# Comparative study of models of teaching on achievement of 8th standard students

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**Submitted By**

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**Under the Guidance of**

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**November-2017**

# DECLARATION

I hereby declare that the thesis entitled '**Comparative Study of Models of Teaching on Achievement of 8th Standard Students'** completed and written by me, has not previously been formed as the basis for the award of any Degree or other similar title upon me of this or any other Vidyapeeth or examining body.

**Place : Pune**

**Date : | | 2017** **Mrs. Aarti Prashant Gangurde**

# CERTIFICATE

This is to certify that the thesis "**Comparative Study of Models of Teaching on Achievement of 8th Standard Students**" which is being submitted herewith for the award of Degree of Vidyavachaspati (Ph.D.) in Education of Tilak Maharashtra Vidyapeeth, Pune is the result of original research work completed by **Mrs. Aarti Prashant Gangurde** under my supervision and guidance. To the best of my knowledge and belief the work incorporated in this thesis has not formed the basis for the award of any Degree or similar title of this or any other University or examining body upon her.

**Place : Pune**

**Date : / / 20**

**Dr. Dattatreya Tapkeer**
**Research Guide**

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# CHAPTER - I

## INTRODUCTION

### 1.1 Introduction:

Today's age is the age of Science and technology. Science and technology makes the world, it changes the world. Now a days nothing is permanent, in every field we observe change. Because of technologies the changes are taking place rapidly. We face many changes in family and perhaps in children themselves, because technology has changed learner's characteristics. Sensory overload from constant media shower is one possible cause. Government authorities as well as business and industry have become more productive and are demanding changes in schools.

For dealing with new changes, we need to improve the fundamental technology which is 'teaching'. The interaction between the teachers and students are the most important part of Education. A teacher does make a significant difference in what a student learns. The old method of teaching may not work effectively with today's kids; therefore, we must modify our teaching to accommodate the ways they learn.

Few activities dominate the classroom teaching and learning .These activities are lecture method, recitation, writing in the note book etc. which leaves no time for other methods and modes of teaching. If we take a look at Dr. Blooms' Taxonomy of Cognitive Domain, these activities show that we are teaching for the lowest two levels i.e. knowledge and comprehension. Therefore the new millennium teachers need to have exact and sound teaching strategies that will help to brain out learning outcomes in all levels of Cognitive, Affective and Psychomotor domain. Bruce Joyce and Marsha Weil (1996:11) in their book 'Models of Teaching' explained about various models that can help the teacher to bring out the best learning outcomes in the students. These needs to be used by every teacher specially Science teachers, since "Science' is ruling the present world and has established its supremacy in every field. (Bhatia and Bhatia 2000:390)

In recent years Science educators have been working on reforming Science teaching. This reformation has been based on a vision of teaching and learning. Science in which all students have a greater opportunity to be scientifically literate

(Ebenezer and Connor 1998:28). In India there has been a movement in the past decade to upgrade and restructure the teaching of Science in public schools. Reformation of Science teaching is very important for the students to learn Science better in this scientific world.

This reformation should help the Science teachers to know many teaching strategies, models and methods so that they can be used effectively in the classroom. The models which can be used to teach Science are Concept Attainment Model, Advance Organizer Model, Inductive Thinking Model, Inquiry Training Model etc. All these are from the Information Processing family of Models. These help the students to think and process information. Therefore the researcher used these models to teach Science subject to 8$^{th}$ standard students in Pune city.

## 1.2 Existing Situation of Science Teaching In School:

It is found that four activities which are dominant in classroom teaching and learning are lecture method, recitation, writing in the note book and filling the note book. The researcher had surveyed and observed various teaching strategies used by Science teachers and also discussed with various experienced Science teachers and Science educators about the existing situation in teaching and learning of Science in schools. The following methods are mainly used by Science teachers to teach Science subject.

### 1.2.1 Lecture Method:

This is very common and is practically the only method that is used in our schools. When used in secondary schools it usually means an informal talk. This may be supported with questioning and illustrated by means of demonstration. If the teacher is stimulating and use attractive description, the lecture becomes a great value.

On the other hand the teacher who uses difficult language is proper to find the class far away at the end of the talk. This method is used when a certain amount of work is necessary. The teachers come to the class with text book and begin to talk till the period is over. This may be accompanied with practical demonstration or may not be.

- **Advantages:**

  1. It is very easy for the teacher to prepare and talk.
  2. The number of student does not matter. Only space and audible voice is required.
  3. It is useful for highly intellectual people, who know the subject and can take notes.
  4. This is fast method. The teacher divides the syllabus into subheads and proceeds on systematically with it.

- **Disadvantages:**

  1. A good lecturer or teacher is very difficult to find. He or she should be an presenter and well-read with subject matter.
  2. The pupil may leave out certain portion of a lecture unless some very definite stress is laid upon it.
  3. The working over the notes is left out till just before the examination. The lecture itself is not of primary value.
  4. Organization of material is generally incomplete and this leaves the pupil amaze for deeper understanding
  5. The amount of knowledge acquired by the pupil under this system is inadequate.
  6. In a school this method is a poor way of imparting knowledge. The teacher works not with individual but with a mob and is not interested, so he or she is doing harm to the subject instead of good.

### 1.2.2 Demonstration Method:

In Demonstration method both the classroom work and laboratory work is taken into account. In a school the lecture room is a place for teaching and demonstration table is the teacher's laboratory table. The one, who performs experiments, illustrates, confirms or verifies facts and principles, is called the

demonstrator. The assembled students listen, see, observe and make notes. In this method the teacher works and experiments with the help of students.

It is true that pupil in this method does not use his hand but the teacher reinforces the learning by use of two channels, the ears and the eyes. The spoken words are combined with a series of action.

- **Advantages:**

1. It serves as a model laboratory instruction.
2. Experiments shown point out the matter of observation and indicate the inferences.
3. Experiments requiring special skills will only be shown by the teacher.
4. No time is wasted in the laboratory method.
5. The teacher makes students familiar with the nature and use of apparatus.

- **Disadvantages:**

1. Teacher may be tempted to lecture rather than to demonstrate.
2. Less experiments than those given in the text are attempted.
3. Oral discussion may not be encouraged.
4. Not getting first hands experiences.
5. Learners lose interest and concentration also.

### 1.2.3 Textbook method:

From the earliest days this has been a traditional method of teaching. This was a type of recitation and reading method. The text contained summary of facts and was used in memorizing. This often contained questions or an extra problem which serves to guide the pupil somewhat towards the goal.

- **Advantages:**

1. It provides readymade information.
2. It is a source of reference.

3. Good for memorization
4. Good for reading.

- **Disadvantages:**

1. The book reading becomes monotonous or dull.
2. It lacks interest.
3. It turns out crammers.
4. So many pupils simply read a text without clear understanding of concept and hence get little from it.

A Science teacher who thinks that he or she can teach subject just by transferring the content of text book into brains of pupil is under a great misunderstanding. Even the text has to be supplemented in a many ways.

The above mentioned method has many disadvantages in the teaching of Science and also the students that need conceptual understanding. Therefore the researcher experimented with three Models of Teaching in present study.

## 1.3 Basics of Models of Teaching:

Model approach to teaching was proposed by a number of Educationists and Psychologists. Flanders put his interaction analysis as a Model of Teaching and for his approach he categorized the statement of students and teachers into ten categories. Glaser developed his stripped down model of teaching which after some modification became well known as basic teaching Model (Siddiqui, M .H and Khan M.S.2004:6)

Joyce and Weil developed more than 20 Models of Teaching, which were grouped on the basis of their chief emphasis- the way they approached educational goals and means. Each of these Models is available for teachers to use and each produces useful results. If one comes with certain specific learning outcome, for example –inductive reasoning, abstract thoughts or the ability to memorize, certain models of teaching are more effective and efficient than others. Each of these models has substantial research base demonstrating its effect on learners.

The Models of Teaching are grouped into 4 families.

A. Information Processing Family of Models of Teaching.

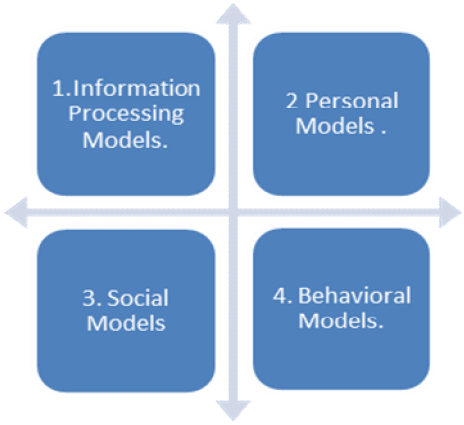
B. Personal Family of Models of Teaching.

C. Social Family of Models of Teaching.

D. Behavioral Family of Models of Teaching.

**Figure No. 1.1**

**Families of Model of Teaching**




### 1.3.1 Information Processing Models:

According to Murray and Mossberg (1982), the Information Processing Models came up during post Sputnik curriculum borrowed from computer engine. It was the Model of a mind as an information processor that did many of the things computer did, like accepting information, manipulating and transforming it, storing it and retrieving it. For teaching, children how to learn, the implication involved the teaching of potentially useful and powerful strategies for efficient and meaningful storage and retrieval of information as well as the different strategies applicable to different purposes of information processing.

**Table No. 1.1**

**Information Processing Models**

| Model of Teaching | Developer | Main objective |
|---|---|---|
| 1. Inductive Thinking Model | Hilda Taba | To motivate for logical and inductive thinking. |
| 2. Inquiry Training Model | Richard Suchman | To arrange the information systematically, formation and checking of Hypothesis. |
| 3. Biological Science Inquiry Model | Joseph Schwab | Motivation for Biological inquiry and introduction to research methodology. |
| 4. Concept Attainment Model | Jerome Bruner | Inductive thinking, concept formation and its analysis. |
| 5. Advance organizer Model | Devid Ausubel | To get and organize the information. |
| 6. Memory Model | Harry Lorayne and Jerry Lucas | To improve the capacity of memory. |
| 7. Cognitive Development Model | Jean Piaget | General development of social, intellectual and moral values. |
| 8. Synectics Model | George M. Prince and William J.J. Gardon | Problem solving methodology that stimulates thought process. |

### 1.3.2 Personal Models:

Personal models share an orientation towards the individual and the development of selfhood. The personal category contains Models designed to increase student learning among self and as such emphasize intrapersonal knowledge. Some

useful methods that develop self- awareness and self- esteem, others promote personal activity- thinking metaphorically and using analogies. Models of this family are the Non- directive teaching Model, Awareness Model, Synectic Model, Conceptual System Model and the Classroom Meeting Model.

**Table No. 1.2**

**Personal Models**

| Model | Developer | Main Objective |
|---|---|---|
| Non Directive Teaching Model | Carl Rogers | Self-awareness and self-concept for Personality Development. |
| Concept of Self | Abraham Maslow | Development of Self-Concept. |

### 1.3.3 Social Interaction Models:

Social interaction models emphasize the relationship of the individual to society and to other persons. One of the most popular methods of teaching today is cooperative learning. Cooperative learning belongs to the social category of models. There are a number of social models, some very simple, other quite complex. In general the more complex the model is the greater the student growth. Student's outcome from these models includes personal and academic development as well as social growth.(Green (995:6). Models of this family are the Group investigation model, Social Inquiry Model, Laboratory Method, Jurisprudential Model, Inquiry training Model, Role playing Model, and the Social Simulation Model.

**Table No. 1.3**

**Social Interaction Models**

| Model | Developer | Main Objective |
|---|---|---|
| Group Investigation | John Dewey and Herbert Thelan | To develop the capacity to acquire knowledge through democratic way. |
| Role Playing | Fannie and Jorge Shaftel | To develop the critical awareness about personal and social values. |

| | | |
|---|---|---|
| Partners in Learning | David Johnson, Roger Johnson, Margarita Calderon, Elizabeth Cohen and Robert Slavin. | To develop self-awareness among students and also Social and Educational development through cooperative learning. |
| Jurisprudential Inquiry | Donald Oliver James Shaver. | To study social issues on the basis of Social Justice. |

### 1.3.4 Behavioral Models:

The Models in the behavioural family are based on the idea that human learns through naturally occurring feedback mechanism and that reinforcement is basic to learning. A number of these models also include the idea of mastery. They work well for material that is easily broken into small steps that can be sequenced, are logical and need to be learned, often to the point automatically. They emphasize the deductive learning process.

Behaviour modification Models were evolved from attempt to develop efficient systems for sequencing learning tasks and shaping behaviour by manipulating reinforcement. Exponent of reinforcement theory, such as Skinner (1957) have developed these models and operant conditioning as their central mechanism. Among the various models were the programmed instruction models. Managing behaviour model, Relaxation model, Anxiety Reduction Model, Assertive training Model.

**Table No. 1.4**

**Behavioural Models**

| Model | Developer | Main Objective |
|---|---|---|
| Mastery learning Model | Benjamin Bloom and James Block | Mastery on Content. |
| Direct Instruction Model | Tom Good, Jere Brophy, Carl Gereiter, Ziggy Engleman, Wes' Backer. | Systematic arrangement of content or skills. |

| | | |
|---|---|---|
| Simulation | Carl Smith and Mary Smith | To help to get mastery on presentation, practice and feedback from peer group. |
| Social Learning | Albert Bandura, Carl Theresen, and Web' Backer. | To help to symbolize the guideline for behavior. |

A number of Models of Teaching are designed to increase student's ability to process information more powerfully. These include methods for presenting information so that the student can learn and remember it more effectively by operating on it more conceptually; teach students to collect and organize information conceptually and the models to teach students to use the methods of disciplines, to engage in casual reasoning and to master concepts (Joyce, Showers, Bunner 1987:55) Many of these models have an extensive research base.

Information Processing category contains the largest number of Models and is the most familiar and easy for most teachers. Models in this category are designed to do just what the title suggests, help students to process information. And how do we want students to process information? In a lot of complex way, from memorizing to thinking inductively, some of these are teacher – focused and directed, whereas others are student oriented.

Information processing models share an orientation towards the information processing ability of students and always they can improve their ability to master information. Various Models of this family are the Inductive Thinking, Scientific Inquiry Model, Concept Attainment Model, Cognitive Growth Model and the Advance Organizer Model.

## 1.4 Definition of Models of Teaching:

Joyce and Weil have given 3 Definitions of Teaching Models.

1 Models of Teaching are just instructional designs. They describe the process of specifying and producing particular environment situation which causes the student to interact in such a way that specific change occurs in his behavior.

2 Models of Teaching are a "pattern or plan which can be used to shape a curriculum or courses, to select instructional materials and to guide a teacher's action". Models are designed to attain specific goals, when a teacher identifies a goal, select a particular strategy designed to attain that goal". We can say that he is using model approach.

3 A Model of Teaching consists of guideline for designing educational activities and environment. It specifies ways of teaching and learning that are intended to attain certain kinds of goal.

Models of Teaching are very useful for the teachers in planning and organizing teaching activities. The teacher can use them for curriculum, planning, student- teacher interaction, preparing student activities and to develop specific teaching aids.

## 1.5 Salient Features of Models of Teaching:

Following are the features which form the layout of the models of teaching by Joyce and Weil (1996)

**1.5.1 Focus –** Each Model has its specific focus, like to develop inductive reasoning of the students or to bring out creative learning in the student or to give a central idea of the content.

**1.5.2 Syntax –** The Syntax means the steps of Models that describes the model in action. It is the sequence of activities which are called as phases. Each model has specific flow of phases.

**1.5.3 Principles of Reaction –** Principles of reaction provides the teacher rules of thumb by which to tune into the student and select model appropriate response to what the student does. Principle of reaction tells the teacher how to regard the learner and how to respond to what the learner does. In some models the teacher overly tries to shape the behavior by rewarding certain student activities and maintaining a neutral stand towards others. In other Models, such as those designed to develop creativity, the teacher tries to maintain a non-evaluative, equal stance so that the learner becomes self- directing. Principles of reaction provides the teacher rules of thumb by which to tune

into the student and select model appropriate response to what the student does.

**1.5.4 Social System –** The Social System describes student and teacher's role and relationship and the kind of norms that are encouraged .The relationship roles of the teacher vary greatly from Model to Model .In some Models the teacher is indicator or a helper of group activity , in others a counselor of individual and in other a task manager. In some models the teacher is the center of activity. The source of information and the organizer and pacer of the situation (high structure). Some models distribute activity equally between teacher and students (moderate structure), whereas at other places students are at the center, encouraging a great deal of social and intellectual independence (low structure).

**1.5.5 Support System –** The support system describes the supporting conditions necessary for the existence of the model such as additional requirements, technical facilities, human skills support in the form of books, films and self-instructional system etc.

