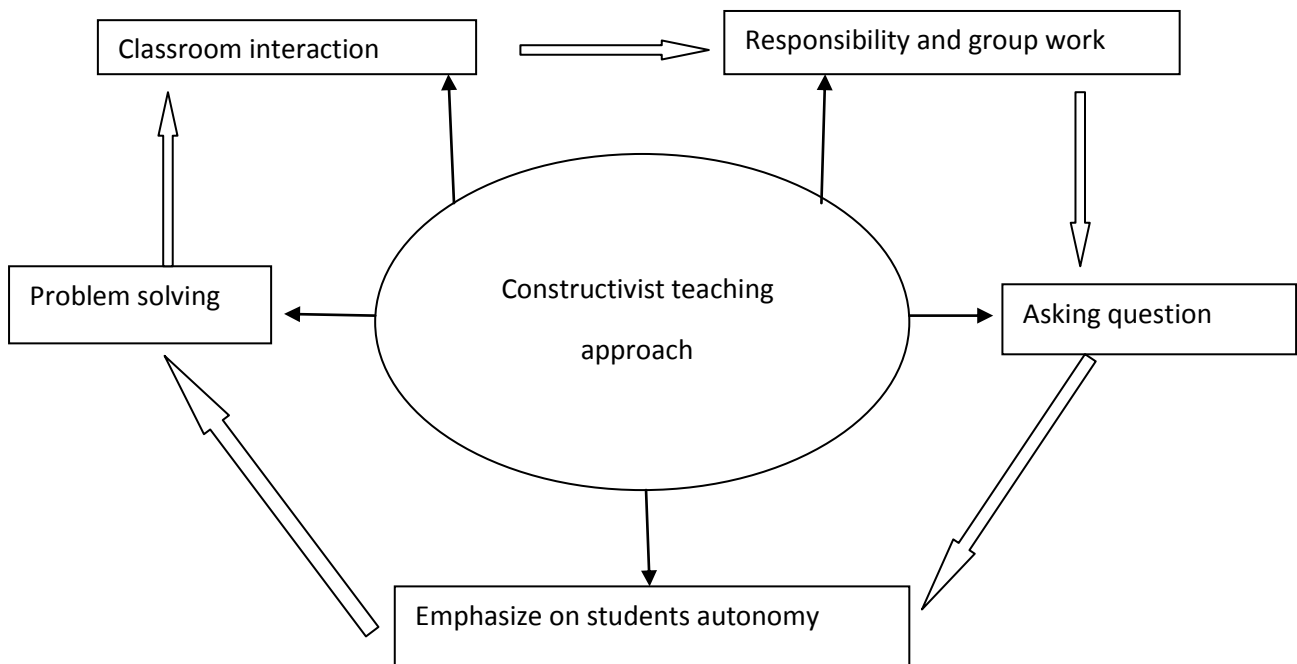


Figure: 1

Source: Modified from Shovakhar Paudel (2016)

In the constructivist classroom, there is a need to create an atmosphere in which students' discuss their ideas with one another, share ideas with peer group and have discussion on these ideas in the healthy environment. In the constructivist classroom there are different activities like teacher students discussion would be organized. In the period of teaching provide environment to the students to think, reflect upon and construct ideas and classroom environment is non- threatening to allow free discussion and meaning full dialogues. The students seared the knowledge from the more knowledgeable other. The students solve practical work with the help of their speech as well as their eyes and hands have social origins and that they learn through interaction with others.

The above diagram shows that the classroom is run by the interaction between teacher students and students with students by making the good environment and the class work is depend upon the student center activity and the problem were solved by the discussion but

first researcher focused or impressed them to solve by themselves and finally provide the cleared concept by the researcher himself. Researcher focused to the students to do in group and say the answer with the way solving problem strategies. Researcher provides the concept to the student by this episode and makes them active in classroom activity. Finally researcher provides the different question to the students and makes them solve the problem them solves.

Chapter: III

METHODS AND PROCEDURES

Research method is a plan, which determines how to complete the research systematically. This chapter describes the design of the study, rationale of selection of study area, site selection, selection of sample school, selection of case respondent, instruments for data collection, data collection procedure and data analysis and interpretation.

Design of the study

The pre-test, post- test and non-equivalent group design was adopted for the purpose of this study. The structure of the study is as follows:

Group	Pre-test	Treatment	Post-test
E	T(I)	Constructivist method	T(III)
C	T(II)	Traditional method	T(IV)

Where, E= Experimental group

C= Control group

T_I and T_{III}= Pre-test and post-test given to the students of experimental groups.

T_{II} and T_{IV} = Pre- test and post-test given to the students of control groups.

Study site

In the present research, the population of the study was consisted of all the grade VIII students in government school of Bara District.

Sample of the study

The researcher could not evaluate, observe or administer to teach and every unit population. Therefore this study was adopting the intact group from the class VIII of school

shree Kankali higher secondary school and shree Janta secondary school for the study.

Researcher selected Shree Kankali higher secondary school for experimental teaching and

Shree Janta secondary for traditional method teaching by the simple random sampling

method (lottery method). Researcher taught the same curriculum and covered the same

mathematics content of grade VIII with each school. There were 32 students' in experimental

group and 30 students' in control group. All students participant is between 13 to 14 years

old.

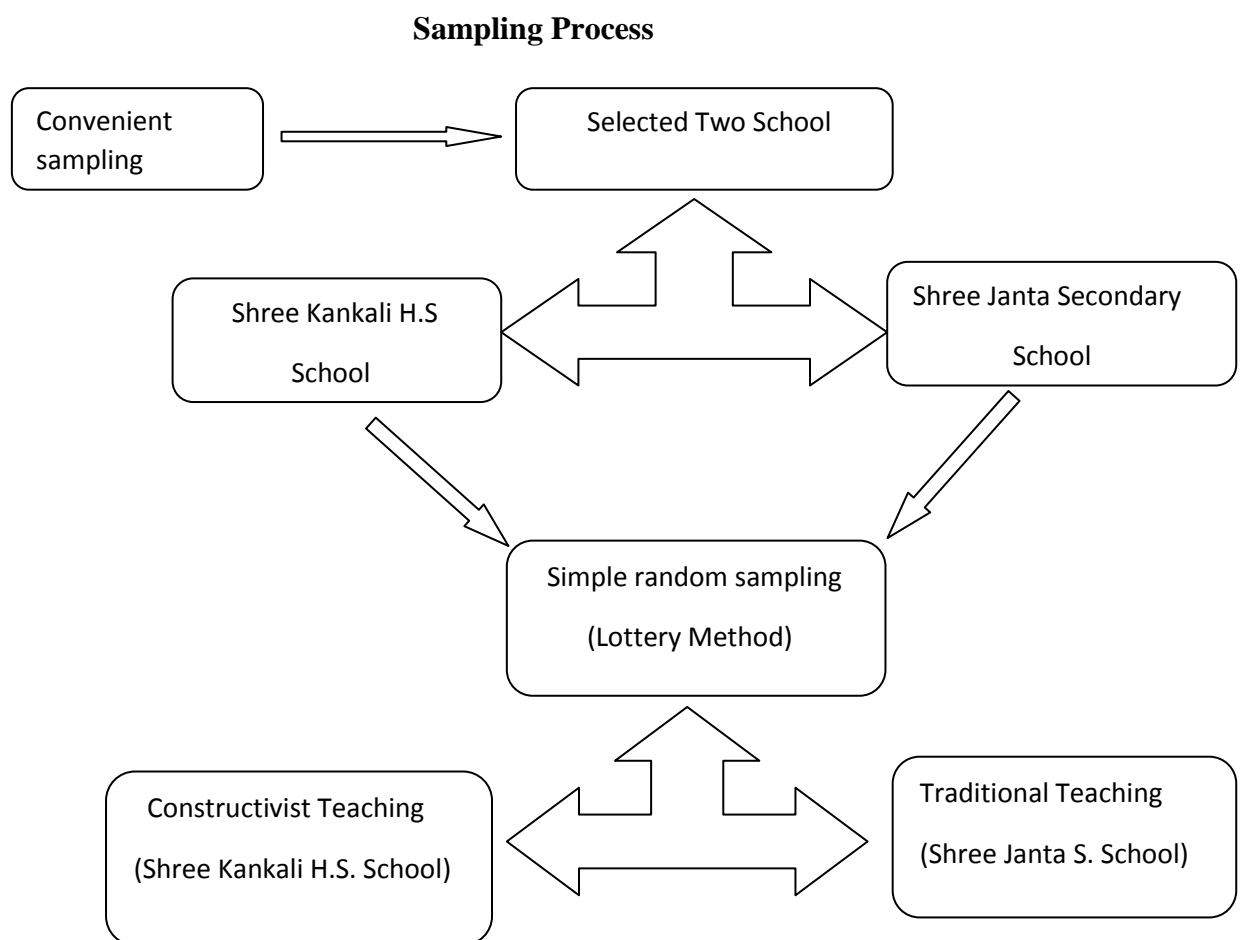


Figure:2

This study was experimental in nature. Every experimental study deals with independent and dependent variable. So, it also deals with the dependent and independent variable which can be described as follows.

1) Independent Variables

In this study, the independent variable is method of teaching mathematics in the classroom instruction in accordance with the characteristics of constructivism.

2) Dependent Variables

In this study, the achievement scores in the test of mathematics is dependent variables.

Controlling Extraneous Variable

Since, the aim of the study will to find an experimental research: use of constructivist approach for teaching in mathematics.

- Same subject matter were taught for both groups
- The same test was used for both groups
- Experimental and control groups were divided by simple random sampling method (lottery method).
- The same teacher taught both groups.

Instrument of the study

To measure the achievement of mathematics by using constructivist approach, the researcher developed some constructivist lesson plan from the compulsory mathematics of Grade VIII. The achievement test paper was developed on the basis of prescribed curriculum and text book of grade VIII in mathematics from different topic.i.e. Profit and Loss, Simple Interest, Unitary Method, Co-ordinates and Mensuration.

Teaching episodes were prepared to teach experimental group according to constructivist approach.

Tools for the Study

There are multiple tools were use in this study. Data collection was involved tests item, observation form and interview schedule. Each of the data collection and generation techniques is discussed below.

Test Item

One form of written assessments, test were given to students. Test can collect information on students' knowing and what they are able to do. Tests convey a number of mathematical questions related with the mathematics textbook in order to assess students' mathematical knowledge regarding the textbook content.

To test the achievement of the students, researcher made some tests which consists 20 questions. There were 10 multiple choice questions and 10 subjective type questions. All the items of the test were constructs from the different mathematical content.

Observation Note

A way to gather data by watching people, events, or noting physical characteristics in their natural setting. Observations can be overt (subject know they are being observed) or covert (do not know they are being watched). Observation is the supported data collection tool of this study. Researcher was maintenance the daily note of the student's activities and behaviour on his note book. Especially researcher observed students participant, motivation, and class room activities by using daily note and researcher observes effectiveness of constructivist approach by using observation form. Moreover researcher observed classroom activities, effectiveness of constructivist approach and changes of student behaviour by using observation form.

Interview Schedule

Interview is a powerful way of eliciting the ideas of people, their knowledge, values and attitudes "An interview is often a verbally administered questionnaire" (Bainbridge, 1992, p. 74). Interviewers can use oral questions to get personal information. This study adopted individual face-to-face interviews and telephone interviews.

For this, to measure the non-cognitive aspect of students, the researcher will take the interview with 10 students from experimental group according to random selection. This interview will encourage to response towards the question for the students clearly. The direct interview will conduct with students in this study. The researcher will not only ask the question but also observe all the behaviour and answering method of respondents. In this study, the researcher will develop the interview guideline to collect the information from students.