**1.5.6 Application –** The description of the effect of models can validly be categorized as the direct or instructional effect and the indirect or nurtarant effects. The instructional effects are those directly achieved by leading the learner in certain conditions. The nurtarant effects come from experiencing the environment created by the model. Instructional and nurtarant effects reinforce one –another and there is no undesirable nurtarant side effect.

## 1.6 Selection and Adaption of Models of Teaching for the Study:

The researcher selected 3 Models of Teaching for the study. These are Advance Organizer Model, Concept Attainment Model and Inductive Thinking Model. All these Models belong to Information Processing Model family. These models were taught with the help of Power Point presentation.

### 1.6.1 Advance Organizer Model:

**David P. Ausubel** presented this Model. According to Ausubel's **Theory of Meaningful Verbal Learning**, Advance Organizers are introduced. Advance Organizers are presented at higher level of abstractness, generality and inclusiveness than the material to be learnt and they serve to provide especially relevant fixing ideas for the differentiated derailed material i.e. subsequently presented. In Advance Organizer Model the central idea / theme/ gist is presented in the beginning. The current knowledge is meaningfully attached with the previous knowledge. Sometimes the Advance Organizer Model is shown graphically, by using charts of models etc. Each unit and sub-unit is explained with their inter-relations then it is explained in detail and asked the relevant questions, so that the teacher can understand whether the students have understood the content or not and at what extent they understood it.

- **Steps of Advance Organizer Model:**

**Syntax-**

A. **Presentation of Advance Organizer:** This is the first and important step of Advance Organizer Model. In this step all the important points are discussed, the central idea of the chapter is explained.

B. **Presentation of Learning Material:** The learning material is presented in the form of charts, graph, models, objects, power point presentation, films etc. The learning material acts as the support system. It helps the students to understand the content clearly. Teacher shows the learning material in proper sequence and with the support of theoretical explanation assist to memorize the content for longer time.

C. **Strengthening Cognitive Structure:** The learning material is systematically arranged in advance Organizer Model, so the inter-relation between the sub topics becomes very clear. The students can organize the knowledge. A chain is formed among the previous and the new knowledge.

These are the three main steps of advance Organizer Model.

- **Social System:** Teacher relates the learning material to the organizer and hence students can differentiate new material from previously learnt material.

In the beginning teacher shows the summary or main points of the content in front of the students in the form of Advance organizer. It contains the entire main and sub points of the content.

- **Principles of Reaction:** The interaction between teacher and students are very important in Model based Lessons. The Advance Organizer Model is teacher cantered model .Teacher helps students to promote a critical approach to knowledge. Here students can link the new knowledge with the previous knowledge appropriately.
- **Support System:** This is useful at the stage of presentation of learning material .Various teaching aids can be used as support system, some of them are mentioned above. Well organized material is the critical support requirement of the model. In this research the researcher used **Power Point Presentation** as a support system.
- **Instructional Effect:** It is the direct effect happened due to teaching the content by using Model of Teaching. This effect is related with the content understood by the students. The Advance Organizer Model has following Instructional effects**.**

1. Meaningful assimilation of information and ideas. It gets linked properly with previous knowledge.
2. Conceptual formation is done.

- **Nurtarant Effect:** It is the effect which is additional to instructional effect. Apart from understanding the content knowledge, there is improvement in thinking skill also. The Nurtarant effect lasts for the long life and it becomes the part of the personality. Advance Organizer Model has following nurtarant effects.

1. Students get interest in inquiry.
2. Develops the habits of precise thinking.
3. Develops the systematic arrangement of knowledge.

### 1.6.2 Concept Attainment Model:

It has been presented by **Brunner, Goodnow and Austin**. Concept Attainment is "the search for and listing of attributes that can be used to distinguish exemplars and non-exemplars of various categories."

- **Steps of Concept Attainment Model**
  - **Syntax**- The teacher Presents the data to the learner which includes exemplars and non- exemplars. Here the teacher gives the 'Yes' type examples which have the characteristics of the concept which are called as exemplars. The teacher also gives some 'No' type example which do not have the characteristic of the concept. Sometimes they may show some similar characters but the one, very essential character which makes the concept distinct from others is missing in those examples. Such kinds of examples are called as non-exemplar. The teacher may show 'Yes' and 'No' type example all at a time, or step by step- one example of each type.
  - **Social System**- This is very interactive model, at every time teacher gives 'Yes' type and 'No' type examples. Students identify the similar aspects of exemplars and also try to add their own example having similar characteristics. Teacher helps the student to form the concept with essential attributes. Observation, Classification on the basis of similarities and dissimilarities, formation of concept, addition of example which are same like the concept – these all are the systematic way of understanding and are the high level thinking skills.
  - **Principles of Reaction**- As said earlier student-teacher interactions are the soul of this model. Students pay attention towards analysis of their concepts and thinking strategies. They observe the similarities and dis-similarities. Students also pay attention to what other students are adding the exemplars. They can redirect their thinking process according to the proper direction. So the student-student reactions are also meaningful. The teacher can observe the way of thinking of the student and motivate them.
  - **Support System**- The main work of teacher is to be ready with many data source including 'Yes' type and 'No' type examples. For this- real objects, photos, pictures charts or any other teaching aids can be used.

- **Instructional Effect:**

  1. The learner understands the nature of concept with all attributes.
  2. The concept building strategies gets improved.
  3. Student's Inductive reasoning capacity increases.
  4. Formation of specific concept with the help of similar characteristics.

- **Nurtarant Effect:**

  1. The learner gets awareness of alternative perspectives.
  2. Tolerance of obscurities.
  3. Sensitivity to logical reasoning in communication.
  4. Gives directions to the thoughts.

In this Model students observe similar and dissimilar examples, they classify it, add the examples which can fit in the concept. While adding their own example in 'yes' category there is logical thinking. They have to give rational for adding the example in 'Yes' category. Here they will give justification to support their thought. All these high level mental activities are developed by using Concept Attainment Model.

### 1.6.3 Inductive Thinking Model:

The Inductive Thinking Model is discovered by **Hilda Taba**. She has great contribution in the curriculum development at primary level. She had developed a series of teaching strategies which help to developmental process, especially the ability to categories. She built her approach on three assumptions….

1. Thinking can be taught.
2. Thinking is an active transaction between the individual and data.
3. Process of thought evolved by a sequence that is lawful.

- **Steps of Inductive Thinking Model**
  - **Syntax** – It includes three strategies, which are concept formation, interpretation of data and application of principles. This Model can be

considered as the higher level of Concept Attainment Model. In the beginning the teachers put forth many examples and ask students to make groups of it. Student classifies the examples on various categories. After that teacher asks the reason of the way they have classified the examples. They interpret the data and by this way they form the concept. The student can apply the acquired knowledge in different situations to solve the problem. This skill is very important in real life to solve the problems by implementing the knowledge as knowledge is meaningful only if it is used properly.

- **Social System** – The model has to moderate structure, it is co-operative. The teacher is initiator and controller of the activity. The concept is formed in inductive way by observing many examples. The student analyses the data and interpret it. Further they apply the gained knowledge whenever necessary.
- **Principle of Reaction** – Teacher matches tasks according to student's level of cognitive activity and determines student's readiness. Students observe the examples and organize it on the basis of similarities and differences .Teacher asks them some thought provoking questions to evaluate their understanding. Here students explains their views, opinion and suggest some remedies to solve the problem. The brainstorm technique is applied here.
- **Support System** – Raw data is provided to students to recognize and analyse. Here the power point presentation will be used as support system.
- **Instructional Effects** – The positive effect by acquiring the content knowledge is considered as Instructional effect. Following are the instructional effects of Inductive Thinking Model.

  **1.** A clear Concept Formation process takes place.

  **2.** To understand various concepts.

- **Nurtarant effect** – The additional effect which reflects the higher order thinking developed among the students**.** Following are the nurtarant effects of Inductive Thinking Model.

  **1.** Student's attention to logical thinking increases.

  **2.** Students become sensitive to language.

  **3.** Awareness of the nature of knowledge increases.

4. The habit of keen observation and classification develops.

## 1.7 Need of the Study:

Science teaching became more difficult than it has ever been in the past (Bhatia and Bhatia 2000). Today's Science teacher must have a mastery of the subject matter and they should know the various methods and Models to teach with.

- Science introduces a large number of concepts; these concepts are mostly not understood by the students (Twining, 1991:203). This situation is caused due to non- effective methods of teaching used to teach Science concepts.
- Physics, Chemistry and Biology are very important branches of science, which introduces many concepts at secondary level. These needs to be mastered and the students should be able to apply them in their day to day situation.
- If one looks at present scenario of science teaching, one can easily observe that most of the students are not able to grasp the basic principles, concepts and cannot apply them in their life.
- Students become passive listeners instead of active learners.
- Often the doubts of students remain unanswered and this can even lead to misconceptions.
- The teachers are in a hurry to complete their portion in a limited time, so they stick to simple method which is nothing but lecture method and use the textbook to the maximum.
- No extra information, teaching methods or teaching aids are used in the teaching.
- Because of the present nature of Science teaching in the schools the students do not understand Science concepts, laws and principles in proper manner.
- Many learners do find it difficult to understand concepts especially if they are explained it in a difficult way. The transmission may be as an explanation by the teacher in the class or by the text book (Ebenezer, J. and Haggerty, S., 1999:56)

Therefore the researcher felt that the teaching methods which are used in science teaching are not effective to teach Science concepts. The researcher is a teacher educator; she often observed during practice teaching and Internship of B.Ed. students that many school teachers use the traditional way of teaching Science subject. Many concepts of Science subject remains unclear and sometimes misconceptions also occur .So the researcher decided to teach Science subject by using three different Models of teaching for std. 8th standard students.

This study proposes to find out which Model is most effective among the three, after comparing with traditional teaching method.

## 1.8 Title of the Research:

Comparative Study of Models of Teaching on Achievement of 8thStandard Students.

## 1.9 Statement of the Problem:

To compare the effectiveness of Models of Teaching with traditional teaching method for Science subject on 8th standard students of Abhinav Education society's English Medium School. Ambegaon (bk) Pune - 46.

## 1.10 Conceptual Definitions:

- **Effectiveness:** It is the degree to which something is successful in producing a desired result; success. (Oxford Dictionary)
- **Models of Teaching:** Models of Teaching are the instructional designs**.** They describe the process of specifying and producing particular environment situation which causes the student to interact in such a way that specific change occurs In his behavior. (Joyce and Weil.)
- **Traditional teaching Method :** A teaching method comprises the principles and methods used for instructions to be implemented by teachers to achieve the desired learning by students.

- **Science subject:** Study of the natural world based on facts learnt through experiments and observations.
- **8th standard students:** The highest class of primary Education in India.

## 1.11 Operational Definitions:

- **Effectiveness:** The effectiveness of teaching learning method will be determined on the basis of significant difference in marks obtained in post-test and pre-test. Also the difference between the mean of post test scores of controlled group and experimental group will be considered as the effectiveness of the teaching by using Models of teaching.
- **Models of Teaching:** The Models of Teaching given by Joyce and Weil. The three Models from Information Processing family are selected for the present research. The Models are **Advance Organizer Model, Concept Attainment Model and Inductive Thinking Model.**
- **Traditional Teaching Method:** Teaching method following Herbart's steps.
- **Science:** A subject in the curriculum of 8th std. prepared by S.C.E.R.T (Maharashtra State) which includes the content from basics of Physics, Chemistry and Biology
- **8th standard students:** Students studying in 8th standard of S.S.C. board schools.

## 1.12 Objectives:

1. To find out the present status about the use of Models of Teaching in classroom teaching.
2. To find out the effectiveness of Advance Organizer Model on achievement of 8th std. students in Science subject.
3. To find out the effectiveness of Concept Attainment Model on achievement of 8th std. students in Science subject.

4. To find out the effectiveness of Inductive Thinking Model on achievement of 8th std. students in Science subject.
5. To compare the effectiveness of Models of Teaching with traditional method on achievement of 8th std. students in Science subject.

## 1.13 Scope:

- The program developed is applicable for all the students of 8th std. of S.S.C. board school.
- The program is useful to teach the selected units of Science prescribed by any board.
- The lesson plans of Models of Teaching are the example for Science teachers and also to B.Ed. students for how to write lesson plan.

## 1.14 Limitations:

- Interest and attention of students in Science subject is out of researcher's control.
- Administration of school posed some limitations on teaching Program.
- The Infra structure is out of researcher's control.

## 1.15 Delimitations:

- The program is conducted in one school from Pune city.
- The research is delimited for 8th standard. English medium school of S.S.C. Board only.
- The content is "Metals and non-metals, Diseases, Air, and Soil" From 8th standard, Science textbook.
- The program is in English language only.
- The program is implemented only in 3 divisions of the selected school.

## 1.16 Research Questions:

- What is the existing status of use of Models of Teaching in classroom teaching?
- Which units of Science can be taught by using Models of Teaching to std.8$^{th}$?
- What is the effect of Advance Organizer Model of Teaching on achievement of 8$^{th}$ standard student in Science subject?
- What is the effect of Concept Attainment Model of Teaching on achievement of 8$^{th}$ standard student in Science subject?
- What is the effect of Inductive Thinking Model of Teaching on achievement of 8$^{th}$ std. student in Science subject?
- Which is the most effective model of teaching among the three?

## 1.17 Hypotheses:

### 1.17.1 Hypothesis – 1

**$H_1$**: There will be difference in achievement in pre-test and post-test of 8$^{th}$ standard students in Science subject.

**$H_0$:** There will be no significant difference in achievement in pre-test and post-test of 8$^{th}$standard students in Science subject.

### 1.17.2 Hypothesis – 2

**$H_{2:-}$**: There will be difference in achievement of 8$^{th}$standard students of models of teaching as compared to traditional method in Science subject.

**$H_0$:** There will be no significant difference in achievement of 8$^{th}$standard students of models of teaching as compared to traditional method in Science subject.

## 1.18 Population:

All English medium students studying in 8th std. in S.S.C. board schools are able to participate in this research.

## 1.19 Sample and Sampling:

Non Probability-Purposive Sample.

The researcher has selected the 8th std. students from Abhinav Education Society's English Medium school, Ambegaon.Pune-46.

Three equal groups, each of 50 students prepared according to their grades in 8thstandard and the fourth group taught by traditional method.

## 1.20 Assumptions:

- Models of Teaching are effective for learning.
- Students have the previous knowledge about the selected topics (Metals and Non-metals, Air, Soil and Diseases).

## 1.21 Tools for Data Collection:

- **A Questionnaire:** To check the present status about the use of Model of Teaching in day today classroom teaching.
- **An Achievement test:** The effectiveness of Models of Teaching will be determined on the basis of marks obtained in an achievement test.
- **Statistical tool:** Percentage, Mean, Standard Deviation, Standard Error, t test and ANOVA test.

## 1.22 Type of Research: Applied research.

- **Multi-method**– Survey Method, Product Development Method and Experimental Method.

## 1.23 Rationale for Method:

- **Survey method:** The researcher wants to identify the current status about the use of Models of Teaching in day today classroom teaching. For this, a questionnaire was prepared and filled by the teachers who teach Science subject in English medium schools for $8^{th}$ standard.
- **Product Development Method:** For teaching by using Models of Teaching researcher has prepared the lesson plans according to the structure of Models of Teaching.
- **Experimental Method:** The researcher has selected Experimental method to measure the effectiveness of three Models of Teaching.

## 1.24 Research Methodology:

The research has used multi method i.e. Survey method, Product Development method and Experiment method.

- Before taking Survey, a questionnaire was prepared to check the present status about the use of Models of Teaching. Questionnaire was given to 54 school teachers who teach Science to $8^{th}$ std. students. ( for objective no.1)
- Lesson plans were prepared according to the Models of Teaching.
- Pretest was given to all four groups.
- Teaching was done by using Models of Teaching.
- The controlled group was taught by using Traditional Teaching method.
- All the four groups were post tested.
- The difference was calculated statistically for all three models (for objective no.2,3,4).
- The results of Models and Traditional Teaching were compared.(For objective no. 5).