Reliability and Validity of the Instrument

First, Researcher prepared the test items and use following steps to take test:

- Calculate the Difficulty level of the items.
- Calculate the Discrimination index.

Also, these research instruments will be prepared and validated by passing through different stages drafting, tryout and piloting as well as validating through expert comments.

The content validity of the test was established by mathematics education experts, school teacher and thesis supervisor. For the reliability of the test, researcher used pilot test among 25 students of grade VIII of Shree Shankar ma.vi Bankul (Rautahat). Before administering the test paper, the investigator instructs the student how to response the test

paper. For the reliability of the study the researcher administrate the pilot study to the student of grade VIII of Shree Shankar ma.vi school, Rautahat. After piloting, the data was analyzed by Kudar Richardson (KR 20) formula, calculated value was 0.98. It indicated that the mathematical achievement test was reliable.

Stage of the study

The study was conduct in the following three stages:

Pre-Experimental Stages

The sample schools were the school adopted traditional method while teaching mathematics at Grade VIII. The stage where the traditional approach of teaching was being used is the pre-experimental stage. A pre-experimental test was conducted to find out the achievement level of the students in this stage.

Experimental Stage

In this period, the researcher went to the field where researcher taught both the groups i.e. experimental (Shree Kankali higher secondary school) and control (Shree Janta secondary school) group by the constructivist method and traditional method (by the selection of lottery method) respectively for two weeks. Since the aim of this study was to examine the effect of constructivism on mathematics achievement of grade VIII students. It was very difficult and minimized the effect of other variables besides the experimental variable which directly impress the achievement.

Post Experimental Stage

In this stage, Research conducted post-test by using achievement test paper. The achievement test paper consist of 20 items. All the nature of questions was same as the pre-

test but the questions were different and collect the data for analysis and interpretation by using statistical tools and technique.

Data Collection Procedure

Researcher visited the selected school, Shree Kankali higher secondary school and Shree Janta secondary school. Then, researcher taught the experimental group with constructivist approach and control group with traditional approach respectively for two weeks. Then data collected by scoring of answer sheets given by students. Then, researcher tested the hypothesis on 0.05 levels of significant and also calculate mean, S.D. and variance with the help of interview schedule, the interview was conducted with some of the students from experimental group.

Data Analysis Procedure

The collected data was analyze and interpreted by using following statistical devices: Means, Variance and coefficient of variance was calculated for both groups with their obtained marks in the test. Z- test at 5 % level of significance was use between two means to find the significant difference between the achievementsof two groups of sample students. Graphical presentation was applied, so that the result could be easily understood by the reader.

In this research, Researcher also gathered qualitative data by using daily note student's activities, behaviour, observation sheets and interview. The information's were collected from the observation then researcher analyzed by using three steps that are organization of data, summarizing the data and interpreting the data. Researcher explained the data and their perspectives according to the respondent's responses.

In this research, the researcher analyzed data by using following steps.

- **Organising the Data:** The first step is to get to know our data. It's important to get a through overview of all the data we collected before we start analyzing individual items. This might involve reading through the text and taking initial notes, and generally looking through the data to get familiar with it.
- **Coding:** Next up, we need to code the data. Coding means highlighting sections of our text- usually phrases or sentences- and coming up with shorthand labels or "codes" to describe their content.
- **Generating themes:** Next, we look over the codes we've created, identify patterns among them, and start coming up with themes. Themes are generally broader than codes. Most of the time, we'll combine several codes into a single theme.
- **Theoretical Sampling:** Theoretical sampling is the needed person, event or behaviour which is impotents to add for function of data analysis.
- **Interpretations:** The analysis of research variables with universal sentences in quantitative research is called interpretations of data. This type of theory assumes emergent, multiple realities, indeterminacy, provisional and social life as processual.

My research was focus on inspecting three areas: students' learning, learning attitudes, and teaching practices. Thus, the multiple research methods of this study could produce rich and detailed data to fit into the inquiry in this study.

Chapter IV

DATA ANALYSIS AND INTERPRETATION

Analysis and interpretation of the data is the main body of the any research. Without analysis and interpretation of the data, the study becomes meaningless. So, the collected data should be reduced in the desirable simplified form, or in understandable form. The analysis of concise data enables the investigator to interpret data, draw conclusion and make generalizations. This study “Effectiveness of constructivist approach in teaching mathematics” is an experimental study where involving pre-test and post-test as well as experimental and control group design. Since the objective of this study was to compare the achievement of the students taught by constructivist approach with achievement of the students taught by traditional approach and to find out the effective of constructivist approach to teaching mathematics. So, the quantitative data were collected before and after the experiment. They were tabulated and analyzed for mean, variance, standard deviation and t-test for differentiate the means.

The data of the achievement test scores were analyzed as follows:

- Comparison of mean achievement scores of experimental and control groups from pre-test data.
- Comparison of mean achievement scores of experimental and control groups from post-test data.

Comparison of the Achievement Score of the Control Group and Experimental Group from the Pre-test Data

There were thirty two students in the experimental groups and thirty students in control groups. The Pre-test score of the students of both experimental and control group are

presented in **Appendix E** and summarized statistical calculation of both the groups on the pre-test is presented in the following table **I**.

Table I: Comparison between the achievement scores of control group and experimental group from pre-test data.

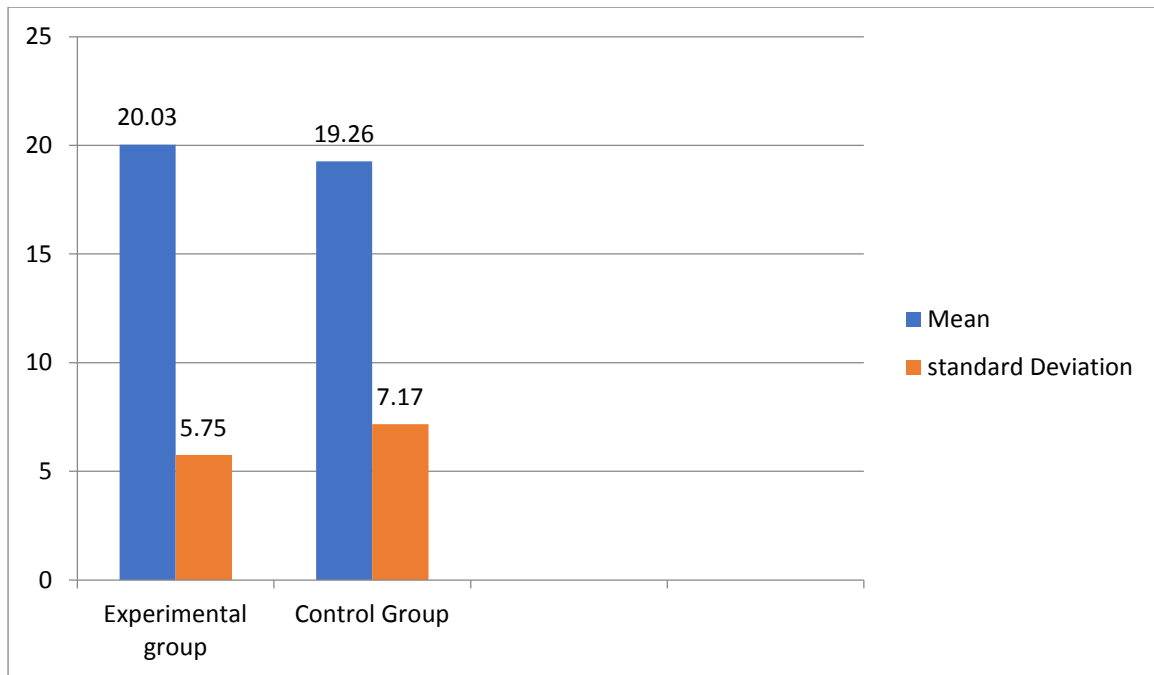
Group	No. of Students	Mean	Variance	Standard Deviation (S.D)	z-value	Level of significance
E	32	20.03	33.09	5.75	0.46	0.05
C	30	19.26	51.52	7.17		

The above table reveals the mean, variance and standard deviation of experimental and control groups on pre-test. From above table it is clearly seen that both the mean and standard deviation of both the group are nearly equal. In other words, the mean score of experimental group was 20.03 and the mean score of control group was 19.26 and also the standard deviation of experimental group was 5.75 and control group was 7.17. In order to see whether initial difference existed between the two groups, Z-test was employed. The calculated z-value is 0.46 and tabulated value is 1.645 at 5% level of significance. In other words, the null hypothesis was accepted (not rejected). By this we conclude that the means of two groups were not found to be significant and therefore the groups were treated as equal.

Bar Diagram Presentation of the Data

The comparative mean achievement of experimental and control group for pre-test result can also be presented in bar diagram. The researcher hopes that the bar diagrams helps in understanding the data easily. The bar diagram of above score is presented below:

Bar Diagram I: Mean and S.D score distribution of pre-test result.



The bar diagram I shows that the mean and standard deviation scores obtained by the students of experimental and control group on the pre-test. The mean score of experimental and control groups are 20.03 and 19.26 respectively. And the standard deviation of experimental and control groups are 5.75 and 7.17 respectively. The result shows that there is no significant difference in mean score of both groups on pre-test scores.

Comparison between the achievement scores of control group and experimental group from post-test data.

There were thirty two students in experimental and thirty students in control groups. The post-test score of the students of both experimental and control group are presented in **Appendix F** and summarized statistical calculation of both the groups on the post-test is presented in the following table **II**.

Table II: Comparison between the achievement scores of experimental group and control group from post-test data.

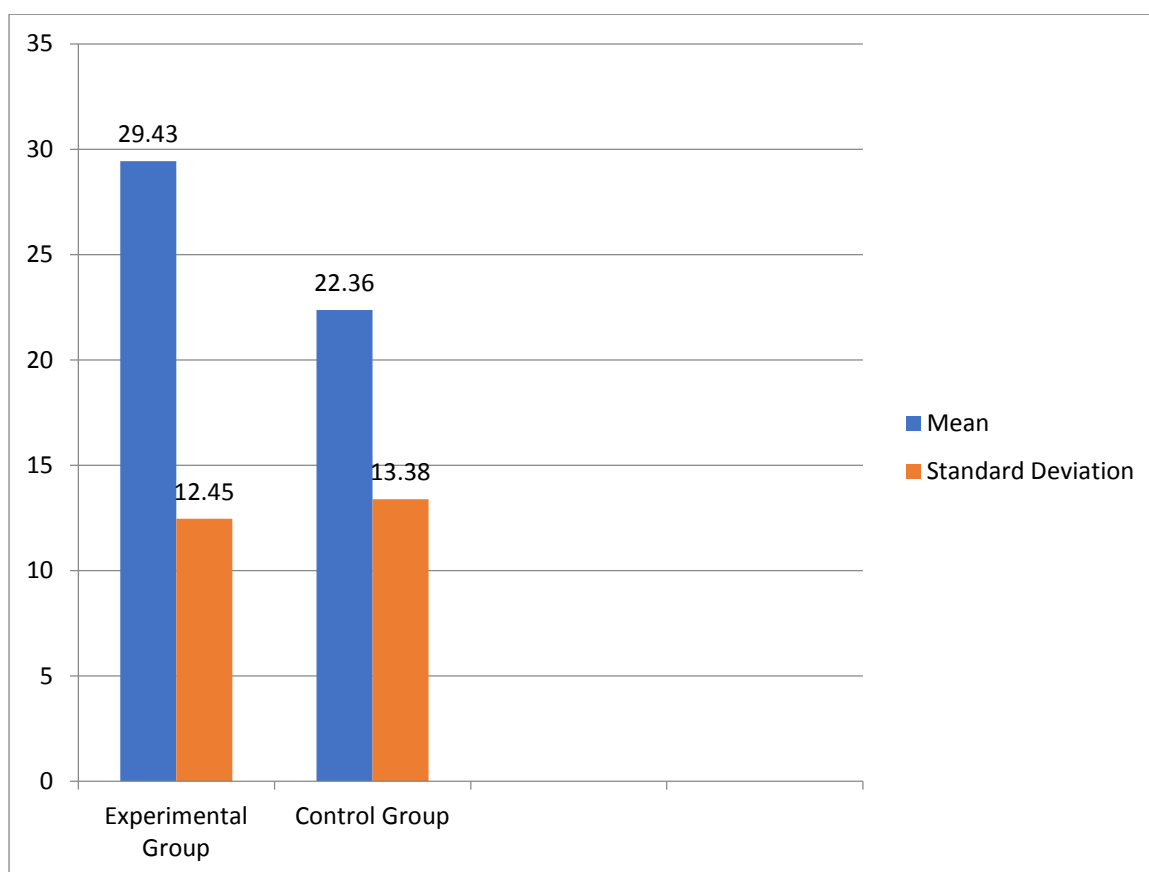
Group	No. of Students	Mean	Variance	Standard Deviation (S.D)	z-value	Level of significance
E	32	29.43	155.11	12.45	2.15	0.05
C	30	22.36	179.09	13.38		