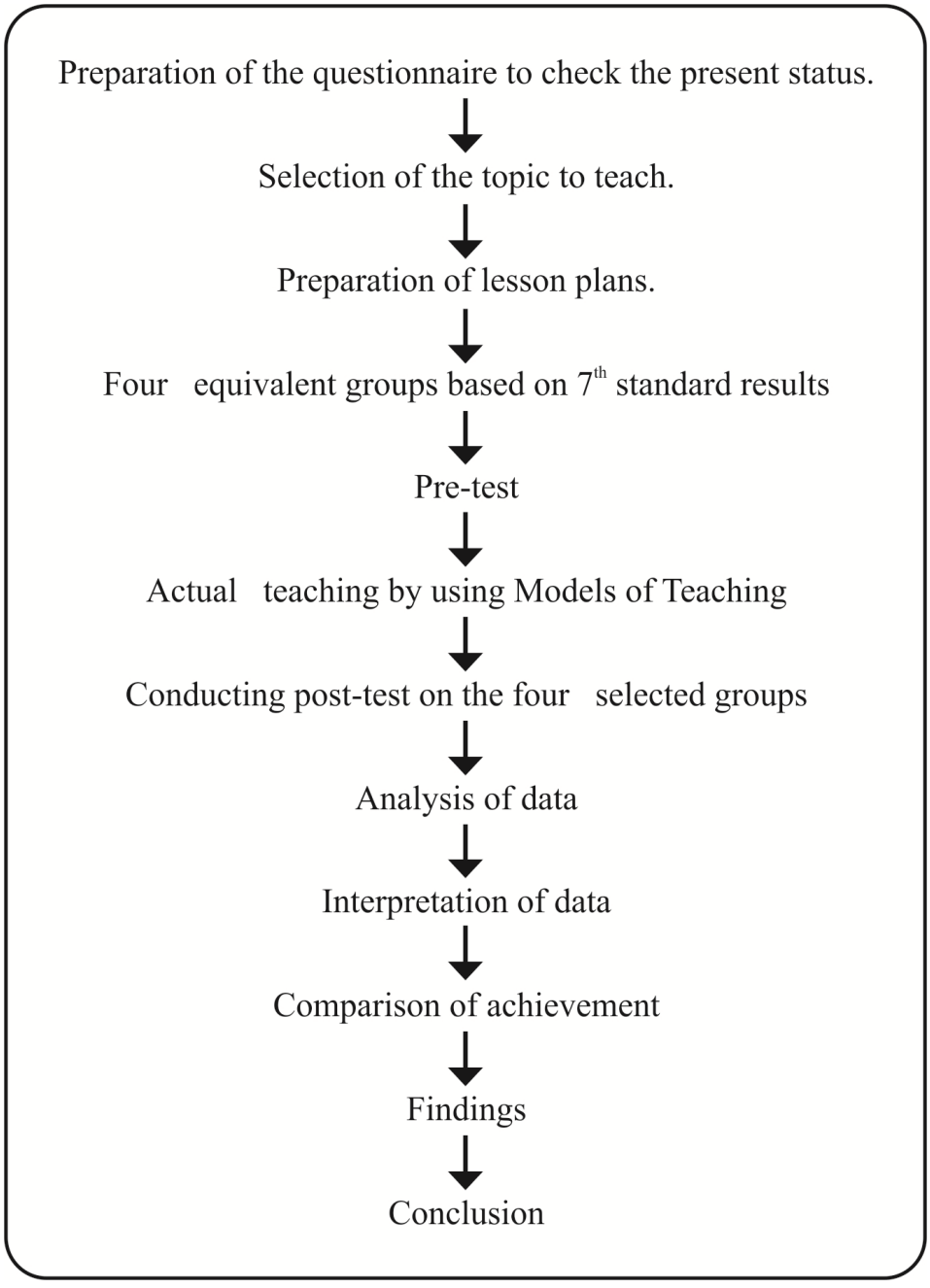
**1.25 Research Design**: True Experimental design.

Pre-test, Post-test Equivalent Group Design.

**1.26 Action Plan of the Research:**

**Figure No. 1.2**

**Action Plan of the Research**



## 1.27 Variables :

- **Independent Variables** : Use of Models of Teaching.
- **Dependent Variables** : Achievement of the students.
- **Controlled Variables** : Subject and Units.

  Time duration of teaching.

  Students from same school.

  Age group of students. (14-15 years old)
- **Extraneous Variable** **:** Interest of students in Science subject.

  Administration of school.

## 1.28 Closure :

In the present chapter the researcher has explained about :

- The Research Proposal,
- Details about Models of Teaching and its types,
- Selection of Models of Teaching
- Research design and methodology

Thus the detail idea about the research becomes clear in the present chapter.

❑❑❑

# CHAPTER - II

## REVIEW OF RELATED LITERATURE AND RESEARCHES

### 2.1 Introduction:

The review of related literature involves the systematic identification, location and analysis of documents containing information related to the research problem. For the present study information regarding related research was obtained from journals, articles, books, Ph.D. thesis, M.Phil. and M.Ed. dissertation and internet.

Review of related literature is not a series of abstract or annotation but rather a summary and analysis of relationship and difference among relevant studies and reports (Gay 2006).

The phrase 'Review of Literature' consist of two words review and literature. Literature refers to knowledge of a particular area of investigation of any discipline which includes theoretical, practical and its research studies. Review means to organize the knowledge of various fields in which research has been done and to verify the utility of these studies for a particular problem area (Dr. Jha 2011 Research Methodology P.58).

Models of teaching have great potentiality for achieving this goal of Education. Joyce Weil 1980 developed more than 20 models, those were grouped on the basis of their chief emphasis and their approach towards educational goals.

Relating to Models of Teaching in India, Chitriv Uddhav G. at Nagpur University completed the first study at Ph.D. level, while at M.Ed. level Budhhisagar at Indore conducted the first study. These studies were related to training of teacher educators and student teachers in Models of Teaching.

In 1985, a large scale study on two models of teaching –Inquiry Training Model and Concept Attainment Model was undertaken by the NCERT in collaboration with Department of Education, Devi Ahilya Vishwavidyalaya, Indore. In this study, thirty colleges of Education from different parts of India were participated. A three stage study was planned.

The first phase was to provide training to teacher educators followed by demonstration lessons and peer practice.

The second phase was planned to provide training to student teachers by the trained teacher educators in their respective colleges and department of Education.

The third phase study was implementation of models in schools by the student teachers. The participants were also asked to conduct test on theoretical understanding of the model. 16 colleges participated in this program and bought data of the test, which was analysed in a workshop at Indore. This made the model better known and understood by Indian Educators. A number of research studies on Models of Teaching were also undertaken.

The following are the studies in which Models of Teaching have been used. In the fourth survey of research in Education, majority of research were on Microteaching. In the fifth survey of research in Education their number decline and their place was taken by Models of Teaching. Out of 44 research studies reported in the fifth survey of research in Education, nearly half are on Models of teaching. Here again the Models chosen were mainly from information processing family. Largest number of studies is on Concept Attainment Model; this is followed by Advance Organizer Model and Inquiry Training Model. Few studies were done on training student teacher on the use of models and other was to study impact of use of models on achievement of student teacher.

Some investigators have compared one or two models to judge which is more effective. The gain should not be measured only in terms of achievement test. Each model makes a unique contribution to student's thinking. The Concept Attainment emphasises on reasoning, the Advance Organizer model focuses on understanding the broad principle of a topic and organization of factual data around the central principle. While the Synectic model emphasises the use of analogies and imaginations. These gains may be missed in the usual achievement test.

Research studies have convincingly shown that models give superior results in terms of achievement scores by the students. Use of Models will make them more active participants in the process of education. Since in models much of the initiative is passed on students, these provide an opportunity to them to use their imagination and thinking. Looking to these gains models should be introduced as regular part of teacher training. There are a large number of teacher educators who themselves have rarely used Models of Teaching. They may have read about it in theory but they have

less experience of their practical use. There is need for instructional material that gives a number of practical examples of how a model is to be used in teaching a topic at the school level. Video cassettes of demonstration lessons, if prepared would be very useful.

NCTE has made a specific reference to Models of Teaching in the document dealing with quality concern of secondary teacher education (Das, R.C. 1998) .There is no mention of Models of Teaching in a similar document on quality concern of elementary teacher education. Some of the Models of Teaching are quite appropriate for the elementary stage and it would be better if the institution preparing elementary teachers also take up few selected models of teaching.

To conduct the research in right direction it is necessary for the researcher to know about the work done in the problem area and study the different variable of the problem in detail. Thus for any specific research, the researcher must be thoroughly familiar with both the previous theory and related researches done in the past.

The main reason of review of related literature in allowing the researcher to acquaint herself with current knowledge in the field or area in which she has conducted her research. It enables the researcher to define the limits of the field. The important specific reason for reviewing the related literature is to know about the recommendation of previous researches listed in their studies for further research. Thus by reviewing the literature, the researcher develops the foundation of ideas and results on which her study is built.

## 2.2 Need of Review of Related Literature:

- To avoid the replication of study.
- To formulate Hypothesis.
- To provide rationale for the study.
- To do quantitative and qualitative analysis of previous research in the relevant area.
- To direct the research about the research work and the steps of research.
- To plan and conduct the study.

- To acknowledge the researcher with the method of research, tools and statistics.
- To discuss the result and findings of the study.
- To justify the effort of the research related to his research.
- To achieve further advancement of knowledge.

Thus the review of literature indicates the clear picture of problem to be solved and gives direction to the researcher. Practically all human knowledge can be found in books and libraries. Unlike other animals that must start a new with each generation. Man is built upon the accumulated and recorded knowledge of past. This constant adding to the vast store of knowledge makes possible progress in all area of human endeavor (John W. Best).

Thus in any field related literature forms the foundation upon which all further work is to be built and repetition of knowledge can be avoided. Present research has been designed keeping in mind the research gap identified through this review.

To take the review of related researches the researcher has visited different libraries, such as Department of Education, Savitribai Phule Pune University, SNDT Women's University, Pune Campus, Tilak College of Education etc. in Pune city.

## 2.3 Theoretical Aspect:

The researcher read many reference books for the detail study of the topic. The gist of the books is given in brief as follows.

### 2.3.1 Books Related to Research Methodology:

- **Best, J. and Kahn, J. (2009). Research In Education:**

  This book gave a proper guideline about how to frame objectives, Hypothesis, how to select appropriate sample for our research work. This book also clears many concepts and ideas about research. The book also focuses on different research designs, methods, tools and techniques of data collection and data analysis etc. Thus this book is really a mainstay for the researchers in the field of Education.

- **Koul Lokesh. (1984). Methodology of Educational Research:**

  This book gives all the detail knowledge regarding educational research. It covers all the essential concepts of research. This book helped the researcher at many stages. It also gives detail guideline about data analysis and statistics. This book is useful from preparation of proposal till report writing.

- **Kothari, C.R. (1985). Research Methodology:**

  This is one of the enriched books on Educational Research. It compiles all the topics like concept and types of research, methodology, research design, sampling, measurements and scaling technique. Also hypothesis testing by using various statistical tools, interpretation and report writing. This book proved good assistance through- out the research work to the researcher.

  The researcher also read some more books related to research methodology like- 'Educational Research' written by Muniruddin Quereshi,' Educational Research' written by- Mohd. Sharif Khan also 'Methods of Educational'- written by Ravi Prakash. All these books gave the guidelines for Educational Research.

### 2.3.2 Books Related to Models of Teaching:

- **Joyce, B. & Weil, M.(1996) Models of Teaching:**

  This book is perfect treasure of the knowledge about 'Models of Teaching'. It gives all the detail information about all the families and each Model of Teaching. The authors have explained in detail about each model. They also have given various examples to make the content very clear. It includes syntax of the model, social system, support system, teacher-student interactions, instructional and nurtarant effects etc. It is really a Beacon.

- **Sohani, C. (2008) Adhyapanachi Pratimane:**

  This book is in Marathi language. It also gives detail idea about the Models. The author has given a sample of lesson plan for the Model. It was a great help for the researcher. The researcher has prepared the lesson plans based on Models of Teaching as given in this book. This book also gives details of all families of

Models of Teaching. The researcher has taken the first hand guidance for preparing the lesson plans from the author i.e. Dr. Sohani Chitra.

- **Mahale, S.(2005) Adhyapan Pratimane Aani Adhayan Shaili:**

  This book is also in Marathi language. In this book the author has given detail information about history and types of Models of Teaching. This book hoards the information about Advance Organizer Model, Inductive Thinking Model, and comparison between them. This book guided to the researcher while preparing the lesson plans and implementing it.

  The researcher also referred some books like 'Teaching learning Process' written by Dr. Archana Tomar, Dr. Mandira Sikdar and Ms. Pratibha Gupta. This book contains various aspect regarding teaching and learning. There are separate chapters for 3 Models which the researcher has selected for her research.

  The researcher has also taken review from Marathi book i.e. '*Adhyayan – Adhyapan Prakriya'*. Which focuses on the various models like Advance Organizer Model, Concept Attainment Model and Inductive Thinking Model. All these books were really helpful.

### 2.3.3 Books Related to Science Teaching:

- **Ebenezer, J.V.& Haggerty, S.M.(1999).Becoming a Secondary School Science Teacher:**

  In this book the author has focused on the psychology of learner. The author also discussed about the objectives of teaching Science subject at different levels. What is the role of teacher, what are the qualities and competencies of Science teacher and the different ways of teaching Science. All these points are written well.

- **Chaudhary, K.(1996). Student Teaching Field Program: Micro Teaching Cum Models of Teaching:**

  In this book the author covered many topics related to teaching process. The author explained various micro teaching skills in detail, which is the soul of teaching process. The author also explained about the Models of Teaching, its history, families, syntax and merits of Models of Teaching.

- **Borse C.M. Content Cum Methodology :-**

  This book is in Marathi and English language. It covers various teaching methods with their merits and demerits. This book assembles the qualities and responsibilities of Science teacher. It also contains the objectives of teaching Science at various levels.

  The researcher also referred some books for data analysis and statistics.

  All these books were really a light house while doing the research work.

## 2.4 Review of Ph.D. Level Researches:

- **From- 4th Survey of Educational Research by M.B. Buch.**

1. **Researcher's Name: Chittriv Udhhav G. (1982)**

- **Title:** Evaluating differential Effectiveness of Asubel and Bruner strategies for acquisition of concept in Mathematics, University: Nagpur.
- **Objectives**:
  1. To ascertain the comparative effectiveness of Bruner's strategy (Concept Attainment Model) with the traditional one on the various criteria of concept acquisition in Mathematics.
  2. To ascertain the relative effectiveness of the Ausubel and Bruner strategies on the various criteria of concept acquisition in Mathematics
- **Methodology:** The sample included 3 intend sections of grade 11th at Nagpur city. Treatments were randomly assigned to these 3 sections. Six concepts were chosen from the Mathematics syllabus of Science stream. Twenty five lessons were prepared by researcher for each of the 3 strategies – Ausubel's Advance Organizer Model, Bruner's Concept Attainment Model and Traditional Method. Non-equivalent control group designed was chosen for the study.
- **Findings:**
  1. Bruner's strategy (Concept Attainment Model) was superior to the traditional strategy for teaching Mathematical concepts so far as scientific knowledge,

heuristic transfer, short term retention and long term retention of concepts were concerned.

2. Bruner's strategy (Concept Attainment Model) was superior to Ausubel's strategy Advance Organizer Model for teaching Mathematical concepts so far as scientific knowledge, heuristic discover new relationship to retain knowledge of concepts learnt for short as well as long period of time were concerned.

- **Similarities:** In previous and current study Concept attainment and Advance organizer models were used.
- **Differences:** In current research, researcher has used three different models. Inductive Thinking Model is also used. In the previous study the sample taken for research is class $11^{th}$ students for teaching of Science subject. Whereas in current research $8^{th}$ standard students are taken as sample for teaching of Science.In previous study non- equivalent group design was used while in present study equivalent group design was used.

**2. Researcher's Name: - Bhattacharya G.C.** (1984)

- **Title:** Effectiveness of various Models of Teaching Geography in relation to Institutional Resources, Banaras Hindu University
- **Objectives:**

  To find out effectiveness of teaching Geography through Concept Attainment Model and Inductive Thinking Model in relation to institutional recourses.

- **Methodology:** The study was conducted on Junior High school students with parallel group design with three treatments.

  **a)** Teaching with traditional method.

  **b)** Teaching with Concept Attainment Model

  **c)** Teaching with Inductive Thinking Model

  Mean, t' test, 'f' test and 3 ways analysis of variance in a 2*2*2 factorial design were used for analysing data and drawing conclusion.

- **Findings:**

  1. The Concept Attainment Model group of students did not differ significantly in achievement from the traditional teaching technique group in high resource status educational institution

  2. The students were taught through Concept Attainment Model showed better achievement in Geography than inductive Thinking Model group in low and average resource status educational institutions.

  3. The Models of Teaching approach produced better achievement in Geography even in average and low source status educational institution.

- **Similarities:** In both the research Concept Attainment Model and Inductive Thinking Models were used.

- **Differences:** In the previous study two models were used, but in the current research three models are used. The sample was from Junior High school and the subject is Geography, in the current study the sample is $8^{th}$ standard students and the subject is Science.

3. **Researcher Name: Sushma.** (1987)

- **Title:** Effectiveness of Concept Attainment Model and Biological Science Inquiry Model for teaching Biological Science of class $8^{th}$, Banaras Hindu University.

- **Objectives:**

  1. To study the effect of Concept Attainment Model based on teaching on pupil's achievement.

  2. To compare the effectiveness of Concept Attainment Model, Biological Science Inquiry Model and traditional teaching approaches on pupil's achievement.

- **Methodology:** The sample consisted of 78 students from class $8^{th}$ standard. Three groups were made and the controlled group was taught by traditional method, the second group by Concept Attainment Model and the third group by Biological Science Inquiry Model. The students were between age group 13-14.

- **Findings:** Concept Attainment Model and Biological Science Inquiry Model were found to be effective than traditional approach at 0.1 level of significance. Concept Attainment Model was more effective than Biological Science Inquiry Model.
- **Similarities:** In both the studies Concept Attainment Model was used. The sample is also from $8^{th}$ standard.
- **Differences:** In the present research two other models were used. The subject was Biological Science in the previous study and it is General Science for the current study.

**4. Researcher Name: Baveja B. (1989).**

- **Title:** An Experimental Study of Information Processing Model of Teaching in School of India, Delhi University.
- **Objectives:**
  1. To develop a teaching program in a specified content area in Biology based on Information Processing Model of teaching designed to teach concepts inductively by Concept Attainment Model and Information Processing Model.
  2. Compare teaching program based on the two information processing Model i.e. Concept Attainment Model and Inductive thinking Model with traditional teaching program in biology.
- **Methodology:** Using the purposive sampling method 99 students (29 girls, and 70 boys) were distributed among the experimental and control group. They were further divided into two groups. The tools used included Raven's Progressive Matrices (Advanced), a criterion test developed by the researcher and an Interview Schedule, developed in the affective domain, Mean, S.D. 't' test and 'Chi square' were used to treat the data.
- **Findings:**
  1. The teaching program in Biology based on the Information Processing Model of Teaching specially designed to teach concepts, Concept Attainment, and

Inductive thinking Model were more effective than traditional program for concept and retention.

2. Teaching programs based on Concept Attainment and Inductive Thinking Model of teaching made learner's critical observers and interested in biology and classified data observed outside the classroom.

- **Similarities:** In both the studies Concept Attainment Model and Inductive Thinking Models were used.
- **Differences:** In the current research apart from these two models Advance Organizer Model is also used. The standard is not clearly mentioned and the subject is Biology whereas in the current research the sample is 8th standard students and the subject is Science.

- **Researches from 5th survey of Educational Research by M.B. Buch.**

**5. Researcher's Name: Kamlesh Chaudhary. (1989)**

- **Title:** Teaching of concepts through the Concept Attainment Model and facts through traditional Teaching competency in teaching skills of pre-service teachers, University of Pune.
- **Objectives:**

1. To find out if student-teacher had indirectly learned the teaching skills during college- based peer practice and school based practice teaching.
2. To find out if there was any difference in their competency in the various teaching skills during teaching of concepts through the Concept Attainment Model and the teaching of facts through traditional teaching(TT)

- **Methodology:** The sample comprised 10 female student- teachers from Adarsha college of Education and Research, with Science as one of the method who were trained in Concept Attainment Model.
- **Finding:**

1. There was no significant difference in the competency of student-teacher in stating the aim. However, few students showed improvement while teaching during traditional teaching, even though these skills were taught directly.

2. Two student- teachers had performed better in the skill of questioning and three student- teachers performed better in the skill of explaining, one had performed better in the skill of reacting, one had performed better in the skill of stimulus variation and the students had improved in the skill of evaluation.

- **Similarities:** Concept Attainment Model is used in both the studies.
- **Differences:** Two more models are also used in present study. The samples used are 10student teachers and the subject was science in previous study. In present research the sample is class 8th standard students and the subject is Science.

**6. Researcher's Name: Rajinder Pal Kaur (1991)**

- **Title:** Effectiveness of the Bruner and Ausubel's Model for teaching of concept in Economics to high and low achieving students across creativity levels, Punjab University.
- **Objectives:**

1. To determine the teaching effectiveness of Bruner's Concept Attainment Model, Ausubel's Advance Organizer and conventional teaching in the teaching of concepts in Economic in relation to the various levels of academic achievement and creativity of students.
2. To compare the teaching effectiveness of Bruner's Concept Attainment Model and Ausubel's Advance Organizer Model.

- **Methodology:** The sample comprised 180 female senior secondary students studying in class 11th who were selected through the convenient purposive sampling technique. The tools used inductive Criterion Test , three lesson plans, Torrance test of creativity –verbal form-A, Jalotu and tendon's Group Test of General Mental Ability, Social class Scale devised by Sharma. One way and 3 way ANOVA, ANCOVA, t' test, and the pre-test –post- test control group and quasi experimental designed were used. In the case of all three groups, two experimental and one control, the treatment was executed for 20 working days. Covering one unit, each day. The three groups, two experimental and one control were matched with respect to age, intelligence, socio- economic status and Pre-test Criterion Scores.

- **Finding:**

  1. There results of one-way ANCOVA related a statistically significant difference between students who had been taught through Bruner's Concept Attainment Model and Ausubel's Advance Organizer Model and conventional teaching with respect to the score of attainment of concepts in Economics, Also Ausubel's Advance Organizer Model was more effective than conventional teaching, whereas no statistically significant difference was found in the effectiveness of the two experimental group.

  2. While applying three way ANOVA to gain scores in concepts learning in Economics among 120 students , a statistically significant different was found between the three teaching approaches where Ausubel's Advance Organizer Model was found to be more effective than Bruner's Concept Attainment Model , Bruner's model was more effective than the conventional method.

  3. Neither academic achievement nor creativity affected the gain scores of subject pertaining to the attainment of concept in Economics.

- **Similarities:** Concept Attainment Model and Advance Organizer Models were used in both the studies. ANCOVA, the statistical tool is also used in both studies.

- **Differences:** In the previous research creativity and achievement is measured. But in present study achievement is considered. In the present study Inductive Thinking Model is also used. The subject is Economics in previous study while current research is on Science subject.

**7. Researcher's Name: Vineeta Manocha.(1991)**

- **Title:** Development of Textual Material in Biology for class $9^{th}$ using Bruner's Concept Attainment Model of teaching, Devi Ahilya Vishwavidyalaya, Indore.

- **Objectives:**

  1. To develop textual material on Biology concepts for class $9^{th}$ on Bruner's Concept Attainment Model of teaching.

2. To determine the comparative effectiveness of the developed textual material in terms of reception v/s Traditional, Selection v/s Traditional , and Reception v/s Selection strategy.

- **Methodology:** The Pre-test-Post- test control experimental group designed was used. The sample of the study consisted of class 9th students of higher secondary school of Indore. The number of sample in the experimental group 1 and group 2and the control group were 36, 36, 32 respectively. The following tools developed by the researcher were used for data collection – Scale, willingness, scale for teachers and Reaction scale for Concept Attainment Model for trainee-teachers, Mean, S.D., 't' test and ANCOVA were used for the analysis of data.
- **Findings:** The reception strategy of Concept Attainment Model was significantly superior to the conventional group, when matched on the pre-test achievement scores.

  1. The Concept Attainment Model was found to be significantly superior to the conventional method of teaching Biology to class 9th students when compared to the pre- test achievement scores.
  2. The selection strategy was superior to the conventional group when matched on the pre- test achievement scores.
  3. There was no significant different between selection and reception strategy with respect to achievement scores.

- **Similarities**: In both the studies Concept Attainment Model was used.
- **Differences**: In the present study apart from the above model other two models are used. In the present study 8th std. student are used as sample and the topics are from General Science. While in previous study 9th std. students were the sample and the topic was from Biology subject.

**8. Researcher's Name: Phatak S. (1999)**

- **Title:** Efficacy of Models of Teaching, University of Pune.

  (The study was taken for 'slow learners' in special school).

- **Objectives:**

  1. To study the effectiveness of the Concept Attainment Model with reference to achievement in concept of slow learners.
  2. To study the effectiveness of Memory Training Model in developing memory skills of learner as tested on objective type achievement test in spellings.
  3. To study the effectiveness of using Assertive Training Model to train slow learners.
  4. To study the relationship between Concept Attainment Model, Memory Training Model and Assertive Training Model.

- **Methodology:** The experimental and case study method were chosen for the research study.

- **Findings:**

  1. Concept attainment Model is an effective teaching strategy for acquiring concepts in English Grammar for slow learners.
  2. The Memory training Model is effective in developing memory skills in slow learners.
  3. The Assertive Training Model was effectively used to facilitate inner personal communication ,thereby reducing stress, and anxiety
  4. There was significant relationship between Concept Attainment Model and Memory Training Model.

- **Similarities:** In the previous research and current research effectiveness of Concept Attainment Model is checked.

- **Differences:** In the previous research Concept Attainment Model and Memory Training Models were used. The study was conducted on slow learners in special school for English language. Whereas in the present research, researcher is comparing the effectiveness of three different Models of Teaching. The sample includes the student of normal school and the subject is Science.

9. **Researcher's Name: Salvi R.C. (1991)**

- **Title: A S**tudy of Effectiveness Concept Attainment Model for teaching concepts of English language, Gujarat University.
- **Objectives:**

1. To study the effectiveness of CAM in terms of
   - **a)** Attainment of concepts of English.
   - **b)** Achievement in English
   - **c)** Reductive Reasoning
   - **d)** Reaction towards CAM.
2. To compare Concept Attainment Model and Traditional Method (TM) in terms of the above mentioned (a) (b) and (c) separately, by taking intelligence, socio economic status (SES) and previous achievements in English as co-variants.
3. To study the influence of treatment, sex, self-concept and their various interactions on the above mentioned 3 dimensions separately.
4. To study the change in attitude towards English of the pupils taught through CAM and those through TM.
5. To study the change in pupil's reaction towards CAM.

- **Sample:** Purposive sample 207 pupils of grade 9 were selected from 2 schools of Ahmadabad. The age group of sample was 13-14.5 years.
- **Statistical technique:** 't' test, percentile, coefficient of variation ANOVA, chi-square test.
- **Findings:**

CAM was found to be more effective in terms of attainment of concepts of English, achievement in English, inductive reasoning and reaction towards CAM.

1. CAM was found to be significantly superior to TM in terms of attainment of concepts of English, achievement in English, inductive reasoning of pupil when the groups were matched statistically with respect to intelligence, SES, and previous achievement in English.

2. Treatment produced differential effect on attainment of concepts of English, achievement in English, inductive reasoning of the pupil.

3. Though both the groups had a significant favorable changes in attitude towards English, CAM group was superior to other group.

- **Similarities:** In the previous research there was comparison between CAM and TM. In the current research there is also comparison between three different Models of Teachings and Traditional Method.
- **Differences**: In the previous research only one Model of Teaching is compared with Traditional Method but in the current research there is comparison between three Models of Teachings and Traditional Method. The the previous research was conducted for 9$^{th}$standard student for English language and the sample was from 2 different schools. But in present research the content is from Science subject for standard 8$^{th}$ of one school.

**10. Researcher's Name: Agarwal R. and Misra K.S. (**1988)

- **Title:** Effectiveness of reception CAM for enhancing attainment of Science concepts.

  Book: Indian Educational Review Vol-23(2) 130-136)

- **Objectives:**

  To investigate the effectiveness of the Modified Reception Concept Attainment of Teaching (MRCAMOT) for enhancing the attainment of Science concept.

- **Sample:** Random sampling was adopted to select 18students studying in class 7$^{th}$ of the government girl's intermediate college Allahabad.

- **Findings:**

  1. The MRCAMOT was decidedly effective in increasing the knowledge and understanding of Science concept of class 7$^{th}$ students.

  2. It helped in student's Concept Attainment.

- **Similarities:** In the previous and current research Concept Attainment Model is used to attain the concepts in Science subject.

- **Differences:** Only CAM is used in the previous study while in current research three models are used and those are compared with traditional method.

- **Reviews from 5thSurvey of Educational Research (Vol-2)**

**11. Name of the Researcher: Gupta Suman (1991)**

- **Title:** Effectiveness of the Advance Organizer Model of Asubel in developing the teaching competencies of student –teacher and their attitude towards teaching: An experiment, Agra University

- **Objectives:**

  1. To compare the effectiveness of teaching through Advance Organizer Model and conventional method in the simulated condition in development of the teaching competence of student-teacher.

  2. To compare the effectiveness of teaching through Advance Organizer Model of Ausubel and the conventional method in real classroom conditions in the development of teaching competence of student teacher.

  3. To compare the effectiveness of teaching through Advance Organizer Model and the conventional method on the attitude of student-teacher towards teaching.

- **Methodology:** Experimental Method.

- **Sample:** The sample comprised 100 B.Ed. students from Bijnor and Dhampur teachers training college, who took Hindi as one of the teaching subject.

- **Tools:** Teacher attitude inventory of S.P. Ahluvalia, Mean, S.D. and 't' test were used to treat the data.

- **Findings:-**

  1. There existed a significant difference in the teaching competence between the experimental and the control groups of student- teachers. The effect of training on the Advance Organizer Model approach on the experimental group was visible as they had high teaching competence in the simulated condition.

2. There existed a significance difference in the teaching competence between experimental and control group. It was indicated that the experimental group was better after using AOM of Ausubel so far as teaching competence was considered in the real classroom situation.

3. There existed a significant difference in the attitude of the experimental and the Control groups of student teachers. There was the effect of AOM approach on the attitude of experimental group of student teacher.

- **Similarities:** In both the researches Advance Organizer Model is used.
- **Differences:** In the current research three models are used. The subjects in the previous research were Hindi method students of B.Ed. whereas in the current research Science subject is taught for $8^{th}$ standard students.

**12 Name of the Researcher: Kaushik (1988)**

- **Title:** The long term effect of Advance Organizer Model upon achievement in Biology in relation to reading ability, intelligence, and scientific attitude, Devi Ahilya Vishwavidyalaya, Indore
- **Objectives:**

1. To investigate the long term effect of written Advance Organizer upon the achievement of ninth grader in biology.

2. To study the effect of Advance Organizer on students of different reading abilities, intelligence and scientific attitude.

3. To study the interaction of study conditions and retentions.

4. To study the interaction of study conditions level of reading abilities, intelligence, scientific attitude and retentions.

5. To study the relative effectiveness of study conditions on immediate ability, intelligence and scientific attitude as covariance.

6. To study the relationship of reading ability, intelligence and scientific attitude with mean achievement score on immediate and delayed tests respectively of other groups' viz.-Advance Organizer Model, General introduction and additional method.

- **Methodology:** Experimental Method was used.
- **Sample:** Sixty, 9th class students of Kendriya Vidyalaya were constituted the sample.
- **Findings:**
  1. AOM facilitated immediate and delayed learning in Biology.
  2. The organization of learning material, employing the principles of progressive differentiation and integrative reconciliation, enhanced as much learning and retention as the AOM.
  3. A general introduction or an interview general proceeding the learning material in the lectures, lessons or text book was of little value as compared to AOM.
  4. Pupil with high intelligence, reading comprehension and scientific attitude derived the greatest advantage for the presentation of an Advance Organizer.
  5. General learners were also profited by AOM.
  6. The achievement of learners in Biology was found to be highly positively co-related with their intelligence, reading comprehension and scientific attitude.
- **Similarities:** In the present and previous research Advance Organizer Model is used.
- **Differences:** In the present research researcher has compared three different Models of Teaching. The sample is 8th standard students and the content is from Science subject; in the previous study the researcher had used 9th standard as sample and the subject was Biology.

**13. Researcher's Name:** Paul, Nanibala Immanuel.(2010)

- **Title:** Study of effectiveness of Concept Attainment and Concept Formation models on teaching for teaching science to 7th standard students of English medium schools in Pune City, Pune University
- **Objectives:**
  1. To find out the limitation of the traditional methodology for teaching of Science.

2. To evaluate the effectiveness of CAM and CFM on academic achievement of $7^{th}$ standard student in Science.
3. To evaluate the combined effectiveness of CAM and CFM on concept attainment test of $7^{th}$ standard student.
4. To evaluate the combined effectiveness of CAM and CFM on Science interest test of $7^{th}$ standard student.