The above table reveals the means, variance and standard deviation of experimental and control groups on post-test. In the table the mean and standard deviation of both groups are different. The score of experimental group from certain range with the mean score 29.43 and score of control group on a certain range with the mean score 22.36. The standard deviation of experimental group was 12.45 and standard deviation of control group was 13.38. The calculated z-value was 2.15 and the tabulated z-value was 1.645 at the 5% level of significance. **Table II** shows that the calculated z-value is greater than the tabulated z-value. Therefore, the null hypothesis was rejected and but alternative hypothesis was accepted. This implies that there is significant difference between the mean achievement score of both groups experimental and control groups. In other words, there is significant different between constructivist method and traditional method in student achievement was accepted. Therefore the researcher concluded that the students of experimental groups are significantly benefited in the achievement of score than the students of control group. It means that constructivist method of teaching produces the better result achievement on the mathematical content of grade VIII. Therefore, the result indicates that constructivist method of teaching mathematics is more effective than the traditional method of teaching in lower secondary level of Bara district.

Bar Diagram presentation of the Data

The comparative mean achievement of experimental and control group for post-test result can also be presented in bar diagram. The researcher hopes that the bar diagram helps in understanding the data easily. The bar diagram of above score is presented below:

Bar Diagram II: Mean and S.D score distribution of post-test result



The bar diagram II indicated that the mean and standard deviation scores obtained by the students of experimental and control groups on post-test. The mean scores of experimental and control groups are 29.43 and 22.36 respectively. And the standard deviation of experimental and control groups are 12.45 and 13.38 respectively. The mean score of experimental group is greater than the mean score of control group.

The coefficient of variation (C.V) of experimental group 0.42 and C.V of control group is 0.59. This shows that the individual student in experimental group was almost very

near to each other than the individual students of control group. The experimental group seems to be more consist than the control group. This indicates that the experimental group had better result than the control group. Therefore, the bar diagram II indicates that the constructivist method of teaching on mathematical contents of grade VIII.

Qualitative Part of the study

Researcher developed observation note. Then take the responses of the students with used appendix-H and daily note and they were noted. Researcher used observation sheet note writing on both experimental group and control group. There was no limitation to responses for the respondents. They were able to express freely whatever they have in their mind. Thus, students feeling are difference to constructivist approach. Generally, researcher observed student's participant in mathematics classroom, motivation, student's class activities and student's behaviour change. Then they were noted and analyzed as a following with the using steps; Organising the data, Coding, Generating theme, Theoretical sampling, Interpretation.

- a. Participant: Students took part in a teaching activities or teaching event.
 - Response of control group: Students are active to copy teacher's prove on note book.
 - Response of experimental group: Students are actively tried to solve problem with group discussion.
- i. Coding: Copy on students note book, try to solve and group discussion
- ii. Generating theme: Control group students are only centered to copying teacher's activities. But experimental group students tried to solve problem and involved into group discussion.

- iii. Theoretical Sampling: If students are passive in class activities then it is called not participant. But, if students try to understand problem, try to solve it and involved into group discussion then it called participant.
- iv. Interpretation: Above explanation show that, control groups are not actively participant in class activities but the experimental group students are actively participant into class activities. It implies constructivist approach is effective to teach airthematic.
- b. Motivation: Motivation is the self interest or interest to class activities or try to solve problem themselves.
- Response of control group: mathematics class is boring class. I don't interest to participant there.
 - Response of experimental group: Students are not interest to earlier episode but after the four and five episode student are interested into mathematics classroom.
- i. Coding: Not interested and interested
- ii. Generating theme: Students of the control group are not interested in class activities but the students of the experimental group are interested in class activities.
- iii. Theoretical sampling: If students are not interested to teaching activities then it is called not motivated to class activity. But if students are interest to teaching activities then it is called motivation to class activities.
- iv. Interpretation: Above explanation show that student of the control groups are not motivated to teaching learning activities but the experimental group students are motivated to teaching learning activities.

C. Student's behaviour change: Difference between earlier episode's behaviour of the student and last episode's behaviour of student is called student's behaviour change.

- Response of control group: there was not change of behaviour from earlier episode to last episode.
 - Response of experimental group: there was vastly change of behaviour from earlier episode to last episode.
- i. Coding: Behaviours not change and behaviours vastly change
 - ii. Generating theme: Control group student's behaviour was not change from first episode to last episode but experimental group student's behaviour was vastly difference from first episode to last episode.
 - iii. Theoretical sampling: If there is a change of behaviour while using treatment it is positive behaviour and if not it is constant behaviour.
 - iv. Interpretation: From beginning to the end of the experimental episode, control groups students was only centered to copying teacher's solve and rote that. It means behaviour of control group students are not change at the first episode to last episode. Experimental group students are not perfect to the steps of constructivist approach at the earlier episode. After four and five episode students are perfect to the steps of constructivist approach and their behaviour was changed vastly. Students change copy writing and rote learning style into learning by group discussion way, learning to each other and collaborative learning.

Moreover, the researcher had analyzed the student's responses as following with the support of Appendix-D. The question do you like arithmetic subject? 60% students like the arithmetic subject. It means 40% students don't like arithmetic. It implies 40% of the students are feel arithmetic topic was difficult. The question do you think arithmetic problems are easier rather than the problems of other mathematics? 90% students think

arithmetic problems are difficult than other mathematics problem. Similarly, the question is you satisfied your mathematics teacher? Around 55% students are satisfied their class teacher teaching method.

Response of student is show their class teacher didn't used teaching material at the classroom activities, Regular class teacher should be used tradition approach in control group to teach arithmetic problems. Again, the question what do you think researcher teaching style? The students were give following response learning by doing, discussion method, student centered method, self-doing method. Student claim that, there was vast difference between researchers used teaching approach and class teacher used teaching approach. The difference of teaching style were following according to students response, in the researcher style teacher was only environment maker, all the problem solve students itself and student are learned by using group discussion but in class teacher style teacher was center point of teaching activities, teacher do everything do, students were only receiver. It show researcher approach was better effective then class teacher approach. So researcher use constructivist approach and class teacher use traditional approach. It implies that constructivist approach was better effective than traditional approach at lower secondary level.

Around 85% students are satisfied to researcher teaching approach and behaviour. At the earlier episode of teaching episode students didn't interest to constructivist approach. So the researcher was feels difficult to use constructivist approach at class room activities. After 6 teaching episode student should be perfect to constructivist approach's steps. So the researcher feels easier to use constructivist approach at classroom.

The result of post test and response of students show, constructivist approach were support to the students to understanding learning mathematics. Moreover, student's

response of the question “which method does you like between researcher method and class teacher method”? Are 20% students asked both method was like, 55% students asked constructivist approach like and 25% students asked traditional approach like. It concludes that most of the students were like constructivist approach. Finally, response of students conclude, most of the students believe that the concept of mathematics can be learned by discussing with friends.

Finally, above explanation prove constructivist approach was able to encourage the habit of self learning and self-correcting.

Encourage of Constructivist Approach to self-Learning and Self-Correcting

In this section, to address the second research question, “Does constructivist approach encourage the habit of self-learning and self correcting”? Which answer was found by using interview and regular classroom observations?

Student’s opinion on self-learning

After the interview had taken to the target students and fill to the observation form, the researcher had found the following opinions:

The students said, “First, we studied the instructions clearly and to start solution, we observed the related example. It could not make us confident then we discussed among the group, consulted the reference text book, practice books”.

When the researcher asked them whether they had any interaction concerning to the activities. Students replied, “As soon as the solution was found, we looked the answer key. Then we discussed to other groups in order to exchange the ideas and common techniques. The researcher adds another question if the students were satisfied students

said, “in the beginning stage, we huddled but when we went on consulting the different resources one at after another, we really felt satisfaction.

Do you have any positive comment on self learning method, the students added their opinions, and “we think one of the possible way of learning is self-practice. It makes the learner more active and we active and we came to realize the team work is better.

Researcher’s Views on Promoting Self-learning

The researcher took an interview with the students who were studying in class VIII and collected the reflections which are given below:

- The researcher found that the students had extremely attempted to consult the reference materials: example, spelling copy, practice books.
- When students began suffering from different confusions, they tried to come in contact with other groups in order to discuss.
- Ultimately, when they got the solution they were found to be satisfied and shared their somewhat innovative ideas to each other.

Chapter: V

Summary, Finding, Conclusion and Recommendations

This study was an experimental study, conducted to find out the “effectiveness of constructivist approach in teaching mathematics of grade VIII students”. For this purpose, this chapter includes the summary, finding, conclusion, recommendation and suggestion for the further study. They have been represented as follows:

Summary

The study was experimental design, which the researcher conducted a research, concerning with two types of teaching approach such as constructivist approach and traditional teaching approach. The experimental duration was two weeks and also traditional duration was two weeks. There were 10 lesson plans covering 5 different chapters and the achievement of the control group and experimental group were examined through a post-test. And for the non-cognitive aspects, the researcher was made interview schedule.

Findings of the Study

On the basis of analysis and interpretation of the data obtained from the achievement test which has been described in a chapter IV. Then the researcher was drawn following findings.

Objective1.

- The achievement of score of the experimental group who was taught by using constructivist approach performed better than the control group taught by the traditional approach of teaching mathematics.
- Pre-test and post-test’s result shows that constructivist approach is more useful and practical.

Objective2.

- According to interview, most of the students expressed that new methods them easy to understand the geometrical and arithmetical problem than other.
- This approach able to encourage the habit of self-learning and self-correcting.
- It can advocate the student's need and interest.
- This approach helps to increase the student's participation on learning.

Conclusion of the Study

The main objective of the study was to see the effectiveness of constructivist method in teaching mathematics. As a major finding, the researcher has found that the achievement score of the students taught through constructivist method is better than the students treated through traditional method of teaching. As constructivist method emphasizes on children's cognitive and affective development, it has formatted their active participation in learning. Students learn by doing, engaging, discussing, searching, and responding and so on. After the study, the researcher came to the conclusion that the constructivist method was found very helpful for the student to motivate for learning by applying the known functional concepts in unfamiliar conditions. As the major achievement of the study, the researcher has found that the constructivist method of teaching increases the achievement of the students in mathematics. Constructivist method is found more effective than any other existing method for teaching mathematics at grade VIII. The conclusion of the study also implies that the constructivist method leads the learner to be constructive enough themselves while learning mathematics and for the teachers to adopt this method while teaching.

Recommendation for educational implication

On the basis of the finding of the study, some insightful learning have been recommended for the improvement of teaching learning mathematics at lower secondary level, especially at grade VIII. The major points of recommended are given below:

- Constructivism provides opportunity to the students for self-correction and independent learning. So, it is useful to the students.
- Students should be encouraged to get involved in active participation in classroom activities.
- Individual difference exists in every classroom. So, mathematics teacher should provide the task and environment according to student's ability in constructivist approach.
- The textbook writers and curriculum designer should emphasis on constructivist method of teaching mathematics.
- The teacher should leave the students to discover the answer of question on their own way instead teacher's answer.
- Teaching episode is the highly technical documents that help teaching and learning process. So, teachers should be encouraged to use teaching episode.
- Constructivist models should be used to develop the mathematical ideas and concepts.

Recommendation for Further Study

From the wide-ranging reviews, reflections included in this study and the results of this study, the following suggestion have been put forward for further study.

- i. Study on designing different teaching and learning modules should be carried out, so that these modules can be used in classroom teaching.

- ii. This study was confined only to Bara districts of Nepal. Therefore further studies should be done in different districts of Nepal, and the results of the study can be generalized.
- iii. The similar empirical study may be conducted in different socio-cultural context.
- iv. The larger researcher must be designed and carried out in order to investigate the effectiveness of constructivist approach of teaching in large samples and various schools of different regions of Nepal.
- v. Similar empirical study may be conducted of different levels of school.
- vi. Different variable other than those which are included in present study may be taken as independent variable.

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APPENDIX- A

TRADITIONAL APPROACH - 1

School: Shree janta secondary school

Subject: Compulsory math

Level: VIII

Topic: Profit & Loss

Time: 35 minutes

Objectives: At the end of this class student will be able to:

- I. Define the concept of profit & Loss.
- II. Problem will be solved by the definition of profit & loss.

Instructional Material: Daily uses

Classroom Activities:

- I. At first I will define the concept of profit & loss:
 - **Cost price (C.P) :** Cost price of an article is the price or the money for which the article has been purchased.
 - **Selling Price (S.P) :** The selling of an article is the price or the money for which the article has been sold.
 - **Profit:** If selling price (S.P) is more than C.P then the difference between S.P & C.P is called profit.
 - **Loss:** If C.P is more than S.P then the difference between C.P & S.P is called loss.

Important formula:

- i. Profit = S.P – C.P
 - ii. Profit % = Profit/C.P × 100
 - iii. Loss = C.P – S.P
 - iv. Loss % = Loss/C.P × 100
- II. Q) If cost price (C.P) = Rs.1200, S.P= Rs.1280, then find the profit / loss and also profit% / loss%.

→ Given that, 1st part

C.P = Rs.1200, S.P= Rs. 1280

Now, we know that,

Profit= S.P – C.P =Rs.1280 – Rs. 1200= Rs. 80ans.

2nd part(for profit%)

Given, profit= Rs.80, C.P= Rs. 1200

Then we know, profit% = profit/C.P × 100 = 80/1200×100 = 6.6% ans.

Evaluation: I) Define the profit & loss?

II) Shyam bought 5 apples for Rs. 30 and sold each apple at Rs.8, how much percentage did he gain(profit)?

Homework: complete this exercise.

Teaching Episode – 2

Topic: Discount

Objectives: At the end of this class student will be able to :

- i. Define the concept of discount
- ii. Problem will be solved by the concept of discount

Instructional material: Daily uses

Classroom Activities:

- i. At first , I will define the concept of Discount:

Marked Price: The listed price or the printed price of an article is called the marked price, denoted by M.P.

Discount: The reduced price in the marked price is called the discount.

Important formula:

Marked price: Selling price + Discount **Discount (%) =** Actual discount / M.P $\times 100$

Marked Price – Discount = Cost Price + Profit

- ii. **Q.** The marked price of a bag is Rs. 750. What is the selling price of it if 12% discount is allowed?

\Rightarrow Given, Marked price of a bag (M.P) = Rs. 750

Discount(%) = 12%

Selling price of a bag (S.P) = ?

We know that, Discount = 12% of M.P

$$= 750 \times 12 / 100$$

$$= \text{Rs. } 90$$

Now, Selling price = M.P – Discount

$$= \text{Rs. } 750 - \text{Rs. } 90$$

$$= \text{Rs. } 660 \text{ ans.}$$

Evaluation:

- i. Define the Discount?
- ii. The selling price of a watch is Rs. 270 if this watch was sold at 10% discount on the marked price, what was the marked price?

Homework: Complete the exercise number 1-9 of exercise 16.2.

Teaching Episode – 3

Topic: Simple Interest

Objectives: At the end of this class student will be able to:

1. Formula will be told of simple interest
2. Problem will be solved with related to simple interest

Instructional Material: Daily uses

Classroom Activities:

1. At first, I will write the formula of simple interest

$$I = P \times T \times R / 100$$

$$P = I \times 100 / T \times R$$

$$R = I \times 100 / P \times T$$

$$T = I \times 100 / P \times R$$

Where,

I = Simple interest, P = Principal, T = Time, R = Rate of interest

2. Q. If R = 2%

$$T = 3 \text{ years}$$

$$I = \text{Rs. } 120$$

Then, P = ?

⇒ By Given, We know that

$$P = I \times 100 / T \times R$$

$$= \text{Rs. } 120 \times 100 / 3 \times 2$$

$$= \text{Rs. } 2000$$

Therefore,

Principle (P) = Rs. 2000 ans.

Evaluation:

1. What is the formula of Interest & Rate of interest?
2. Find the simple interest, if P = Rs. 1200, R = 10%, & T = 2 years.

Homework:

Complete the exercise 18.1

Teaching Episode – 4

Topic: Unitary method

Objectives: At the end of this class student will be able to:

- i. Define the unitary method, direct variation and Indirect variation
- ii. Problem will be solved with related to direct method & indirect method.

Instructional Material: Daily uses

Classroom Activities:

- i. At first, I will define the unitary method

Unitary method: The rule of computing the value of one unit of an object. Work, amount etc. on the basis of given values of a sum of above things & vice versa is the unitary method.

Direct Variation: The quantities are said to be in direct proportion, if one quantity of one kind increases or decreases in the same ratio as the other quantity of another kind related to the first quantity increases or decreases.

Indirect Variation: When one quantity goes up then another quantity goes down and vice versa such type of variation is called Indirect Variation.

- ii. **Q.** 24 workers can do a piece of work in 20 days. How many workers should be added to complete the work in 16 days?

\Rightarrow work days	No. of workers
20	24
16	X

Now,

$$20/16 = x/24$$

$$\text{Or, } x = 20 \times 24 / 16$$

$$= 480/16$$

$$= 30 \text{ workers}$$

Therefore, the workers should be added = $30 - 24 = 6$ workers. Ans.

Evaluation:

- i. What is Direct & Indirect variation?
- ii. 20 workers can dig a farm in 240 hrs. How many workers can dig the same farm in 60 hrs?

Homework: Complete the exercise 17.1

Teaching Episode- 5

Topic: Perimeter, Area

Objectives: At the end of this class student will be able to;

- I. Define the concept of perimeter & area
- II. Problem will be solved i.e, Find the value of perimeter & area of geometrical figure

Instructional Material: Daily uses

Classroom Activities:

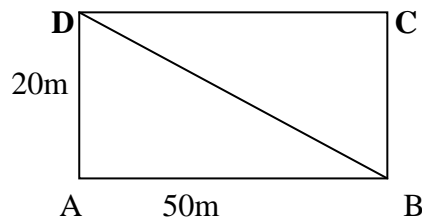
- I. At first, I will define the concept of perimeter & area

⇒ The perimeter of a plane figure is the total length of it's boundary. In the case of triangle and a polygon, the perimeter is the sum of the lengths of its sides.



The area of a plane figure is the measure of the surface enclosed by it's boundary. The area of a triangle or a polygon is the measure of the surface enclosed by it's sides.

II.Q. In the given figure, the length & breadth of a rectangular playground are 50m and 20m respectively. Find the area of ABD.



Given, AB= 50m

AD= 20m

Now, we know that

Area of triangle = $\frac{1}{2}$ base \times height

$$= \frac{1}{2} AB \times AD$$

$$= \frac{1}{2} 50m \times 20m$$

$$= 500m^2$$

Thus, the area of $\triangle ABD$ is $500m^2$ ans.

Evaluation: I. What is the perimeter & area?

II. The perimeter of a square is 40cm. Find the area of the square.

Homework: Complete the question number 1. a, b, c, e

Teaching Episode-6

Unit: Mensuration

Topic: Triangle

Objectives: At the end of this class student will be able to;

1. Formula will be told of area and perimeter of triangle
2. Problem will be solved i.e. Find the area and perimeter of the given triangle

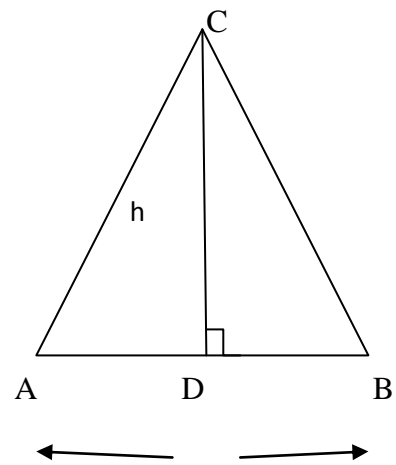
Instructional Material: Card board

Classroom Activities:

1. At first, I will write the formula of triangle by showing figure

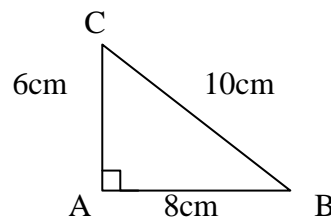
$$\text{Area}(A) = \frac{1}{2} b \times h$$

$$\text{Perimeter}(P) = AB + BC + AC$$



b

2. Q. Find the area and perimeter of the given triangle



⇒

Given, $AB = 8\text{cm}$

$BC = 10\text{cm}$

$AC = 6\text{cm}$

Now, we know that

Area of triangle (A) = $\frac{1}{2} b \times h$

$$= \frac{1}{2} 8\text{cm} \times 6\text{cm} = 24\text{cm}^2$$

For Next,

$$\begin{aligned}\text{Perimeter of triangle}(P) &= AB+BC+AC \\ &= 8\text{cm}+10\text{cm}+6\text{cm} \\ &= 24\text{cm}\end{aligned}$$

Evaluation:

1. What is the area and perimeter of triangle?
2. Find the area and perimeter of triangle, if $AB= 5\text{cm}$, $BC= 4\text{cm}$, $AC= 7\text{cm}$

Homework:

Complete the question number of 1. C,E& F

Teaching Episode- 7

Topic:Square&Rectangle

Objectives:At the end of this class student will be able to;

1. Formula will be told of area and perimeter of square & rectangle
2. Problem will be solved i.e. Find the value of area and perimeter of square & rectangle

Instructional Material: Card board and daily uses

Classroom Activities:

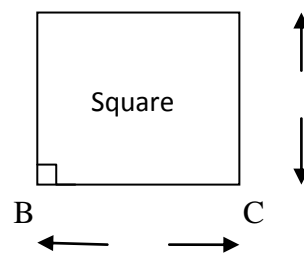
1. At first, I will write the formula of rectangle by showing figure

$$\text{Area of square}(A)= l^2 \text{ AD}$$

$$\text{Perimeter of square } (P) = 4l$$

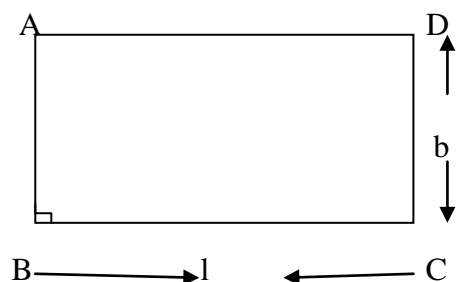
l

l

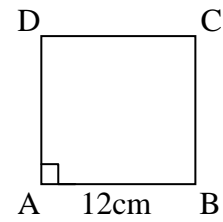


$$\text{Area of rectangle } (A) = l \times b$$

$$\text{Perimeter of rectangle } (P) = 2(l + b)$$



2. Q. Find the area and perimeter of given square



⇒ Here, Given AB = 12cm

$$BC = 12\text{cm}$$

$$AD = 12\text{cm}$$

$$CD = 12\text{cm}$$

Now, we know that

$$\text{Area of square (A)} = l^2$$

$$= (12\text{cm})^2 = 144\text{cm}^2$$

$$\text{Perimeter of square (P)} = 4l$$

$$= 4 \times 12\text{ cm} = 48\text{cm}$$

Evaluation:

1. What is the formula of area & perimeter of square and rectangle?
2. What is the area and perimeter of rectangle? if AB = 12cm and AC = 4cm

Homework:

Complete the question number of 1. A & B

Teaching Episode – 8

Topic: Parallelogram

Objectives: At the end of this class student will be able to;

1. Formula will be told of area and perimeter of parallelogram
2. Problem will be solved; i.e. Find the area and perimeter of given parallelogram

Instructional Material: Card board and daily uses

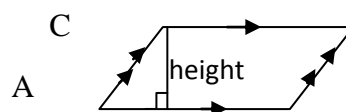
Classroom Activities:

1. At first, I will write the formula of rectangle by showing figure

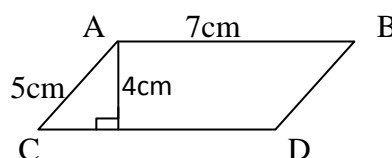
$$\text{Area of Parallelogram (A)} = b \times h \quad \text{D}$$

$$\text{Perimeter of Parallelogram (P)} = 2(\text{AD} + \text{AB})$$

base



2. Q. Find the area and perimeter of given parallelogram



⇒ Here, Given

$$\text{AB} = 7\text{cm}$$

$$\text{AC} = 5\text{cm}$$

$$\text{Height} = 4\text{cm}$$

Now, we know that

$$\text{Area of parallelogram (A)} = b \times h$$

$$= 7\text{cm} \times 4\text{cm} = 28\text{cm}^2$$

$$\text{Perimeter of parallelogram (P)} = 2(\text{AD} + \text{AB})$$

$$= 2(5\text{cm} + 7\text{cm}) = 24\text{cm}$$

Evaluation:

1. What is the formula of area and perimeter of parallelogram?
2. Find the area and perimeter of given parallelogram, if $\text{AB} = 8\text{cm}$, $\text{AC} = 4\text{cm}$ and height = 4cm

Homework:

Complete the question number of 1. D & K

Teaching Episode – 9

Topic: Pythagoras Theorem

Objectives: At the end of this class student will be able to:

- I. Define the concept of Pythagoras theorem
- II. Problem will be solved with the related to Pythagoras theorem

Instructional Material: Daily uses

Classroom Activities:

- I. At first, I will define the concept of Pythagoras

⇒ Square formed on the hypotenuse of a right angled triangle is equal in area to the sum of squares formed on other two sides.

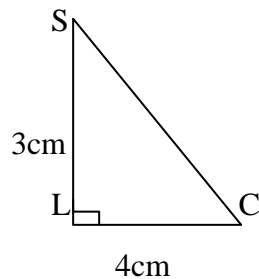
$$h^2 = P^2 + b^2$$

$$h = \sqrt{P^2 + b^2}$$

$$P = \sqrt{h^2 - b^2}$$

$$b = \sqrt{h^2 - P^2}$$

- II. Q. Find the length of unknown sides



⇒

Given length,

$$P = LS = 3\text{cm}$$

$$b = CL = 4\text{cm}$$

$$h = CS = ?$$

We know that,

$$h^2 = P^2 + b^2$$

$$\text{or, } (CS)^2 = (LS)^2 + (CL)^2$$

$$\text{or, } (CS)^2 = (3\text{cm})^2 + (4\text{cm})^2$$

or, CS = $\sqrt{25\text{cm}^2} = 5\text{cm}$ ans.

Evaluation:

- I. What do you mean by Pythagoras theorem?
- II. Calculate the length of diagonal of a rectangle having dimension $8\text{cm} \times 15\text{cm}$.

Homework: Complete the exercise 6.1

Teaching Episode – 10

Topic: Distance between two points

Objectives: At the end of this class student will be able to;

- I. Define the concept of distance between two points
- II. Problem will be solved with the related to distance between two points

Instructional Material: Daily uses

Classroom Activities:

- I. At first, I will define the concept of distance between two points

\Rightarrow The distance between two points $A(x_1, y_1)$ and $B(x_2, y_2)$ is given by the formula,

$$AB = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

\Rightarrow The distance of the given point $P(x, y)$ from the origin $O(0, 0)$ is given by

$$\begin{aligned} OP &= \sqrt{(x-0)^2 + (y-0)^2} \\ &= \sqrt{x^2 + y^2} \end{aligned}$$

- II. Q. Find the distance between the points $A(7, 13)$ and $B(10, 9)$.

\Rightarrow Here, The given points are $A(7, 13)$ & $B(10, 9)$

Then, $x_1 = 7, y_1 = 13, x_2 = 10, y_2 = 9$

Now, we know that the distance formula is;

$$\begin{aligned} AB &= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \\ &= \sqrt{9 + 16} \\ &= \sqrt{25} \end{aligned}$$

Therefore, $AB = 5$ units ans.

Evaluation:

- I. What is the formula of distance between two points?
- II. Find the distance between the points $P(-4, 7)$ & $Q(2, -5)$.

Homework:

Complete the exercise of 6.2

APPENDIX-B

CONSTRUCTIVIST APPROACH – 1

School: Shree Kankali higher secondary school

Time: 45minutes

Topic: Profit & Loss

Objectives:

- I. Define the concept of profit & loss
- II. Problem will be solved by the definition of profit & loss

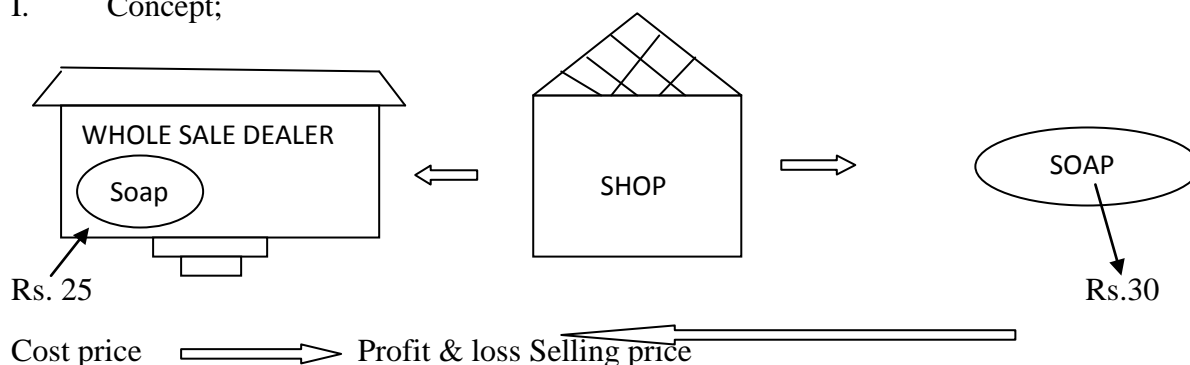
Introducing Task:

⇒ Ask some question with each students :

- What do you mean by profit, loss, C.P, S.P?
- Why are the people interested on business?
- What are the ways to calculate the profit? Do you have any idea?

Collaborative Activities:

I. Concept;



II.

- Divide the students in two groups, one group will be the business man and another group will be the customer.
- The customer group of the students deal with business group by buying different goods.
- The business groups of the students calculate profit & loss without using formula. i.e They will calculate the profit & loss in their own way.
- Help to derive the formula of profit & loss on the basis
- Tell them about profit & loss percentage are always calculated on C.P and connect it with initial value of percentage.
- Give the concept to find percentage. i.e: $\text{part value/whole value} \times 100\%$
- Then encourage them to find formula of P% & L%.

Evaluation Scheme:

Find the P% & L% from that business that you have recently done with the customer group.

Homework as a project work: Go to the market and study the business skill of any one shop and try to find his/her profit & loss of the transaction of one week.

Teaching Episode - 2

Topic: Discount

Objectives:

1. Define the concept of discount
2. Problem will be solved by the concept of discount

Introducing Task

- Ask them some terms which are used in this chapter like;
 - What is marked price?
 - What is discount?
- Encourage them to say some business experience done by them

Collaborative Activities

1. **Concept (Marked price):** The listed price or the printed price of an article is called the marked price (M.P).

Discount: The reduced price in the marked price is called the discount.

Percentage: $\text{part value/whole value} \times 100\%$

Note: The discount is always in marked price of any object.

e.g. the price of any book is Rs. 500 and discount is 10% then,

$$\begin{aligned}\text{Actual discount} &= 500 \times 10\% \\ &= 500 \times 10/100 \\ &= \text{Rs.}50\end{aligned}$$

2.

- Divide the students in two groups. One will be the business man and another will be the costumer
- The costumer group of the students deal with business group by buying different goods on the occasion of Dashain festival.
- The business groups of the students calculate profit and loss without using formula. i.e. They will calculate the profit & loss when discount is allow by their own way.
- Help to derive the formula of discount% on the basis of their result.

Evaluation Scheme

Find the Actual discount and discount % when business man allow 20% discount on marked price.

Homework as a project work

Go to the market and study the business skill of any shopping mall and try to find his/her profit and loss of the transaction of one month.

Teaching Episode –3

On the basis of peer collaboration

Simple Interest

Objectives:

- I. To derive the formula of simple interest.
- II. To solve the problems related to simple interest.

Introducing Task:

Ask some fact about money and discuss about banking system.

Fore.g1. Why do people deposit the money on bank?

2. Why does bank provide a lone for people?

Collaborative Activities:

- Divide the students in some groups in which each group having two students. Some group of students will be lender and some group of students will be borrower.
- Borrower teams take some money from opposite group.
- Tell them the concept about principal, interest, rate, time and amount
- Guide them to find the formula of simple interest by using unitary method.

1 yr's interest of Rs. 100 = R

1 yr's interest of Rs. 1 = R/100

T yr's interest of Rs. 1 = T×R/100

T yr's interest of Rs. 100= P×T×R/100



$$\mathbf{I = P \times T \times R / 100}$$

By using this formula they will find interest,,amount, rate, time etc.

Evaluation Scheme:

Find the interest and amount of the money that you have taken the money from your friend.

Homework as a project work:

Collect the banking rate of different banks (at least 2 banks are necessary) by the help of news paper, economic journals or from parents. And then find which bank is better for lender? and why?

Teaching Episode-4

Topic: Unitary Method

Objectives:

1. Define the unitary method, direct variation and indirect variation
2. Problem will be solved with related to direct method & indirect method.

Introducing Task:

- Ask them some terms which are used in this chapter;
 - What is the unitary method?
 - What is the direct & indirect method?

Exploration activities:

Unitary method: The rule of computing the value of one unit of an object, work, amount etc. on the basis of given values of a sum of above things & vice versa is the unitary method.