- **Methodology:** Survey and Experimental methods were used.
- **Sample:** For this study $7^{th}$ standard students from three schools were selected.
- **Statistical Technique:** Mean, S.D. the data was analysed by Z test to find out significance of difference between mean.
- **Findings:** From survey
  1. Most of the teachers are not aware about Concept Teaching Method.
  2. Majority of the teachers who taught Science to $7^{th}$ standard had only bachelor degree in Science and minority of them had master's degree in Science
  3. All the teachers use lecture method as the main method to teach concept of Science.
  4. Majority of Science teachers said that good concept teaching bring understanding to the students and make the concept clear.
  5. Majority of Science teachers said that ineffective teaching method and inadequate use of teaching aids makes it difficult for students to understand the concepts.
- **Findings from Experiment :**
  1. There was a significant difference in the academic achievement of students when CAM and CFM models are applied to the experimental group and traditional method to the control group in the learning of science concepts.
  2. There is a significant difference in the academic achievement of girl students when CAM and CFM models are applied to the experimental group and traditional method to the control group in the learning of science concepts.

3. There is a significant difference in the academic achievement of students when CAM and CFM models are applied to the experimental group in learning science concepts.

4. There is a significant difference in the concept attainment ability of students when CAM and CFM models are applied to the experimental group.

5. There is a significant difference in the science interest of students when CAM and CFM are applied to the experimental group

- **Similarities:** In both the research Concept attainment Model is used. The methodology is also similar i.e. Survey and experimental methods are used. The content is also from Science subject.
- **Differences:** In the previous method there is comparison between Concept attainment model and Concept Formation model which are two different types of one model .Whereas in the current study the researcher has compared three different models with respect to achievement of $8^{th}$ standard students.The sample contains $7^{th}$ standard students and the researcher has selected $8^{th}$ standard students.

**14. Name of the Researcher: Pathak Rekhas A. (2010)**

- **Title:** Developing a training program or the B.Ed. students to teach the subject Science by using Models of Teaching and finding out its effectiveness**,** Pune University
- **Objectives:**

1. To find out the opinion of science teacher educators about the use of Models of Teaching by B.Ed. students while teaching in school

2. To develop and conduct a training program for Science method B.Ed. students so as to enable them to …

   **a)** Comprehend the Models of Teaching.

   **b)** Prepare lesson note for teaching in schools using Concept Attainment Model and Inductive Thinking Model and teach school students by using these lesson notes.

**c)** To study the opinion of B.Ed. students about the training program organized by researcher on Models of Teaching.

**d)** To compare student's achievement in the subject Science when taught by using Inductive Thinking Model and by Traditional Method.

**e)** To find out the willingness of B.Ed. students about the use of Models of Teaching in day today Science teaching

**f)** To prepare a handbook for B.Ed. students for teaching Science subject in schools.

- **Methodology:** Mixed method. Survey was carried out to find out the opinion of the teacher educators about the use of Model of Teaching while using in schools.

  Experimental method was used. It was conducted in three phases to see and compare student's achievement in science subject.

- **Sample:** 30 Science educators from 15 B.Ed. College from 3 zones were selected for the study.

- **Tools:** Teacher made test, percentage.

- **Findings From Survey:**

  **1.** Teacher education needs training about Models of Teaching theory and practical.

  **2.** The existing situation of Science teaching is that in most cases demonstration and lecture methods are used. Models of Teaching are not used at all in schools.

  **3.** The teacher educators suggested activities for training such as organizing lectures based on theory of Advance Organizer Model and conducting lessons on Models of Teaching.

- **Findings from Experiment:**

  **1.** The B.Ed. students had a favorable opinion regarding the training program.

  **2.** The B.Ed. students learnt to prepare lesson notes independently.

- **Similarities:** In both the research Advance Organizer model and Inductive Thinking Models are used and compared. The content is from Science subject.

- **Differences:** In the current research apart from these two models one more model is also used i.e. Concept Attainment Model. There is comparison between these three models in terms of student's achievement. In the previous research the project (lessons) is carried out by 30 different B.Ed. students, but in the present research researcher herself (single person) is teaching the content to the student.

**15. Researcher's Name: Isave Madhuri (2011)**.

- **Title:** Efficacy of integrated model based on Biological Science Inquiry Training Model and Stress Reduction Model to develop inquiry approach and reduce stress in visually impaired students, Pune University
- **Objectives:**
  1. To study the teaching-learning process involved in teaching of Biological science
  2. To develop an inquiry approach in visually impaired students by using Biological Science Inquiry Training Model.
  3. To investigate the factors related to general stress of visually impaired $6^{th}$ standard students.
  4. To use the stress reduction model on $6^{th}$ standard students to reduce stress.
  5. To analyze the students feedback about stress reduction model.
  6. To prepare an integrated model by addition of Biological Science Inquiry Training Model and stress reduction Model.
  7. To test the efficacy of integrated model to develop inquiry approach and to reduce stress in visually impaired model.
  8. To study the usability of Integrated Model.
- **Methodology**: Mixed method (survey method+ product method + experimental method)
- **Tool used for the study:**
  1. Inquiry Training Model
  2. Stress Reduction Model.

3. 3-R stress reduction program developed by researcher, interview, questionnaire

- **Statistical tool:** Mean, S.D, t' test, ANOVA, Shieffe test.
- **Major Findings:**

1. Biological Science Inquiry Training Model was significantly effective to develop inquiry approach in visually impaired students.
2. Efficacy of the integrated Model was significant to enhance the inquiry approach in visually impaired student.
3. Stress reduction model was effective to reduce general stress of visually impaired student.
4. The overall response of expert was that the integrated model was a novel idea and it was a good attempt in the area of special education.
5. The overall response of user group were that they have finally realized the usability of integrated model .They have shown the positive trend towards integrated models and its efficiency.
6. Integrated model is useful to reduce stress and to develop inquiry approach in visually impaired students.

- **Similarities:** In both the studies Models of Teaching are used. The content is from Science subject.
- **Differences:** In the previous study two models are integrated. Biological Science Inquiry Training Model and stress reduction model were used. The sample included the visually impaired students. While in the present research Advance Organizer Model, Concept Attainment Model and Inductive Thinking Model are used. The sample is from normal school.

**16. Name of the Researcher: Bhakare Lanka Arjun:**

- **Title:** Advance Organizer Model for improving reading skills of higher primary students**.**

- **Objectives:**

  1. To find out the learning difficulties of 6th standard students in basic reading skill of English language.
  2. To develop a teaching problem based on Advance Organizer Model for improving reading skill of higher primary student.
  3. To test the effect of Advance Organizer Model teaching program for improving reading skill.

- **Methodology:** Multi research method. Survey method, products develop method and experimental method.
- **Sample:** Purposive sample technique.
- **Research Design:** True experiment- two equivalent group pre -test-post- test designs.
- **Statistical technique:** S.D. 't' test.
- **Inferences:**

  1. The Advance Organizer Model program is effective to develop learner's reading skills of English language.
  2. The Advance Organizer Model program creates motivation among students to learn English language.
  3. The Advance Organizer Model strategy is effective in increasing student's achievement level in reading skills of English language.

- **Findings:**

  1. Teaching with the Advance Organizer Model was found more effective for increasing achievement level of 6th standard students in reading skills of English language.
  2. There is significant difference in academic achievement of students when Advance Organizer Model teaching was applied to experimental group students in learning reading skills of English language.

3. The Advance Organizer Model teaching program helped in developing communication skills because of sound animated pictures on screen and dialogues they read and listen.

- **Similarities:** In both the studies Advance Organizer Model was used.
- **Difference:** In the present research two more models i.e. Inductive Thinking Model and Concept Attainment Models are also used. The topic is from Science subject of $8^{th}$ standard, while in the previous research English Grammar topic of $6^{th}$ standard was taught.

**17. Researcher's Name:** Singh Daljit K. (1990)

- **Title:** A study of effectiveness of Concept Attainment Model and Inquiry Training Model on Traditional Teaching Method in the subject Human Anatomy.
- **Objectives:**
  1. To compare the effectiveness of Inquiry Training Model, Concept Attainment Model and Traditional method.
  2. To study the relation between intelligence and achievement, achievement and attitude.
- **Findings:**
  1. The scores achievement test in Concept Attainment Model and Inquiry Training Model were high as compare to Traditional method.
  2. There was no significant difference in achievement when taught by Concept Attainment Model and Inquiry Training Model.
  3. While teaching Human Anatomy it is observed that Concept Attainment Model and Inquiry Training Model are equally more effective than traditional method.
  4. There is no significant difference in achievement when taught by Concept Attainment Model and Inquiry Training Model.
  5. It is observed that there is significant relation between achievement and intelligence, achievement and attitude in the subject Human Anatomy.

- **Similarities:** In both the studies Concept Attainment Model was used in comparison with traditional method.
- **Differences:** In the previous experiment- Inquiry Training Model was also used for comparison and in the present study along with Concept Attainment Model Inductive Thinking Model and Advance Organizer models were compared with traditional method.

**18. Name of the Researcher: Devanand Sankhala.**

- **Title:** Study of effectiveness of Traditional Teaching method and Inductive Thinking Model on thinking skill development of students.
- **Objectives:**
  1. To study how learning outcomes are affected by teaching done by Traditional method and Inductive Thinking Model.
  2. To select effective teaching method for the development of thinking skills of the students.
- **Findings:**
  1. For the development of thinking skills of students Inductive Thinking Model is more effective than Traditional Method.
- **Similarities:** In both the studies Inductive Thinking Model and traditional teaching method were used.
- **Differences:** In the previous study the researcher tried to develop the thinking skills of students. But in the present study researcher has focused on achievement in academics. Here is comparison between three models and traditional method.

**19. Name of the Researcher: Kishorkumar K. Leva (2002)**

- **Title:** Study of effectiveness of Inductive Thinking Model based on the competencies of Science, on logical thinking of primary school children, South Gujarat University, Surat.

- **Objectives:**

  1. To study the effectiveness of Inductive Thinking Model based on the competencies of Science, on logical thinking of primary school children
  2. To compare the logical thinking of students from lower, medium and higher socio-economic status.

- **Findings:** The average performance of experimental group was excellent than the controlled group, it proves the usability of Inductive Thinking Model for logical thinking development**.**
- **Similarities:** In both the studies Inductive Thinking Model was used.
- **Differences:** In the previous study the researcher has selected the variable as logical thinking development and for the present research the variable is academic achievement by comparing with three models and traditional method. The sample was primary school children in the previous study while in the present study the sample is $8^{th}$ standard students.

**20. Name of the Student: Prakash Made (2007).**

- **Title:** A study of effectiveness of Inductive Thinking Model on $7^{th}$ standard students for the unit 'Area' of Mathematics subject on achievement of Jijamata Prarthamik Vidyamandir, Bhor, Pune University. Pune

  **Objectives**:

  1. To prepare the structure for lesson plan for $7^{th}$ standard students on the unit 'Area' of Mathematics subject.
  2. To compare the effectiveness of Inductive Thinking Model and Traditional Method on the achievement of students.

- **Findings:**

  1. Inductive Thinking Model was more effective than traditional method for the $7^{th}$ standard students for the unit 'Area' of Mathematics subject.
  2. The score of achievement test was more than Traditional Method when taught by Inductive Thinking Model.

- **Similarities:** In both the studies Inductive Thinking Model and Traditional methods were used and compared.
- **Differences:** The researcher compared the effectiveness between three Models and traditional teaching method. In the previous study the content from 7th standard Mathematics subject was selected but for the present study the researcher has selected the content from 8th standard Science subject total 4 chapters from textbook.

**21. Name of the Researcher: Gupta Nareshkumar. (1991)**

- **Title:** Comparative study of Concept Attainment Model and Hilda Taba's Inductive Thinking Model also study of Hilda Taba's Inductive Thinking Model's success and its scientific attitude.
- **Objectives:**
  1. To prepare and develop lesson plan based on the unit of Physics for 9th standard.
  2. To study the concepts of students, their scientific attitude and the success of Concept Attainment Model.
  3. To study the effectiveness of Inductive Thinking Model, it's success, self-concept and scientific attitude.
  4. To compare the Concept attainment Model and Inductive Thinking Model in relation with student's success.
- **Findings:**
  1. Hilda Taba's Inductive Thinking Model was more effective than Concept Attainment Model.
  2. Inductive Thinking Model is effective for the development of scientific attitude.
  3. Inductive Thinking Model and Concept Attainment Model were not effective for changing the self- concept.

- **Similarities:** In both the studies Concept Attainment Model and Hilda Taba's Inductive Thinking Model were used. Their effectiveness was calculated.
- **Differences:** For the previous research, the researcher has used 9th standard Physics Content and for current research topics of general Science from 8th standard were selected. The researcher compared the effectiveness between three Models and traditional teaching method.

**22. Researcher's Name: Singh S.N.( 1994).**

- **Title:** Comparative study of Inductive Thinking Model and Traditional Method for 11 standard students for 'Economics' subject.
- **Objectives:**
  1. To study the effectiveness of Inductive Thinking Model for 'Economics' subject and study the response of student.
  2. To compare Inductive Thinking Model and Traditional Method with respect to Concept Formation in Economics, high intelligence capacity, scientific attitude, and the success of these methods.
  3. To imagine the educational success of Inductive Thinking Model and Traditional Method with respect to above mentioned points.
  4. To study the feedback of students about Inductive Thinking Model.
- **Findings:**
  1. Inductive Thinking Model was significantly effective than Traditional Method.
  2. Positive feedback was given by students for Inductive Thinking Model.
  3. The scores of students having average intellectual ability was more in Inductive Thinking Model when compared with Traditional Method.
  4. Positive co relation was observed between educational criticism and intelligence.

- **Similarities:** In both the researches Inductive Thinking Model and traditional teaching method are used and compared. The previous researcher has selected 11th standard students and the subject was Economics.
- **Differences:** In the current research along with these models the researcher has used Advance Organizer Model and Concept Attainment Model. There was comparison between these four. In the previous study the subject selected was Economics and students were from 11th standard; whereas in the present study the students are from 8thstandard and the subject is General Science.

**23. Researcher's Name**: **Bhattacharya Gopalchandra.(1987).**

- **Title:** Study of effective teaching method for teaching Geography at secondary school level and study of effect of Concept Attainment Model and teaching by giving examples**,** Banaras Hindu University, Banaras.

  **Objectives:**

  1. To study the effect of various teaching methods used to teach Geography by using available resources in educational institute.
  2. To study the effect of Inductive Thinking Model, Concept Attainment Model on teaching of Geography at higher secondary level.
  3. To study the effect of relation between available sources at educational institute, samples of various teaching method, types of concepts, used at higher secondary level for teaching Geography and its impact to increase the scores.

- **Findings:**

  1. There was no significant difference in achievement between Concept Attainment Model and traditional method used at the institute where high resources were available. Whereas Inductive Thinking Model was significantly high in comparison with the institute where average and low resources were available.
  2. Significant success was shown by the institutes where high resources were available.

3. It is proved that Inductive Thinking Model was more effective than traditional method.

- **Similarities:** In both the researches Inductive Thinking Model and Concept Attainment Model were used. They were compared with Traditional teaching methods. He has used the Models to teach Geography subject at higher secondary level.
- **Differences:** In the present research researcher has compared between three different Models and with traditional Teaching method for Science subject at 8$^{th}$standard. He has used the Models to teach Geography subject at higher secondary level while the Models are used to teach Science in the present research.

## 2.5 Review of M. Phil. Level Researches

**1. Researcher's Name: Sohani Chitra.(1986)**

- **Title:** Comparative study of impact of Reception Oriented Model and Selected Oriented Model on Mathematics Concept of students of age 12+, having different intellectual ability, SNDT, Women's University, Mumbai.
- **Objective:**
  1. To study comparatively the effect of impact of two models on achievements of students having different intellectual ability when their previous knowledge was controlled or not.
  2. To check the impact of selected oriented model on medium intellectual level students when their previous knowledge was controlled.
- **Sample:** 48 students**.**
- **Methodology:** 2*3 factorial designs**.**
- **Statistical Technique:** ANOCOVA.
- **Findings:**
  1. There was increase in achievement when Reception Oriented Model was used.
  2. The impact of Selected Oriented Model was more.

3. Reception Oriented Model was more effective for students of age 12+.

- **Similarities:** In both the studies Models of Teaching are used**.**
- **Differences:** In previous study two types of the same Model was used at 12+ stages. The sample was 48 students and the research design was factorial method, the statistical technique used was ANOCOVA. Whereas in the present research 3 different Models are used to teach Science subject for 8th standard students. In the present research factorial design is used and statistical technique is ANOVA used.

**2. Researcher's Name: Kulkarni Sarla D. (1988)**

- **Title:** Comparative study of effectiveness of Reception Oriented Model and Selected Orientation model on 11thstandard Commerce students of different intellectual level for achievement of fundamental concepts of Account. SNDT Women's University, Mumbai.
- **Methodology:** Parallel Group Design**.**
- **Statistical Technique: 'f' test.**
- **Objective:**

1. To study the effect of Reception Oriented Model and Selected Orientation model on achievement of students.
2. To check the interaction between different teaching methods.

- **Findings:** Reception Oriented Model and Selected Orientation model were equally effective.
  - **Similarities:** In both the studies Models of Teaching are used**.**
  - **Differences:** In previous study two types of the same Model was used for 11th std. students. Whereas in the present research 3 different Models are used to teach Science subject for 8th standard students. In the present research factorial design is used and statistical technique is ANOVA used.

The researcher found many researches done at M.Ed. level in SNDT Women's University Pune Campus by using Models of Teaching. They are mentioned briefly as follows.

## 2.6 Review of M.Ed. Level Researches:

Many researches were done on Models of teaching at M.Ed. level. Some are listed below in short.

- **Madhuri Kalambe:** found that Concept Attainment Model was effective for achievement for 11th standard student for the unit 'Commerce Organization.'
- **Patil Smita:** found that Inductive thinking Model was effective for achievement of 7th standard students for the unit of 'Marathi Grammar.'
- **DivekarVaidehi:** found that effect of Bruner's Reception Orientation Model and Selected Orientation Model on concept of Mathematics of the age group 11 was significantly high.
- **Ghatpande Ashwini:** found that Bruner's Concept attainment Model was effective for teaching the unit 'Triangle' from 6th standard textbook. It was significantly effective for the low achiever's group.
- **Jadhav Ujjwala:** found that Concept attainment Model was effective for teaching the unit 'Types of Triangle' from 6th standard textbook.
- **Mane Kirti:** prepared and implemented the program based on Concept Attainment Model for 9th standard students for one unit of Economics subject. It was effective to score high marks.
- **Sonkule Meenal:** found that Inductive Thinking Model was effective for teaching Grammar topics to 8th standard students. It was effective at 0.01 level.
- **Sanaswal:** found that Reception Orientation Model and Selected Orientation Model were equally effective for teaching Geography subject. There was no difference on achievement regarding gender.
- **Kirti Malusare:** prepared a program based on Concept Attainment Model and implemented it. There was significant improvement in scores of students.
- **Gaikwad Sarita:** found that Concept attainment Model was effective for teaching Geography one unit from 7th standard textbook.

- **Gite Suvarna:** found that Inductive thinking Model was effective for teaching Marathi Grammar topics to 8th standard students. It also increased the scores of students.

Many researches were done at M.Ed. level by using any one Model of Teaching. It was effective.

## 2.7 Reviews from Journals:

1. **Journal of Educational and Psychological Research.** Vol-5, Number-1, January 2015 page (1-4)

   **Effect of Hilda Taba's Inductive Thinking Model on Achievement in Punjabi Grammar at Secondary School Stage.—Dr. Franky Gupta & Amandeep Kaur.**

- **Objectives:**
  1. To develop lesson plans in Punjabi Grammar on the basis of Taba's Inductive Thinking Model.
  2. To compare the mean achievement gain score of the groups thought through Inductive Thinking Model and conventional method of teaching.
  3. To compare the mean achievement scores of the boys and girls on the experimental group.
- **Sample:** 80 student of 9th standard of government school.
- **Research** tools: Pre achievement test, lesson notes based on Inductive Thinking Model and Post achievement test
- **Statistical Technique:** Mean, Standard Deviation and t test.
- **Conclusion:**
  1. The student taught through Inductive Thinking Model shows better performance than their counterpart
  2. The performance of both the gender was same.

2. **Journal of Educational and Psychological Research.** Vol-5, Number-1, January 2015 page (95-102)

   **Effect of Advance Organizer Model and Concept Attainment Model on Achievement in Punjabi in relation to Styles of Learning and Intelligence.** Parvinder Kamboj.

- **Objectives:**

  1. To compare the achievement of groups thought through Advance Organizer Model and Concept Attainment Model of Teaching.
  2. To study the achievement of students having different styles of learning and thinking.
  3. To examine the interaction effect between models approach of teaching,styles of learning and intelligence.

- **Design:** Factorial Design.
- **Sample:** 240 students from 9th standard had taken from 4 government schools of Abhor town-Punjab.

  1. The achievement of group through Advance Organizer Model was found to be significantly higher than that of the group taught through Concept Attainment Model of teaching.
  2. The group with different styles of learning and thinking did not interact significantly with high, average and low level of intelligence on achievement scores.

3. **Shikshan Tarang - Vol-7th, Issue 8th, Month – April 2016.**

   **Advance Organizer Model and Teaching of English grammar-Minakshee Suryavanshi.**

This was a theoretical article published in the above mentioned journal in Marathi language. The writer has explained the meaning and definition of Models of Teaching, all the four families of Models. She has also explained the importance, and benefits of Models. This article also focuses on how Advance Organizer Model is useful to teach the topics of English Grammar.

4. **Shikshan Sankraman: - Issue- 10. April-2017 (page 37-39)**

**Advance Organizer model in Teaching of Science.—Shobha Vijaykumar Patil.**

In the above mentioned article the writer has mentioned what is meant by Models of teaching, Advance Organizer Model, the objectives of this Model, syntax of the Model, merits and demerits of this Model. She has also explained about how to teach effectively by using Advance Organizer Model.

5. **Shikshan Samiksha**: - Issue-3rd,August-September-2015 (page No. 103-106)

**Utility of Concept Attainment Model in teaching of Sanskrit Grammar.—** Ketaki Siras

- **Objectives:**
  1. To prepare the lesson notes based on Concept Attainment Model.
  2. To teach the control group by traditional method.
  3. To teach experimental group by using Model
  4. To take pre-test and post-test and compare it.
- **Tools used:**
  1. Pre-test.
  2. Post-test
  3. Lesson notes based on Models
  4. t test.
- **Statistical technique:** Mean, Standard Deviation, t test.
- **Conclusion:** Concept Attainment Model was more effective than traditional Teaching.

6. **Bharatiy Shikshan:** Issue-8th August-20 16. (Page No. 28-29).

**Use of Inquiry Training Model in Teaching of Geography -- Vijay Chaudhari.**

- **Objectives:**

  1. To help students to create hypothesis for some concepts in Geography.
  2. To help students to find answers about some topics.
  3. To help students to ask questions to satisfy their curiosity related to content of Geography**.**

In this article the writer has explained the meaning of Inquiry Training Model, syntax of the Model, Social System, principles of reaction and support system. The writer has also explained in detail about the benefits and limitations of the Model.

## 2.8 Review from Online Articles/ Researches:

1. **https://www.slideshare.net.>Aileen Asim**

   On this website the researcher came across one power point presentation, which includes following points.

   1. What is Teaching Model?
   2. Concept of Teaching Models
   3. Functions of Teaching Model
   4. Types of Models
   5. Information Processing Model
   6. Types of Information Processing Model
   7. What does our memory have?
   8. Information Processing Model of memory.

2. **https://www.slideshare.net .> Deepty Gupta**

   **Models of Teaching–Plans, Patterns and Blue Print.** The power point presentation focuses on following points.

   1. History
   2. Characteristics of Models of Teaching.

3. Functions of Models of Teaching.
4. Families of Models of Teaching.
5. Advantages of Models of Teachings.
6. Fundamental elements of Models of Teaching.
7. Concept Attainment Model in detail.

**3. www.vkmaheshwari.com – Dr. V. K. Maheshwari & Mrs. Sudharani Maheshwari.**

This article was very useful to understand theoretical points like..

1. Characteristics of Teaching Models.
2. Fundamental elements of Teaching Model.
3. Types (families)of Teaching Models.

## 2.9 Review of Related Researches at a Glance:

**A. Ph.D. Level**.-- All the researchers have used Experimental method.

**Table No. 2.1**

**Review of Related Researches – Ph.D. level.**

| Sr. No | Name of the researcher | Source | Title of the study |
|---|---|---|---|
| **1.** | Chittriv Udhhav G. | 4th survey of Educational Research. | Evaluating differential Effectiveness of Ausubel and Bruber strategies for acquisition of concepts in Mathematics. |
| **2** | Bhattacharya G.C. | 4th survey of Educational Research. | Effectiveness of various Models of Teaching Geography in relation to Instructional resources |
| **3** | Sushma | 4th survey of Educational Research. | Effectiveness of Concept Attainment Model and Biological Science enquiry model for teaching Biological Science of class 8th. |

| Sr. No | Name of the researcher | Source | Title of the study |
|---|---|---|---|
| **4** | Baveja B | 4th survey of Educational Research. | An Experimental study of Information processing Model of teaching in school of India. |
| **5** | Kamlesh Chaudhari | 5th survey of Educational Research. | Teaching of Concept through the Concept Attainment Model and facts through traditional teaching competency in teaching skills of pre-service teachers. |
| **6** | Rajinder Pal Kaur | 5th survey of Educational Research. | Effectiveness of Bruner and Ausubel's Models of Teaching of concepts of Economics to high and low achieving students across creativity level. |
| **7** | Veenita Manocha | 5th survey of Educational Research. | Development of textual material in Biology for the class 9th using Bruner's Attainment Model of Teaching. |
| **8** | Phatak S. | Savitribai Phule Pune University. | Efficacy of Models of Teaching. |
| **9** | Salvi R.C. | 5th survey of Educational Research. | A study of effectiveness of Concept Attainment Model for teaching concepts of English language. |
| **10.** | Agarwal R. & Misra K.S. | Indian Educational Review vol. 23(2) 130-136 | Effectiveness of reception CAM for enhancing attainment of science concepts |
| **11** | Gupta Suman | 5th survey of Educational Research. | Effectiveness of the Advance Organizer Model of Asubel in developing the teaching competencies of student –teacher and their attitude towards teaching: An experiment. |

| Sr. No | Name of the researcher | Source | Title of the study |
|---|---|---|---|
| **12** | Kaushik | 5th survey of Educational Research. | The long term effect of Advance Organizer Model upon achievement in Biology in relation to reading ability, intelligence and Scientific attitude. |
| **13** | Paul,Nanibala Immanuel | Savitribai Phule Pune University. | Study of Effectiveness of Concept attainment and Concept formation models of teaching for teaching Science to 7th standard students of English medium schools in Pune city. |
| **14** | Pathak Rekha. | Savitribai Phule Pune University. | Developing a training program for the B.Ed. students to teach the subject Science by using Models of Teaching and finding out its effectiveness. |
| **15** | Isave Madhuri | Savitribai Phule Pune University. | Efficacy of integrated model based on Biological Science Inquiry Training Model and stress reduction Model to develop inquiry approach and reduce stress in visually impaired students. |
| **16** | Bhakare Lanka Arjun | Savitribai Phule Pune University. | Advance Organizer Model for improving reading skills of higher primary students**.** |
| **17** | Singh Jaljit K. | | A study of effectiveness of Concept Attainment Model and Inquiry Training Model on traditional teaching method in the subject Human Anatomy |
| **18** | Devanand Sankhala | | A study of effectiveness of Traditional Teaching Method and inductive Thinking model on thinking skills development of students. |

| Sr. No | Name of the researcher | Source | Title of the study |
|---|---|---|---|
| **19** | Kishokumar k. Leva | Suoth Gujarath University, Surat. | A study of effectiveness of Inductive Thinking Model based on the competencies of Science, on logical thinking of primary school children. |
| **20** | Prakash Made | Savitribai Phule Pune University. | A study of effectiveness of Inductive Thinking Model on 7$^{th}$standard students for the unit 'Area' of Mathematics subject on achievement of Jijamata Prarthamik Vidyamandir, Bhor. |
| **21** | Gupta Nareshkumar | | Comparative study of Concept Attainment Model and Hilda Taba's Inductive Thinking Model also study of Hilda Taba's Inductive Thinking Model's success and its Scientific attitude. |
| **22** | Singh S.N. | | Comparative study of Inductive Thinking Model and Traditional method for 11$^{th}$ standard for 'Economic' subject. |
| **23** | Bhattacharya Gopalchandra | Banaras Hindu university | Study of effective teaching method for teaching Geography at secondary school level and study of Concept Attainment Model and teaching by giving example. |

**B. At M. Phil. level**

**Table 2.2**

**Review of Related Researches–M.Phil. Level**

| Sr. No. | Name of the Researcher | Source | Title of the Study |
|---|---|---|---|
| **1** | Sohani Chitra | SNDT Library, Karve Road, Pune . | Comparative study of impact of Reception Oriented Model and selected Oriented Model on Mathematics concepts of students of age 12+. having different intellectual abilities. |
| **2** | Kulkarni Sarla D. | SNDT Library , Karve Road, Pune . | Comparative study of effectiveness of Reception Oriented Model and Selected orientation Model on $11^{th}$ standard Commerce students of different intellectual level for achievement of fundamental concepts of a Accounts. |

**C. Journals:**

**Table No. 2.3**

**Review of Related Researches– from Journals**

| Sr. No | Name of the researcher | Source | Title of the study |
|---|---|---|---|
| **1** | Dr. Franky Gupta & Amandeep Gupta | Journal of Educational and Psychological Research. | Effect of Hilda Taba's Inductive Thinking Model on achievement in Punjabi Grammar at secondary school stage. |
| **2** | Pravinkumar Kamboj | Journal of Educational and Psychological | Effect of Advance Organizer Model and Concept Attainment Model on achievement in Punjabi |

| | | | |
|---|---|---|---|
| | | Research. | in relation to style of learning and intelligence. |
| **3** | Minahshee Suryavanshi | Shikshan Tarang, April 2016 | Advance Organizer Model and teaching of English Grammar. |
| **4** | Shobha Vijaykumar Patil | Shikshan Tarang, April 2017 | Advance Organizer Model in teaching Science. |
| **5** | Ketaki Siras | Shikshan Samiksha, Aug. Sept 2015. | Utility of Concept Attainment Model in teaching of Sanskrit Grammar. |
| **6** | Vijay Chaudhari. | Bahratiy Shikshan, Aug 2016. | Use of Inquiry Training Model in teaching of Geography. |

**D. Online References:**

**Table No. 2.4**

**Review of Related Researches – Online Researches**

| Sr.No. | Name of the Researcher | Source | Title of research |
|---|---|---|---|
| **1** | Dr. V.K. Maheshwari & Mrs. Sudharani Maheshwari | www.vkmaheshwari.com | Models of Teaching |
| **2** | Deepti Gupta | www.slideshare.net | Models of Teaching-Plan, Patterns and Blueprint |
| **3** | Aileen Asim | www.slideshare.net | Teaching Models. |

## 2.10 Closure:

After going through various researches at different levels and by referring the related books the researcher came to know the different ways of sample selection, how to frame the objectives, how to select and implement the appropriate research

design and methodology. By referring various theses the researcher came to know that the subject which she has selected is fresh, novel and untouched. So the researcher has finalized the title of her research i.e. **Comparative Study of Models of Teaching on Achievement of 8th Standard Students.**

❑❑❑

# CHAPTER - III

## PLAN AND PROCEDURE OF RESEARCH METHODOLOGY

### 3.1 Introduction:

It is said that need is the mother of investigation. And research is the systematic way of investigation**.** It is the process of discovering new knowledge**.** Research is also considered as searching for and gathering information, usually to answer a particular question. In fact, research is an art of scientific investigation.

### 3.2 Types of Researches:

Research is basically classified into three types such as Fundamental Research, Applied Research and Action Research.

**3.2.1 Fundamental Research:** "Fundamental Research is mainly concerned with generalization and with formulation of theory. It is Gathering of knowledge for knowledge sake." (Kothari1985:3). This type of research generally has no immediate or planned application.

**3.2.2 Applied Research:** "Applied Research is concerned with improving a product or a process and testing theoretical concept in an actual problem situation."(Best & Kahn 2003:33). Most of the Educational researches are applied because it deals with teaching and learning process.

**3.2.3 Action Research:** "Action Research is focused on immediate application and not on development of theory. Its primary aim is to improve a practice" (Parson& Brown 2002:6). Action Research is a part of teacher's professional life.

### 3.3 Methods of Educational Research:

Research methods are of utmost importance in a research process. They describe the various steps of the plan of action to be adopted in solving a research problem. Educational research methods are classified as follows.

**3.3.1 Historical Research:** "Historical research is the systematic collection and evaluation of data to describe, explain and thereby understand action or events that occurred sometimes in the past and has a reference in the present." (Fruenkel & Wallen 2006:545).