Direct Variation	Indirect Variation																														
<p>Two quantities are said to be in direct proportion, if one quantity of one kind increases or decreases in the same ratio as the other quantity of another kind related to the first quantity increases or decreases.</p> <p>e.g. If 40 apples cost Rs. 200, what is the price of 100 apples?</p> <p>⇒ Here, let required price = Rs. x</p> <table style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <tr> <td style="border: none; text-align: center;">↑</td> <td style="border: 1px solid black; padding: 5px;">apples</td> <td style="border: none;"></td> <td style="border: 1px solid black; padding: 5px;">Price</td> <td style="border: none; text-align: center;">↑</td> </tr> <tr> <td style="border: none;"></td> <td style="border: 1px solid black; padding: 5px;">40</td> <td style="border: none;"></td> <td style="border: 1px solid black; padding: 5px;">Rs.200</td> <td style="border: none;"></td> </tr> <tr> <td style="border: none;"></td> <td style="border: 1px solid black; padding: 5px;">100</td> <td style="border: none;"></td> <td style="border: 1px solid black; padding: 5px;">Rs. X</td> <td style="border: none;"></td> </tr> </table> <p>The price of 100 apples is always more than the price of 40 apples. So, given relation is direct variation Therefore, Ratio of price= Ratio of number of apples i.e. $40/100 = 200/x$</p> <p>or, $x = 20000/40$ or, $x = 500$ Hence, The price of 100 apples is Rs, 500.</p> <p>Method;</p> <ul style="list-style-type: none"> • Suppose the required no. be x. • Tabulate the given information in the 	↑	apples		Price	↑		40		Rs.200			100		Rs. X		<p>When one quantity goes up (increases) then another quantity goes down (decreases) and vice versa. Such type of variation is called indirect variation.</p> <p>e.g. If 30 men can do a piece of work in 20 days, in how many days 45 men can do the same work?</p> <p>⇒ Here, let required time= x days</p> <table style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <tr> <td style="border: none; text-align: center;">↑</td> <td style="border: 1px solid black; padding: 5px;">Men</td> <td style="border: none;"></td> <td style="border: 1px solid black; padding: 5px;">Time</td> <td style="border: none; text-align: center;">↓</td> </tr> <tr> <td style="border: none;"></td> <td style="border: 1px solid black; padding: 5px;">30</td> <td style="border: none;"></td> <td style="border: 1px solid black; padding: 5px;">20</td> <td style="border: none;"></td> </tr> <tr> <td style="border: none;"></td> <td style="border: 1px solid black; padding: 5px;">45</td> <td style="border: none;"></td> <td style="border: 1px solid black; padding: 5px;">x</td> <td style="border: none;"></td> </tr> </table> <p>This is indirect variation Therefore, $30/45 = x/20$ Or, $45x = 30 \times 20$ So, $x = 40/3$ days.</p> <p>Method;</p> <ul style="list-style-type: none"> • Suppose the required number be x. • Tabulate the given information in the question respectively. • Use the sign (=) between the quantities and reverse one quantity and write another quantity as it is. 	↑	Men		Time	↓		30		20			45		x	
↑	apples		Price	↑																											
	40		Rs.200																												
	100		Rs. X																												
↑	Men		Time	↓																											
	30		20																												
	45		x																												

<p>question respectively.</p> <ul style="list-style-type: none"> • Use the sign ($=$) between the quantities and construct the equation. • Find the value of x. 	<ul style="list-style-type: none"> • Find the value of x.
---	---

Evaluation Scheme:

- If the price of 12 oranges is Rs. 36, what is the price of 3 dozen oranges?

Homework as a project work:

Complete the exercise 17.1

Teaching Episode- 5

Unit: Menstruation

Topic: triangle

Objectives: Students will be able to:

- To identify the area of triangle.
- To identify the perimeter of the triangle.

Introduction:

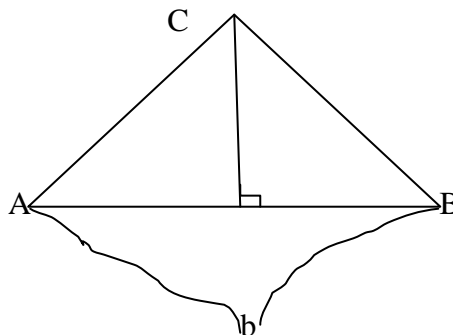
First of all teacher make ready about the topics by asking some question

- Do you know about area of the triangle?
- What is the idea of getting area of all types of triangles?
- Do you know about types of triangle?
- Do you know about the perimeter of the triangle?

By such question and discussion students will be ready to learn and they will be interested for learning more.

Exploration:

Problem I: what is the area of triangle in given figure?



- Motivate the students to share the idea.

- Help them to manage the finding process.
- Say if $h=6$ and $b=5$ then what is the area of this triangle.

Ask about the idea and try to find the result them self and after doing students then solve the teacher himself in the blackboard.

Given, $h=6\text{cm}$ & $b=5\text{cm}$ then

Area of triangle = $\frac{1}{2}$ (base \times height)

Or, $A = \frac{1}{2} (5 \times 6)$

Or, $A = 15\text{cm}^2$

By this process student provide the cleared concept for area of triangle.

Problem II. If triangle ABC has the side $AB=4\text{cm}$, $BC=5\text{cm}$, $CA=6\text{cm}$ then what is the perimeter of the triangle?

First student will be encourage to find the perimeter them self.

- Discuss the answer between students.
- Then after teacher solved the problem as follows;

Given sides are, $AB=4\text{cm}$ $BC=5\text{cm}$ $CA=6\text{cm}$

Then perimeter of the triangle is = $AB+BC+CA$

$P = 4\text{cm}+5\text{cm}+6\text{cm}$

$P=15\text{cm}$

For all the activities on this area and perimeter of the triangle are done as above.

Reflection:

Area of the triangle with given height is find by using the formula

$$= \frac{1}{2} b \times h$$

Area of all triangle with given all side is find by the formula = $\sqrt{s(s-a)(s-b)(s-c)}$

Perimeter of the triangle is found by the sum of the sides of the triangle.

Teaching Episode – 6

Topic: area and perimeter of rectangle

Objectives: Students will be able to;

- To find the area of rectangle.
- To find the perimeter of the rectangle.

Introduction:

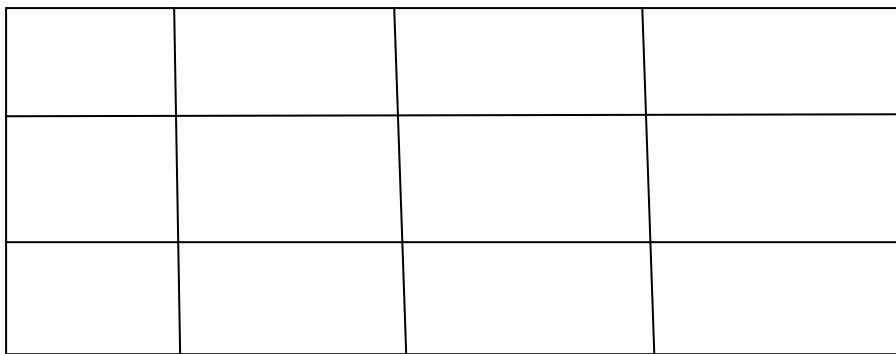
- Ask about the rectangle and discuss about the finding area of the rectangle.



- Ask how we find the area of rectangle?
- Do you know about the perimeter of the rectangle?

Exploration:

- First provide the idea of generalized process of area of rectangle.



- For this we can say that the area is equal to the number of the box
- So for this student encourage the count of this entire box.
- And say the total number of box equalled to the area of this figure.
- Also say the count all the box in outside.
- In this way generalized the formula of the area of the rectangle as follows

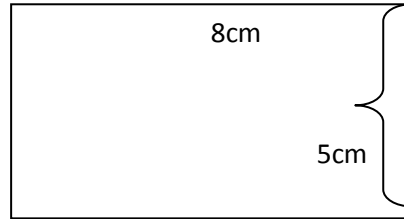
No. of box in length side = 4cm

No. of box in breadth = 3cm

Then the area of rectangle = $l \times b$
= 4×3
= 12cm^2 (which is equal to the number of box in figure)

The perimeter of the rectangle is = $2(l+b)$
= $2(4+3)$
= 14 (which is equal to the side's box)

More discuss about this process and encourage the student to find the area and perimeter. Problem (I) find the area and perimeter of the rectangle given below by the above process.



To solve this problems make student self activate to find the result and finally teacher himself calculates the result.

Reflection;

For all the activities in rectangle to find the area and perimeter we use the following formula.

- Area of rectangle = $l \times b$
- Perimeter of the rectangle = $2(l + b)$

Teaching Episode – 7

Topic: area and perimeter of square

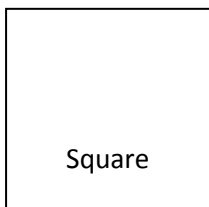
Objectives: Student will be able to:

- To find the area of square
- To find the perimeter of the square

Introduction:

Square are the type of rectangle. We find the area and perimeter of this rectangle by different method.

- First ask the question what is the square and rectangle and prepare them for their shape and discuss about their area and perimeter.
- Draw the figure in board for remaining the shape ;



- Ask the question how we find the area perimeter of this figure?

Exploration:

- First of all discuss about the side of the square and memorized the formula of rectangle.
- Ask student what is the formula for finding the area of rectangle
Then write the formula of rectangle to find area = $l \times b$
- And say L and B are equal in square. Since all the sides of square are equal.
So, we can write $B = L$ then we write $l \times l = l^2$
- Also for the perimeter of the square first discuss about the perimeter of any figure.
- Perimeter is the sum of all the sides.
- So square has four sides with equal length then we can write $p = 4l$
- From the above process we decide the formula then we find the area and perimeter of the square by use this formula.

For exercise, if square has length 5cm then how many area and perimeter covered it?

For finding the value of this problem encourage the student to solve them selves and finally teacher solves the problem and provides the accurate concept of the area and perimeter of the figure.

Reflection:

For finding the area and perimeter of square and parallelogram we can use the following formula.

- To find the area of square $A = l^2$
- Formula for perimeter of the square $P = 4l$

Teaching Episode – 8

Topic: area and perimeter of parallelogram

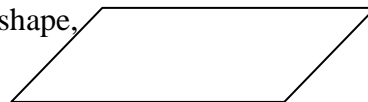
Objectives: Student will be able to:

- To find the area of parallelogram
- To find the perimeter of the parallelogram

Introduction:

Parallelogram are the type of rectangle. We find the area and perimeter of this rectangle by different method.

- First ask the question what is parallelogram and prepare them for their shape and discuss about their area and perimeter.
- Draw the figure in board for remaining the shape,



- Ask the question how we find the area and perimeter of this figure?

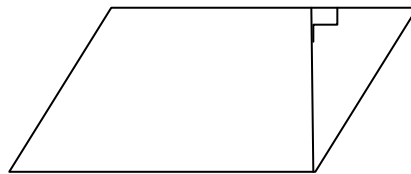
Exploration:

- First of all Discuss about the parallelogram.
- Present the figure as below



- Discuss about the sides.
- Then area of the parallelogram can be written as $A = b \times h$
- And also we can write the perimeter of the parallelogram $p = 2$ (sum of the adjacent sides)
- For further activity we can use this formula to find the area perimeter.

For exercise, find the area and perimeter of the following figure?



- For finding the value of this problem encourage the student to solve them selves and finally teacher solves the problem and provides the accurate concept of the area and perimeter of the figure.

Reflection:

For finding the area and perimeter of parallelogram we can use the following formula.