**3.3.2 Quantitative Research: "**Quantitative Research is the research in which the results are presented as quantities of numbers (that is statistics). It uses quantitative method to describe, record analysis and interpret conditions."(Pattens:2000: 19)

**3.3.3 Qualitative Research: "**Qualitative research involves direct engagement with the participants and the environment to obtain an in depth description and interpretation of behaviour. It uses non- quantitative method to describe relationship between variables". (McMillan & Wergin 2002:6)

**3.3.4 Experimental Research: "**Experimental Research truly tests hypothesis concerning cause and effect relationship. It represents the most valid approaches to the solution of Educational problems, both practical and theoretical and to the advancement of Education as a Science" (Mertens: 1998:60)

"An experimental research describes what will be, when certain variables are carefully controlled or manipulated. The focus is on variable relationship. Deliberate manipulation is always a part of experimental method."(Best & kahn:2003:22)

**3.3.5 Survey Research: "**The purpose of survey is to describe the attitude, believes, views and behaviour of population or a sample".(Patten: 2000:9)

## 3.4 Method of Study:

In the present research Survey and Experimental methods were used. The survey method was used to find out the existing condition about the use of various teaching methods and use of Model of Teaching. Also it aimed to find out the teaching of concepts in Science subject and limitations of traditional methods used to teach Science subject. The researcher had prepared a questionnaire based on 8$^{th}$ standard Science content and other relevant questions. To prepare this questionnaire

the researcher took the guidance of her guide and subject experts of Science. The questionnaire was given to 54 Science teachers who teach Science for 8th standard in English medium(19 schools) and some Marathi medium (5 schools) but semi English division in Pune city.

**Table No. 3.1**

**Product Development Method- Steps**

A-Lesson notes based on Models of Teaching

B- Evaluation sheet for Lesson notes based on Models of Teaching.

| Sr. No. | Title | Description |
|---|---|---|
| **1** | Name of the Product | A- Lesson notes based on Models of Teaching.(Advance Organizer Model, Concept Attainment Model and Inductive Thinking Model.)<br>After conducting the survey the units were selected for teaching by using Models of Teaching. The units selected were- Diseases, Metals and Non Metals, Air and Soil from 8th standard Science textbook of S.S.C. board.<br>B- Evaluation sheet for Lesson notes based on Models of Teaching.<br>To get uniformity in evaluation of lesson notes from experts. The researcher prepared 3 evaluation sheets based on the framework of Models of Teaching. |
| **2** | Objectives of Product | A-To teach the lessons according to the syntax of Models of Teaching.<br>B- To maintain the uniformity in evaluation of lesson notes based on Models of Teaching. |
| **3** | Nature of the Product | A- The lesson notes are in print form covering the content of selected units. The lesson notes are framed according to framework of Models of Teaching.<br>B- The evaluation sheets are in print form attached at the end of each type of lesson note. |

| | | |
|---|---|---|
| **4** | Development of Product | A- The product was developed according to syntax of each different 3 Models of Teaching. The same content was framed as per the 3 different Models. |
| **5** | Description of Product Development | A- Each lesson note contains the information about Models of Teaching, subject name, unit, subunit, objectives, detail lesson note with teacher-student interaction and syntax of Model, questions for evaluation, support system, instructional and nurtarant effects etc.<br>B- The evaluation sheets were framed according to structure of each Model. |
| **6** | Reliability and validity of product | A- Each lesson note of Models of Teaching was checked by 4 experts including guide. The experts were Ph.D. guide and some of them have worked on Models of Teaching. |
| **7** | Modification in the product | A-The researcher made the changes suggested by the experts. The suggestions were based on the syntax of Models and overall implementation of Models of Teaching.<br>So the modifications were also implemented while teaching by the researcher. The details of suggestions are given in point 3.13.9<br>B- The researcher made the changes in evaluation sheets also. |
| **8** | Finalization of the product | A- After considering the suggestions given by experts the lesson notes were finalized. There are total 12 lesson notes prepared according to 3different Models. Total 4 lessons were selected from $8^{th}$ standard Science text book. |
| **9** | Utility (Execution of the experiment) | The three experimental groups were taught by using Models of Teaching.<br>For Div.-A- Advance Organizer Model.<br>For Div.-B- Concept Attainment Model.<br>For Div.-C- Inductive Thinking Model. |

| | | |
|---|---|---|
| **10** | Correlation between objectives and findings | The program was conducted for objective No. 2, 3,4&5. It was found that there was significant difference in achievement of students in Science subject. |
| **11** | Conclusion | It was observed that Models of Teaching were effective for learning. Concept Attainment Model was most effective, followed by Inductive Thinking Model and Advance Organizer Model. All 3 Models were significantly effective than traditional teaching method. |

In the current research the researcher taught the three divisions by using Models of Teaching and to the fourth traditional teaching method was used by subject teacher. The experimental method was aimed at finding the effectiveness of Advance Organizer Model, Concept Attainment Model and Inductive Thinking Model to teach Science subject to 8$^{th}$ standard students. The purpose of this research was to test the effectiveness of Advance organizer Model, Concept Attainment Model and Inductive Thinking Model and to compare its effectiveness among them and with traditional teaching method.

### 3.5 Experimental Design:

**"**The design of the study is the arrangement of the conditions for the collection and the analysis of data. The research design constitutes the blue print for the collection, measurement and analysis of the data." (Kothari:1985: 39). There are various types of experimental designs but a true experimental design was chosen for the present study.

"In a true experiment the equivalence of the experimental and control group is provided by random assignment of subjects to experimental and control treatment. Although it is difficult to arrange a true experimental design, particularly in school-classroom research. It is the strongest type of design and should be used whenever possible."(Best & Kahn 2003:174). There are various types of true experiment designs but for this research pre-test –post –test equivalent group design was selected for the present research the researcher has selected the following methods

- **Multi Method**: Survey method + Product Development (preparation of lesson plans based on Models of Teaching) + Experiment method.

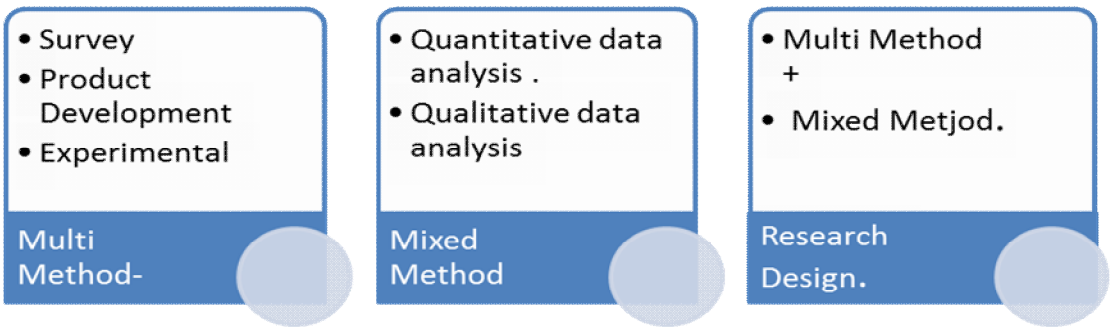
Multi method research means use of more than one method in one's research work. It is defined as "the systematic study of designing, developing and evaluating instructional programs, process and products that must meet the criteria of internal consistency and effectiveness". As per the method the researcher first conducted a survey to check the present status of use of Models of Teaching in teaching of Science. The questionnaires were filled by the Science teacher of 8th standard. After the analysis of data collected through survey, the researcher prepared the lesson plans based on Models of Teaching, and taught the selected content accordingly. The effect of controlled group and experimental groups were calculated. Thus the multi-method was applied in a systematic manner.

### 3.5.1 Pre- test Post-test Equivalent Group Design: -

Here four equivalent groups were selected for the study. Three groups were experimental and the fourth was controlled group. The groups were already made equivalent by the school. The researcher used Models of Teaching method for the experimental group and traditional teaching method was used for the control group by the school teacher.

**Figure No. 3.1**

**Multi and Mixed Method.**




## 3.6 Variables:

Variables are conditions of characteristics that the experimenter manipulates, controls or observes. If one variable depends upon or is consequence of the other variable it is termed as dependant variable and the variable that is antecedent to

dependant variable, it is termed as an independent variable. The variables that are not related to the purpose of the study, but may affect the dependant variable are termed as extraneous variables. (Best& Kahn 1982:59)

The present study is intended to study the effectiveness of Models of Teaching and compare it among them. Therefore the independent variables are the Models- Advance Organizer Model, Concept Attainment model and Inductive Thinking Model taught by researcher to the students.

- **Selection of dependent variable-** The dependent variable in this study are marks scored in achievement test. The achievement test is designed by the researcher.

### 3.7 Experimental Validity:

While conducting the research, there are some factors which are out of control of the researcher; these are called as extraneous factors. These factors can- not be completely eliminated, but precaution can be taken to minimize their effect. In the present research the interest of students in Science subject and the administration of school were the extraneous factors, which the researcher could not control.

#### 3.7.1 Internal Validity:

**3.7.1.1 Maturation:** Over the time the subject may change biologically and psychologically**.** In the present research the treatment was given simultaneously to all the groups. The period of teaching was same for all. So if there is any change due to maturation, then it would be same for all divisions. As there were four equivalent groups, the threat got controlled.

**3.7.1.2 History:** Many stimulating or disturbing effects can be seen on the performance of students, while conducting the experiment**.** –This threat is controlled by using four equivalent groups. The effect would be same on experimental and controlled group.

**3.7.1.3 Testing:** Pre-testing may produce a practice effect making subject more adept in next test performance. In the present study experimental and controlled groups were there, four equivalent groups were made. So they all could get

affected in similar manner. So having experimental and controlled groups automatically controls this threat.

**3.7.1.4 Unstable Instrumentation:** If unreliable instruments or techniques are used to measure the aspect of students, then validity gets affected. – For the present study all the treatment to all three experimental groups were given by the researcher herself. And for the fourth group, the regular subject teacher taught the content to respective class. For this research no extra hand or assistant was used by the researcher. Also for preparation of questionnaire guidance was taken from guide timely. And pilot testing of questionnaire was done. For lesson plan checking, each lesson note was checked by three different experts and by guide also. All the suggested changes were made by the researcher. It can support to minimise such threat**.** All precautions were taken to minimise the unstable Instrumentation effect.

**3.7.1.5 Experimental Mortality:** Loss of subjects during the period of experiment can cause such type of threat —In the present research only those samples were considered who have given pre-test, attended all experimental treatment and have given post-test. For this, the researcher has selected a large group and only those students were included in sample those were present for the experiment.

### 3.7.2 External Validity:

Education is the branch of Social Science. The studies are conducted in real classroom instead of laboratories. So they do not automatically result in externally valid research. Some factors which affect the external validity are -

**3.7.2.1 Interference of Prior treatment:** In an Educational experiment learning produced by the first treatment is not completely erased, and its influence may occur on second treatment – In this research it is found in pre-test that no such treatment was given previously, as the marks scored in pre-test are very less. Soall the groups were fresh for the treatment. Because of selection of experimental and controlled group, the threat got minimised.

**3.7.2.2 The Artificiality of the Experimental Setting:** Sometimes the researcher imposes careful controls that can create an artificial atmosphere, which is not

like the expected natural environment. – But in the present study no such effort was made by the researcher at any stage. All the time the atmosphere in the class was healthy, motivating and interactive. This was helpful for better understanding.

**3.7.2.3 Interaction Effect of Testing:** The use of pre-test in the beginning of study can make student aware for the subsequent test. Here the pre-test makes student alert about post-test.—To overcome this problem the researcher has selected the controlled group also; whatever the effect of pre-test will occur on experimental group, the same effect will occur on controlled group. So in this way the threat was reduced.

**3.7.2.4 The Extent of Treatment Verification:** Most of the researchers have research assistant or others who are not directly involved in framing the hypothesis. This leads to the threat of external Validity.— In the present study there is no scope for such threat, because the researcher herself has framed the objective and hypothesis and implemented the program. There was a deep involvement of the researcher in each activity of the research.

## 3.8 Types of Sampling Procedure:

Sampling is the process of selecting the individuals for a sample. The different methods of sampling are as follows.

1. **Simple Random Sample –** It is one in which each and every member of the population has an equal and independent chance of being selected."(Best & Kahn 2003)
2. **Random Number Sample –** It is one where the individuals are chosen by the use of a table of random numbers.(Best & Kahn 2003)
3. **Systematic Sample –** Every $n^{th}$ individual in the population list is selected for inclusion in the sample. (Best & Kahn 2003)
4. **Stratified Random Sample –** It is the process in which certain sub groups or strata are selected for the sample in the same proportion as they exist in the population. (Best & Kahn 2003)

5. **Area or cluster Sample –** It is the selection of groups or cluster of subject rather than individuals. (Best & Kahn 2003)

6. **Non Probability Sample –** It is the selection of whatever subjects available rather than following a specific subject selection process. (Best & Kahn 2003)

**3.9 Sample Procedure for the Present Study:** Non Probability – Purposive sample.

- **Sample:** The primary purpose of the research is to discover principles that have universal application, but to study a whole population in order to arrive at generalization would be impractical (Best& kahn:2003:26). Therefore one of the most important steps in the research process is the selection of sample of individuals who will participate in the research. The 8th standard students of Abhinav English Medium school, Ambegaon. Pune were chosen as the sample for the study.

### 3.9.1 Number of Students in Controlled and Experimental Group.

**Table No. 3.2**

**Sample Size**

| No. | Division | Model of Teaching | No. of Students |
|---|---|---|---|
| **1** | A | Advance Organizer Model | 49 |
| **2** | B | Concept Attainment Model | 46 |
| **3** | C | Inductive thinking Model. | 48 |
| **4** | D | Traditional Teaching Method. | 47 |

In all total 190 students were selected from four divisions. The experimental group has 143 students and control group has 47 students.

### 3.10 Research Tool:

To carry out any research different tools were used to gather the data, to test the hypothesis and to draw conclusions. Each tool is appropriate for collection of certain type of information. Since the purpose of the present research is to find out the effectiveness of Models of Teaching in terms of academic achievement following tools were used.

**3.10.1 Questionnaire:** A questionnaire was prepared to check the present status of use of Models of Teaching (for objective no. 1). Total 18 questions were included in it. Some personal information, experience and other teaching related questions were framed. These questionnaires were filled from 54 Science teachers teaching to $8^{th}$ standard students in S.S.C. Board English Medium schools.

**3.10.2 Achievement Tests:** An achievement test was prepared, based on 4 chapters.(Metals and Non-metals, Diseases, Air and Soil) .The test was given before teaching to all 4 divisions and post-test was also conducted after teaching.

### 3.11 Statistical Tools:

The role of statistics in research is to function as a tool in designing research, analyzing its data and drawing conclusion there from. (Kothari1985:162). Most research studies result in a large volume of raw data which must be suitably reduced so that the same can be read easily and can be used for further analysis.

The statistical tools used for the further analysis were-

**3.11.1 Percentage:** Percentage was used for analysis of data collected through survey.

**3.11.2 Mean:** Mean was used to find the average of each experimental and control group.

**3.11.3 Standard Deviation:** It was used to know the spread of scores.

**3.11.4 Standard Errors of the Difference between the Means: -** It was used to find out the deviation of the sample mean from the population mean.