- Area of parallelogram $A = b \times h$
- Perimeter of the parallelogram $P = 2(\text{sum of the adjacent side})$

Teaching Episode- 9

Topic: Pythagoras Theorem

Objectives:

1. Define the concept of Pythagoras theorem
2. Problem will be solved with the related to Pythagoras theorem

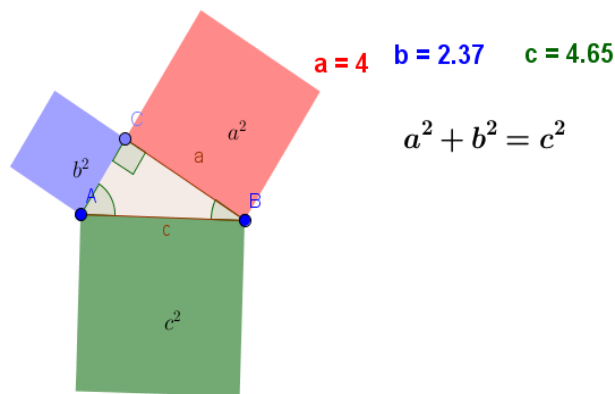
Introducing Task:

- Ask them some terms which are used in this chapter like, perpendicular, base and hypotenuse by showing right angle triangle
- Encourage them to draw the figure of right angle triangle

Collaborative activities:

- I will show the theorem of Pythagoras by visualize with the help of Geo-Zebra application. i.e.

The theorem of Pythagoras



Construction Steps

1. Create segment a with endpoint AB.
2. Create semicircle c through points A and B.
3. Create a new point C on the semicircle.
4. Hide the segment and the semicircle.
5. Construct a triangle ABC in counterclockwise direction.
6. Rename the triangle sides to a, b, c.
7. Create interior angles of triangle ABC.
8. Create a perpendicular line d to segment BC through point C.
9. Create a perpendicular line e to segment BC through point B.
10. Create a circle f with centre C through point B.
11. Intersect the circle f and the perpendicular line d to get intersection point D.
12. Create a parallel line g to segment BC through point D.
13. Create intersection point E of lines e and g.
14. Create the square CBED.
15. Hide the auxiliary lines and circle.
16. Repeat steps 8 to 15 for side Ac of the triangle.
17. Repeat steps 8 to 15 for side AB of the triangle.
18. Create the midpoints of all three squares.
19. Insert static text1: a^2 and attach it to the midpoint of the corresponding square.
20. Insert text2: b^2 and attach it to the midpoint of the corresponding square.

21. Insert text c^2 and attach it to the midpoint of the corresponding square.
22. Hide the midpoint of the squares.
23. Format the text to match the colour of the corresponding squares.

$$h^2 = p^2 + b^2$$

Evaluation Scheme:

Find the length of a diagonal of a rectangle having length 12 cm and breadth 9cm.

Homework as a project work:

Complete the exercise of 6.1.

Teaching Episode- 10

Topic: Mean

Objectives:

1. To find the mean.
2. To compare the mean between any two individual data.

Introducing Task:

- Discuss about average value, mid value, midpoint of any line etc.
- Use a scale of length 30cm and let them find the midpoint of the scale.
- Guide them to find the average value i.e.
Sum of all items/ Total number of items

Exploration Activities:

- Teacher will give some task to each students
i.e.
 - Collect the height of all students of this class.
 - Collect the weight of all students of the class.
 - Collect the marks of mathematics that you had got on first and second term exam
- Find the average height, weight and marks
- Compare between the marks of first term and second term exam of mathematics.
- And ask some question
 - Which term exam has the more average score?
 - Which question paper was easy? Etc.
- Teacher will write the sign \sum and \bar{X} on white board and discuss about it.
- Finally, write the formula
$$\bar{X} = \frac{\sum(X)}{N}$$

Homework as a project work:

Find out the average height and weight of the students of your class.

APPENDIX-C

Post-Test

Subject: Compulsory math

F.M: 60

Class: VIII

Time: 1 hrs

Group: A

10×1=10

Tick(✓) the best answer. Attempt all the question

- 1) If the marked price of a bag is Rs. 750 and 8% discount allowed, then the actual price is
 - a) Rs. 550
 - b) Rs. 600
 - c) Rs. 640
 - d) Rs. 690
- 2) When one quantity goes up (increases) then another quantity goes down (decreases) and vice versa. Such type of variation is called
 - a) Direct variation
 - b) Indirect Variation
 - c) Both (a) & (b)
 - d) None of them
- 3) What is the total selling price of a shirt whose marked price is Rs. 3000 when 13% vat is lived
 - a) Rs. 3390
 - b) Rs. 3051
 - c) Rs. 3500
 - d) Rs. 2700
- 4) Area of parallelogram is
 - a) $A = l^2$
 - b) $A = b \times h$
 - c) $A = l \times b$
 - d) $p = 3a$
- 5) Formula of Pythagoras theorem is
 - a) $h^2 = p^2 + b^2$
 - b) $p^2 = h^2 + b^2$
 - c) $b^2 = h^2 + p^2$
 - d) All of above
- 6) After buying a one got at Rs. 1450 and sold them at Rs. 1740, then the profit percent is
 - a) 22%
 - b) 20%
 - c) 24%
 - d) None of them
- 7) Two quantities, if one quantity of one kind increases or decreases in the same ratio as the other quantity of another kind related to the first quantity increases or decreases is called
 - a) Indirect Variation
 - b) Direct Variation

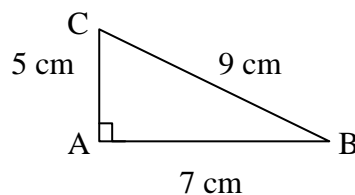
- c) Both (a) & (b) d) None of them
- 8) If the price of 12 oranges is Rs. 36, what is the price of 3 dozen oranges?
 a) Rs. 9 b) Rs. 432
 c) Rs. 100 d) Rs. 108
- 9) The reduced price in the marked price is called
 a) Discount b) vat
 b) Both (a) & (b) d) None of them
- 10) If cost price of any watch is Rs. 500 and profit % = 5% , then the selling price is
 a) Rs. 500 b) Rs. 475
 c) Rs. 525 d) Rs. 550

Group: B

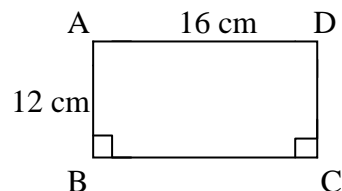
10×5=50

Attempt all the questions

- 1) An article bought for Rs. 500 is sold at a loss of 15% , What is the selling price?
- 2) A mobile set marked Rs. 20,000 is sold at a discount of 25% and still is there is a profit of Rs. 1000. Find the cost price of that mobile set.
- 3) If 25 copies cost Rs. 750, what is the cost of 20 copies ?
- 4) If 30 men can complete a work in 40 days , then in how many days , 15 men will complete it?
- 5) In how many years will Rs. 1200 at the rate of 15% interest amount to Rs. 1740?
- 6) In what time will Rs. 24000 amount to Rs. 30000 at the rate of 10%?
- 7) Find the area and perimeter of the given $\triangle ABC$.



- 8) The perimeter of a square is 40 cm. Find the area of the square.
- 9) Find the length of diagonal AC from the given rectangle.



- 10) Find the distance between the points P(- 4, 7) and Q(2, - 5).

**** Best Of Luck ****

APPENDIX-D

Interview Schedule

The interview with students will take in the following questions:-

➤ What do you think about mathematics subject?

➔ 1) Define:

.....
.....

➔ 2) Reason:

.....
.....

➤ Did you interact with your teacher and peer collaboration in mathematics classroom?

➔

➤ Is there any differences between student center and teacher center method? If

Yes/No, then why?

➔

➤ Do you like group work in mathematics classroom?

➔

➤ Is there topic; profit & loss and simple interest are uses in daily life? How.

➔

Observation Sheet

1. Do you like arithmetic subject?

Ans.....

2. Do you think arithmetic problems are easier rather than the problems of other mathematics?

Ans.....

3. Are you satisfied your mathematics teacher behaviour?

Ans.....

4. Did you express your feeling, confusion, problems about subject matter freely with your teacher?

Ans.....

5. Is your mathematics teacher teaching as your interest?

Ans.....

6. Which of the method class teacher teach you?

Ans.....

7. What do you think about researcher teaching style?

Ans.....

8. Is researcher teaching as your interest?

Ans.....

9. What are the difference between researcher teaching method and your mathematics class teacher?

Ans.....

10. Do you believe that the concept of arithmetic can be learned by discussing/ collaborative with friends?

Ans.....

APPENDIX-E

Shree kankali higher secondary school

Simraungadh, Bara

Pre-test Mark

S.N	Student's Name	Obj.	Sbj.	Total (X)	$x = X - 20.03$	x^2
1	Bikram Sah	8	27	35	14.97	224.10
2	Rahul Kumar jaiswal	5	22	27	6.97	48.58
3	AvinayKushwaha	6	15	21	0.97	0.94
4	Raushan Kumar Kushwaha	6	10	16	-4.03	16.24
5	PawanKushwaha	4	11	15	-5.03	25.30
6	Jitendra Pd. Kushwaha	6	12	18	-2.03	4.12
7	ShyamSundar Kumar	8	20	28	7.97	63.52
8	SurajMahto	7	11	18	-2.03	4.12
9	SudipKushwaha	8	19	27	6.97	48.58
10	SabitaKumari Das	5	16	21	0.97	0.94
11	PriyaPandit	4	22	26	5.97	35.64
12	Krishna Kumar Mukhiya	6	13	19	-1.03	1.06
13	Alamgir Ansari	5	12	17	-3.03	9.18
14	Sargam Ansari	8	14	22	1.97	3.88
15	RenuKushwaha	3	6	9	-11.03	121.66
16	Santosh Kumar sah	7	8	15	-5.03	25.30
17	Sahil Ansari	3	16	19	-1.03	1.06
18	Sarika Sinha	5	9	14	-6.03	36.36
19	Anwari Khatun	4	16	20	-0.03	0.0009
20	ChandanKushwaha	7	15	22	1.97	3.88
21	Irshad Ansari	6	10	16	-4.03	16.24
22	Sandeep Kumar Yadav	3	7	10	-10.03	100.60
23	Anjali Kushwaha	6	8	14	-6.03	36.36
24	KajalKumari Patel	5	10	15	-5.03	25.30
25	GoldiKushwaha	6	18	24	3.97	15.76
26	Bibekanand Kumar Prajapati	8	15	23	2.97	8.82
27	AnupmaKushwaha	7	10	17	-3.03	9.18
28	Nitesh Kumar Baitha	7	15	22	1.97	3.88
29	Niranjan Kumar	5	18	23	2.97	8.82
30	Barun Kumar Mahto	5	15	20	-0.03	0.0009
31	Aachal Yadav	9	23	32	11.97	143.28
32	Rani Kumari Jaiswal	5	11	16	-4.03	16.24
				$\sum X = 641$		$\sum X^2 = 1058.94$

Total Number of students (N) = 32

Total Obtained Marks $\sum X = 641$

Mean = $\sum X / N = 641 / 32 = 20.03$

Standard deviation (S.D or σ) = $\sqrt{\sum x^2 / N} = \sqrt{1058.94 / 32} = \sqrt{33.09} = 5.75$

Variance (σ^2) = 33.09

Shree Janta Secondary School

Kachorwa, Bara (Nepal)

Pre -Test Mark

S.N	Student's Name	Obj.	Sbj.	Total(X)	$x = X - 19.26$	x^2
1	Ujwal Gupta	6	29	35	15.74	247.74
2	Nisha Gupta	6	25	31	11.74	137.82
3	Manisha Khatun	4	18	22	2.74	7.50
4	Rabita Kumari	5	11	16	-3.26	10.62
5	Muskan Yadav	4	9	13	-6.26	39.18
6	Bijnandan Yadav	6	23	29	9.74	94.86
7	Sanjay Kumar Yadav	7	30	37	17.74	314.70
8	Aakriti Gupta	3	13	16	-3.26	10.62
9	Khushi Jaiswal	2	8	10	-9.26	85.74
10	Priti Jaiswal	6	10	16	-3.26	10.62
11	Salman Khan	3	15	18	-1.26	1.58
12	Ankush Kumar Jaiswal	4	18	22	2.74	7.50
13	Faizal Khan	4	20	24	4.74	22.46
14	Srijana Yadav	8	15	23	3.74	13.98
15	Rina Kumari	5	20	25	5.74	32.94
16	Priti Kumari Yadav	7	12	19	-0.26	0.06
17	Roshani Begma Khatun	7	20	27	7.74	59.90
18	Anu Kumari Sharma	4	12	16	-3.26	10.62
19	Komal Yadav	3	14	17	-2.26	5.10
20	Suman Yadav	5	18	23	3.74	13.98
21	Rabana Khatun	5	12	17	-2.26	5.10
22	Sabana Khatun	3	6	9	-10.26	105.26
23	Menka Yadav	6	12	18	-1.26	1.58
24	Ajay Kumar Yadav	5	10	15	-4.26	18.14
25	Raju Kumar Sah	4	12	16	-3.26	10.62
26	Dipendra Kumar Prajapati	4	15	19	-0.26	0.06
27	Priyanka Yadav	3	7	10	-9.26	85.74
28	Babita Yadav	3	8	11	-8.26	68.22
29	Aanjali Yadav	6	3	9	-10.26	105.26
30	Khusmita Kumari Gupta	3	12	15	-4.26	18.14
				$\sum X = 578$		$\sum x^2 = 1545.64$

Total Number of Student's = 30

Total Obtained Marks ($\sum X$) = 578

Mean = $\sum X / N = 578 / 30 = 19.26$

Standard deviation (S.D or σ) = $\sqrt{\sum x^2 / N} = \sqrt{1545.64 / 30} = \sqrt{51.52} = 7.17$

Variance (σ^2) = 51.52

Z-test of pre-test (for group homogeneity)

Steps- 1: Null Hypothesis

There is no significance difference between means of first group and second group ($\mu_0 = \mu_1$).

Steps-2: Level of significance: $\alpha = 0.05$

Steps-3: Critical region: $Z_{0.05} = 1.645$

Steps-4: Computation:

Given, Mean of (X_1) = 20.03, Mean of (X_2) = 19.26

Standard deviation (S_1) = 5.75, Standard deviation (S_2) = 7.17

Total Students (N_1) = 32, Total Students (N_2) = 30

$Z = \text{Mean of}(X_1) - \text{Mean of}(X_2) / \sqrt{S_1^2/N_1 + S_2^2/N_2}$

$$= 20.03 - 19.26 / \sqrt{33.06/32 + 51.40/30}$$

$$= 0.46$$

Steps-5: Conclusion

Since, calculated value of Z is less than tabulated value,

Then, Null hypothesis is accepted.

APPENDIX-F

Shree kankali higher secondary school

Simraungadh, Bara

Post-test Mark

S.N	Student's Name	Obj.	Sbj.	Total (X)	$x = X-29.43$	x^2
1	Bikram Sah	9	50	59	29.57	874.38
2	Rahul Kumar jaiswal	7	45	52	22.57	509.40
3	AvinayKushwaha	8	38	46	16.57	274.56
4	Raushan Kumar Kushwaha	9	27	36	6.57	43.16
5	PawanKushwaha	9	25	34	4.57	20.88
6	Jitendra Pd. Kushwaha	6	18	24	-5.43	29.48
7	ShyamSundar Kumar	8	45	53	23.57	555.54
8	SurajMahto	9	35	44	14.57	212.28
9	SudipKushwaha	8	25	33	3.57	12.74
10	SabitaKumari Das	8	30	38	8.57	73.44
11	PriyaPandit	9	34	43	13.57	184.14
12	Krishna Kumar Mukhiya	8	16	24	-5.43	29.48
13	Alamgir Ansari	9	12	21	-8.43	71.06
14	Sargam Ansari	8	12	20	-9.43	88.93
15	RenuKushwaha	6	15	21	-8.43	71.06
16	Santosh Kumar sah	7	16	23	-6.43	41.34
17	Sahil Ansari	8	16	24	-5.43	29.48
18	Sarika Sinha	6	15	21	-8.43	71.06
19	Anwari Khatun	4	10	14	-15.43	238.08
20	ChandanKushwaha	9	42	51	21.57	465.26
21	Irshad Ansari	8	17	25	-4.43	19.62
22	Sandeep Kumar Yadav	8	14	22	-7.43	55.20
23	Anjali Kushwaha	7	10	17	-12.43	154.50
24	KajalKumari Patel	8	10	18	-11.43	130.64
25	GoldiKushwaha	7	15	22	-7.43	55.20
26	Bibekanand Kumar Prajapati	8	20	28	-1.43	2.04
27	AnupmaKushwaha	7	33	40	10.57	111.72
28	Nitesh Kumar Baitha	6	15	21	-8.43	71.06
29	Niranjan Kumar	4	14	18	-11.43	130.64
30	Barun Kumar Mahto	5	14	19	-10.43	108.78
31	Aachal Yadav	6	10	16	-13.43	180.36
32	Rani Kumari Jaiswal	5	10	15	-14.43	208.22
				$\sum X = 942$		$\sum X^2 = 4963.74$

Total Number of students (N) = 32

Total Obtained Marks $\sum X = 942$

Mean = $\sum X/N = 942/32 = 29.43$

Standard deviation (S.D or σ) = $\sqrt{\sum x^2/N} = \sqrt{4963.74 / 32} = \sqrt{155.11} = 12.45$

Variance (σ^2) = 155.11

Shree Janta Secondary School

Kachorwa, Bara (Nepal)

Post-Test Mark

S.N	Student's Name	Obj.	Sbj.	Total(X)	$x = X - 22.36$	x^2
1	Ujwal Gupta	8	36	44	21.64	468.28
2	Nisha Gupta	6	30	36	13.64	186.04
3	Manisha Khatun	6	30	36	13.64	186.04
4	Rabita Kumari	4	15	19	-3.36	11.28
5	Muskan Yadav	8	20	28	5.64	31.80
6	Bijnandan Yadav	8	35	43	20.64	426.01
7	Sanjay Kumar Yadav	9	38	47	24.64	607.12
8	Aakriti Gupta	7	20	27	4.64	21.52
9	Khushi Jaiswal	4	12	16	-6.36	40.44
10	Priti Jaiswal	3	5	8	-14.36	206.20
11	Salman Khan	4	5	9	-13.36	178.48
12	Ankush Kumar Jaiswal	8	31	39	16.64	276.88
13	Faizal Khan	5	18	23	0.64	0.41
14	Srijana Yadav	8	25	33	10.64	113.21
15	Rina Kumari	3	10	13	-9.36	87.61
16	Priti Kumari Yadav	4	11	15	-7.36	54.17
17	Roshani Begma Khatun	3	6	9	-13.36	178.49
18	Anu Kumari Sharma	7	6	13	-9.36	87.61
19	Komal Yadav	4	4	8	-14.36	206.21
20	Suman Yadav	6	5	11	-11.36	129.05
21	Rabana Khatun	7	16	23	0.64	0.41
22	Sabana Khatun	5	16	21	-1.36	1.85
23	Menka Yadav	4	4	8	-14.36	206.21
24	Ajay Kumar Yadav	7	-	7	-15.36	235.93
25	Raju Kumar Sah	8	35	43	20.64	426.01
26	Dipendra Kumar Prajapati	8	33	41	18.64	347.45
27	Priyanka Yadav	6	5	11	-11.36	129.05
28	Babita Yadav	5	3	8	-14.36	206.21
29	Aanjali Yadav	4	1	5	-17.36	301.37
30	Khusmita Kumari Gupta	7	20	27	4.64	21.53
				$\sum X = 671$		$\sum x^2 = 5372.87$

Total Number of Student's = 30

Total Obtained Marks ($\sum X$) = 671

Mean = $\sum X / N = 671 / 30 = 22.36$

Standard deviation (S.D or σ) = $\sqrt{\sum x^2 / N} = \sqrt{5372.87 / 30} = \sqrt{179.09} = 13.38$

Variance (σ^2) = 179.09

Z-test of the post test

Steps-1: Null hypothesis and Alternative hypothesis:

$$H_0: \mu_1 = \mu_2$$

$$H_1: \mu_1 \neq \mu_2$$

Steps-2: Level of significance: $\alpha=0.05$

Steps-3: Critical region: $Z_{0.05} = 1.645$

Steps-4: Computation:

Given, Mean of $(X_1) = 29.43$, Mean of $(X_2) = 22.36$

Standard deviation $(S_1) = 12.45$, Standard deviation $(S_2) = 13.38$

Total students $(N_1) = 32$, Total students $(N_2) = 30$. Now,

$$Z = \frac{\text{Mean of } (X_1) - \text{Mean of } (X_2)}{\sqrt{S_1^2/N_1 + S_2^2/N_2}}$$

$$= \frac{29.43 - 22.36}{\sqrt{155.11/32 + 179.09/30}}$$

$$= 2.15$$

Steps-5: Decision:

Since, calculated value of Z is greater than tabulated value.

Then, Null hypothesis is rejected.

APPENDIX-G "Item Analysis"

	Upper 27%						Average 46%														Lower 27%					
students	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	
items																										
1	1	1	1	1	1	1	1	1	0	0	1	0	0	0	1	1	1	0	0	0	0	1	0	0	1	
2	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0
3	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	1
4	1	1	1	0	0	0	0	1	1	1	0	1	1	1	1	1	0	0	1	1	1	0	1	0	0	0
5	1	0	1	0	0	0	1	0	1	1	1	1	1	0	0	0	0	1	0	1	0	1	0	1	0	0
6	1	1	1	1	1	1	0	0	1	0	1	1	0	0	1	0	0	1	0	0	0	1	0	0	0	0
7	1	1	1	0	0	1	1	0	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	0
8	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	0
9	1	1	1	1	1	1	0	1	1	1	0	1	1	1	1	1	1	1	0	1	1	0	0	1	0	0
10	1	1	1	1	1	1	1	0	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	0	0	0
11	1	1	1	1	1	1	1	1	0	1	1	0	1	0	1	1	0	0	1	0	1	0	0	1	0	0
12	1	1	1	1	1	1	1	0	1	1	1	0	0	1	1	1	1	0	0	0	0	0	0	1	0	0
13	1	1	1	1	1	0	1	1	1	1	1	0	1	0	0	1	0	1	1	0	0	0	0	1	1	1
14	1	1	1	0	0	1	1	1	1	0	0	1	0	1	0	0	1	0	0	1	1	0	0	1	0	0
15	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
16	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1
17	1	1	0	1	1	0	0	0	0	1	0	0	1	0	0	0	1	0	0	1	0	0	0	0	0	0
18	0	1	1	1	1	1	1	1	1	0	1	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
19	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	1
20	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	18	17	16	13	13	13	12	12	12	12	11	11	11	8	10	10	10	10	10	9	9	8	7	6	5	

Items	Right answer	P%	D	Remarks
1	14	56	0.66	
2	9	36	0.66	
3	18	72	0.83	
4	15	60	0	
5	12	48	-0.16	
6	12	48	0.83	
7	19	76	-0.16	
8	22	88	0.16	
9	19	76	0.5	
10	20	80	0.5	
11	16	64	0.66	
12	15	60	0.83	
13	17	68	0.33	
14	13	52	0.16	
15	2	8	0.16	
16	22	88	0.16	
17	8	32	0.5	
18	14	56	0.83	
19	4	16	0	
20	2	8	0.16	