**3.11.5 t-test:** It was used to compare mean scores of control and experimental groups in post-test.

**3.11.6 Kurtosis:** It was used to test Normality of control and experimental group data during post-test.

**3.11.7 Skewness:** It was used to test Normality of control and experimental group data during post-test.

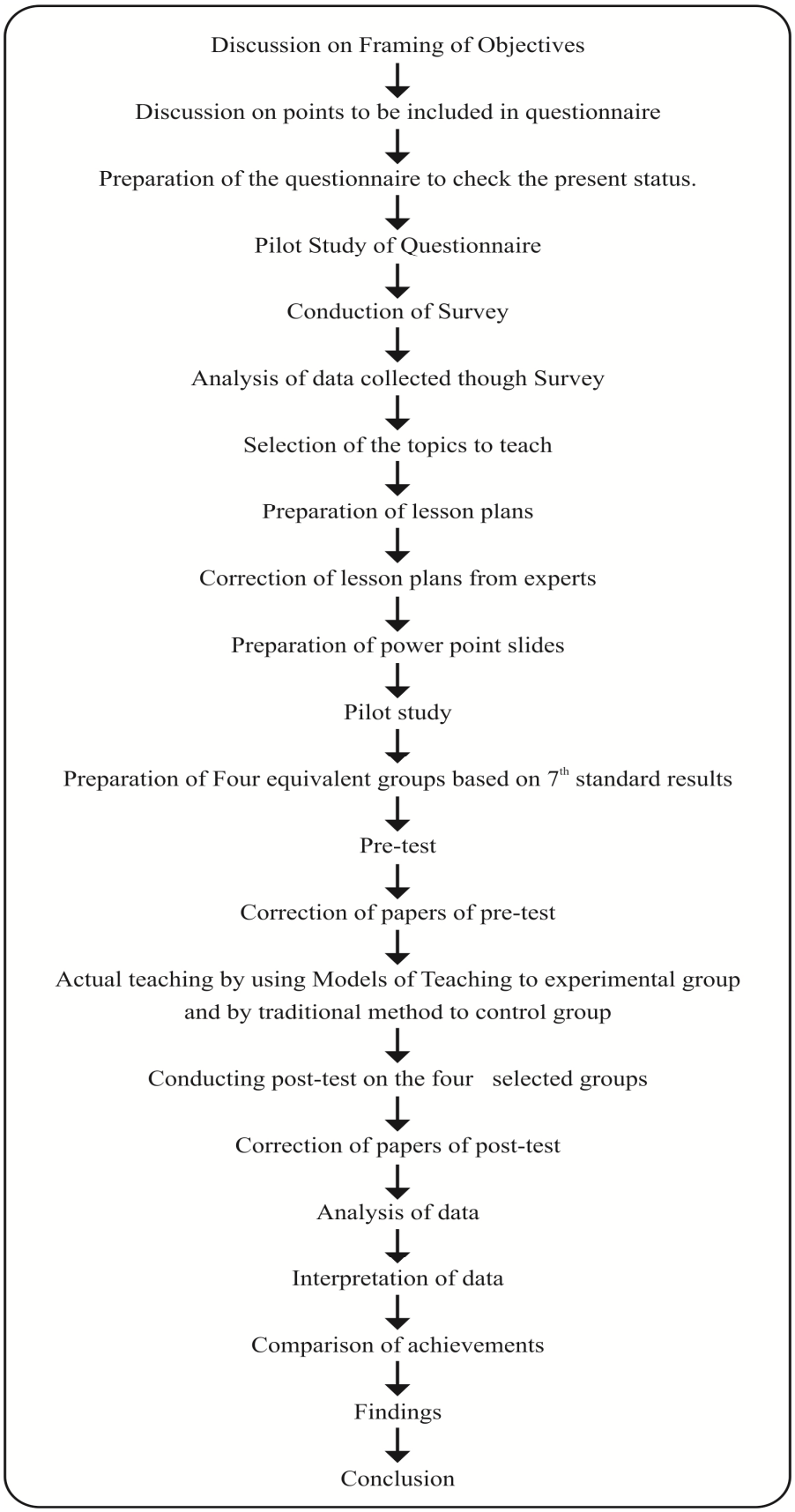
**3.11.8 Levene's Test of Equality:** It was used to ascertain homogeneity of variance between control group and experimental group data in post-test.

**3.11.9 ANOVA** was used to find to the significance of the difference between the mean.

## 3.12 Flow Chart of the Study:

**Figure No. 3.2**

**Flow Chart of the Study**



### 3.13 Details of Each Step:

**3.13.1 Discussion on Framing of Objectives: -**Every activity should be goal oriented. If the objectives are framed properly in the beginning, then it gives appropriate direction towards the goal. The researcher discussed with the guide and framed the following objectives.

1. To find out the present status about the use of Models of teaching in classroom teaching.
2. To find out the effectiveness of Advance Organization Model on achievement of $8^{th}$ std. student in Science subject.
3. To find out the effectiveness of Concept Attainment Model on achievement of $8^{th}$ std. student in Science subject.
4. To find out the effectiveness of Inductive Thinking Model on achievement of $8^{th}$ std. student in Science subject.
5. To compare the effectiveness of Models of Teaching with Traditional Method on achievement of $8^{th}$ std. student in Science subject.

**3.13.2 Discussion on points to be included in the Questionnaire:** In the beginning the researcher read the related literature and some research thesis, related to the selected topic. From that she came to know how to prepare the questionnaire and which questions should be added. The researcher took guidance of research guide about how to frame the questions, what should be the sequence, which question should be open ended and which should be closed ended. After such discussion the researcher prepared and finalised the questionnaire. The questionnaire was checked by subject expert.

**3.13.3 Preparation of the Questionnaire to Check the Present Status:** The first objective of this research was to check the present condition of awareness and implementation of Models of Teaching in classroom teaching. A questionnaire was prepared which included the questions to check the knowledge of teachers about Models of Teaching and its implementation in classroom teaching. The first few questions were related to personal information. Then some closed

ended and some open ended questions were included in the questionnaire. The final draft of questionnaire was prepared under the guidance of guide.

**3.13.4 Pilot study of Questionnaire**: The questionnaire was given to 5 Science teachers who teach Science subject to 8th standard in S.S.C. board English Medium Schools. According to their suggestions the sequence of some questions were changed, and the framing of sentences were also simplified.

**3.13.5 Conduction of Survey:** The questionnaires were given to fill to the subject teachers who were teaching Science subject to 8th standard. Many teachers were teaching in English medium Schools (19) and some were teaching in Marathi Medium schools but to semi-English divisions (5). The data was collected through 54 questionnaires filled by Science teachers. The name of schools and number of respondents are given in appendices.

**3.13.6 Analysis of Data collected though Survey:** The data was collected from 54 Science teachers teaching in 24 different Schools in different areas of Pune city. The data was analysed in quantitative and qualitative form. The detailed analysis according to each question is given in chapter 4.

**3.13.7 Selection of the topic to teach:** The questionnaire which was prepared by the researcher was given to 54 Science teachers who teach to 8th standard. One question was there that suggest the suitable Model of Teaching for each chapter. Very few teachers were aware about the Model of Teaching, most of teachers considered it as a teaching aid like chart, object, model etc. The responses given to this question clearly reflects that most of the teachers are not using Model of Teaching in their classroom teaching. The response of teacher could not become much helpful for selection of content; therefore the researcher discussed with guide and subject experts about the selection of chapters for teaching by using Model of Teaching. One precaution was taken that the same content can be taught by using three different Models of Teaching. So the content was chosen from general science and not from any particular branch of Science- like pure Chemistry, Physics or Biology. The

chapters selected for the present research were –Disease, Metals and Non-Metals, Soil and Air.

**3.13.8 Preparation of lesson plans:** As the chapters were selected the researcher studied the Models of teaching from various books in detail. The researcher tried to understand the format, syntax, merits, instructional and nurtarant effects, social system and support system of the Models of Teaching. The content of the lesson was framed according to the syntax of the particular Model. The precaution was taken that there should be proper interaction between the students and the researcher. The same content was taught by using three different Models, for this the chapters were selected in such a way that they can fit in the framework of selected Models. As a teaching aid power presentation was prepared. It was used as support system; some pictures were shown on it to make the content clear. The researcher prepared 12 lesson plans in all. The whole of the 4 chapters were selected for each Model.

**3.13.9 Correction of lesson plans from experts:** For content validity all the lesson plans were checked by the experts. The experts were-

**Table No. 3.3**

**Name of Experts**

| Name of the Model | Name of Expert |
|---|---|
| **Advance Organizer Model** | **Dr. Neha Dev**<br>HOD, College of Education, (M.Ed.), SNDT, Pune. |
| | **Dr. Mrudula Ranade**<br>Associate Prof. College of Education (M.Ed.), SNDT, Pune. |
| | **Dr. Surekha Bhagyavant**<br>Asst. Prof. College of Education(M.Ed.), SNDT, Pune. |
| | **Dr.Dattatreya Tapkeer (Guide)**<br>Assist. Prof. College of Education (B.Ed.), SNDT, Pune. |

| | |
|---|---|
| **Concept Attainment Model.** | **Dr. Sanjeevani Mahale**<br>Associate Prof. Education Dept. YCMOU, Nasik |
| | **Dr. Sangita Shirode**<br>Asst. Prof. College of Education (B.Ed.), SNDT, Pune. |
| | **Dr. Lalita Vartak**<br>Principal, Adarsh College of Education, Pune. |
| | **Dr. Dattatreya Tapkeer (Guide)**<br>Asst. Prof. College of Education (B.Ed.), SNDT, Pune. |
| **Inductive Thinking Model** | **Dr. Isave Madhuri**<br>Associate Prof. Tilak College of Education, Pune. |
| | **Dr. Londhe Gautam**<br>Associate Prof. College of Education (B.Ed.), SNDT, Pune. |
| | **Dr. Patil Bhushan**<br>Principal, Azam College of Education, Pune. |
| | **Dr.Dattatreya Tapkeer(Guide)**<br>Asst. Prof. College of Education (B.Ed.), SNDT, Pune. |

All the experts are well known in the field of Education in Pune city. The experts are the guide for M.Phil. and Ph.D. Students. The experts are from three different Universities i.e. Savitribai Phule Pune University, SNDT women's University and YCMOU, Nasik. All the experts have checked the lesson notes and gave valuable suggestions for the improvement of lesson plans. Apart from these experts the researcher also took guidance from Dr. Sohani Chitra regarding lesson plans, as Dr. Sohani had written a book on Models of Teaching in Marathi named as "Adhyapanachi Pratimane", Dr. Sanjeevani Mahale have done her Ph.D. research on Models of Teaching and wrote a book named as "Adhyapanachi Pratimane aani Adhyayan Shaili ", Dr. Isave Madhuri also had done her Ph.D. research on Models of Teaching. Following suggestions were given by the experts for improvement of lesson plans.

- To add instructional and nurtarant effects of Models of Teaching at the end of lesson plan.

- To add some thought provoking questions in the lesson plan and should be asked while teaching by using Models of Teaching.
- To make the lesson more interactive the experts suggested some activities,- the researcher add those activities in lesson plan and implemented it while teaching.
- The Advance Organizer should be in detail.
- The experts suggested to give more examples for clarification of Concept Attainment Model,- the researcher added those examples in teaching.
- In Inductive Thinking Model many questions were asked which were based on the formation of concept few of them were suggested by the experts.
- The experts suggested to write all the objectives in the beginning of lesson plan
- For the lesson plans of Concept Attainment Model the expert suggested to give the list of concepts which were included in the lesson.
- The experts suggested mentioning the support system on lesson note.

As per the suggestions given by the experts the researcher had made all the required changes in her lesson plans. In this way the guidance of the experts proved very valuable to make the lesson plan enriched and as per the syntax. The researcher also added some information which was relevant to the content but was not given in the text book.

**3.13.10 Preparation of Power Point Presentation:** Power point presentation was used as a support system. The pictures related to the content were included in presentation; this helped the students to understand the concepts very clearly. The researcher could implement the Model effectively with the help of power point presentation. It is said that one picture is equal to thousand words. Here also Power point presentation helped to make the content easy to understand for the students, actual images were shown by Power point presentation.

**3.13.11 Pilot Study**: A pilot study is a small scale preliminary study conducted in order to evaluate the effectiveness of the program and to improve the study design before implementing it on full scale. In the present research the researcher also conducted pilot study to test the impact of Models of teaching. The researcher taught one lesson from each Model on 8th standard 'F' division, which was not a part of sample. In the pilot study the following points were studied.

- The total time required for teaching the selected content by using Models of teaching.
- Student's interest and response to Models of teaching.
- Attention span of students.
- The summary presented in the beginning as Advance Organizer.
- Examples used to bring out the concept in Concept Attainment Model.
- Inductive Thinking process of the students.
- The working of phases in Models.

The researcher made necessary changes according to the above observation in the light of pilot study.

**3.13.12 Preparation of four equivalent groups based on 7th standard result:** For the present research the Students of Abhinav English Medium School's 8th standard were selected. Division A, B, C were selected for experiment group and division D was selected as controlled group. Before making the groups equivalent the researcher talked with the Principal of Abhinav School, she replied that every year the divisions are made equal on the basis of performance of students at last year. Each division is already made equivalent. So the researcher used the divisions as it is, without disturbing it.

**3.13.13 Pre-test-**After confirming that all 4 groups are equivalent, one pre-test was given to all 4 division students. The pre-test was based on the selected units. It was used as an achievement test.

**3.13.14 Correction of Papers of Pre-test:** The papers of all 190 students of 4 divisions were checked by the researcher. It is observed that as the content was not taught to the students before, students could-not write the answers. So they scored very less marks. The average (mean) of pre-test of each group was calculated. It was observed that there was not much difference in the mean of all groups at pre-test level.

**3.13.15 Implementation of developed program.** The mean of each group was calculated for pre-test. After that the researcher taught the selected 3 divisions by using Models of teaching. The controlled group was taught by the subject teacher of that class. The features of Models were as follows-

- Student-Teacher and Teacher –Student interactions were enhanced.
- All the three Models were belonging to Information Processing Family Model.
- Power-point Presentation was used in all three Models.
- Motivational statements thought provoking questions and reinforcement were used.

- **The planning was as follows**

  Division A - Advance Organiser Model.

  Division B - Concept Attainment Model

  Division C - Inductive Thinking Model

  Division D - Traditional Teaching Method.

  The teaching was started from second week of July 2016 till first week of October 2016. Total 4 months were taken for teaching the units, according to school's planning. During the same time for the division D, subject teacher taught the same content with traditional teaching method. Few lessons of the school teacher were observed by the researcher. The subject teacher also used some teaching aids while teaching.

**3.13.16 Conducting Post-Test on 4 Selected Groups:** After teaching the selected content to each group the same achievement test was given to students of all 4 divisions as post-test. **Correction of papers of pre-test: -**After checking the papers the mean was calculated. There was not much difference in mean of the divisions taught by using Models of Teaching. The detail statistical analysis of all data is given in Chapter-4.

**3.13.17 Analysis of Data:** For data analysis the following statistical techniques were used.

- **Mean:** Mean was used to find the average of each experimental and control group and they were compared. In the beginning pre-test was given to all 4 divisions which was one and same for all. The mean of each division was calculated. After teaching the units by using Models of Teaching to experimental group and by traditional teaching method to control group by their subject teacher. All the students underwent the post-test. The mean of each division's scores were calculated.
- **Standard Deviation:** It was used to know the spread of scores for each division.
- **Standard Errors of the difference between the means:** It was used to find out the deviation of the sample mean from the population mean.
- **t test:** It was used to compare mean scores of controlled and experimental groups and also pre-test and post-test.
- **ANOVA:**ANOVA was used to find the significance of the difference between the means of pre-test—post-test and difference between various Models of Teaching and Traditional teaching method.

**3.13.18 Interpretation of Data:** After analysis of data it was given the proper meaning.

**3.13.19 Comparison of Achievements:** After checking the papers of pre-test and post-test of all 4 divisions results were ready. First comparison was done between pre-test and post-test for each division then the results of Models and traditional methods were compared.

**3.13.20 Findings:** For each division there was significant difference in pre-test and post-test mean of scores. It was found that the mean gain score of Concept Attainment Model was the highest then was the Inductive Thinking Model and third came the Advance Organiser Model. It was found that the mean of scores of traditional teaching Method was the lowest.

**3.13.21 Conclusion:** From the findings it was clear that Models of Teaching are more effective than regular traditional Teaching methods. There was significant difference in mean scores of Models of Teaching and Traditional Teaching method.

### 3.14 Research at a Glance- Objective wise

**Table No. 3.4**

**Research at a Glance- Objective wise**

| Description | Research Method | Population | Sample | Data collection tool | Data Analysis tool. |
|---|---|---|---|---|---|
| Obj. 1 | Survey | All English medium teachers who teach Science to 8th standard of S.S.C. board schools. | Purposive, total 54 teachers from 22 schools in Pune city. | Questionnaire for teachers. | Percentage, frequency, graphs |
| Obj. 2 | Experimental Method | All English medium 8th standard students of S.S.C. board schools. | Abhivan English Medium School's 8th 'A' division students. | Achievement test as pre-test and post-test. | Mean, standard deviation, & t test |
| Obj. 3 | Experimental Method | All English medium 8th standard students of S.S.C. board schools. | Abhivan English Medium School's 8th 'B' division students. | Achievement test as pre-test and post-test. | Mean standard deviation, standard error mean & t test. |
| Obj. 4 | Experimental Method | All English medium 8th standard students of S.S.C. board schools | Abhivan English Medium School's 8th 'C' division students. | Achievement test as pre-test and post-test. | Mean, standard deviation, standard error mean & t test. |
| Obj. 5 | Experimental Method | All English medium 8th standard students of S.S.C. board schools | Abhivan English Medium School's 8th 'A, B, C & D' division's students. | Achievement test as pre-test and post-test. | Mean, standard deviation, standard error mean, t test & ANOVA. |

### 3.15 Time-table Schedule of Activities:

**Table No. 3.5**

**Time-table Schedule of Activities**

| Sr. No. | Activity | Time ( From-To) |
|---|---|---|
| 1 | Reading of reference books and relevant theses. | May–July 2014 |
| 2 | Discussion on points to be included in questionnaire. | August 2014 |
| 3 | Preparation of questionnaire. | September 2014 |
| 4 | Pilot study of questionnaire and making the necessary changes. | October 2014 |
| 5 | Conducted survey in different schools. | November 2014-March 2015 |
| 6 | Analysis of data collected through survey | April-May 2015 |
| 7 | Preparation of Achievement test based on selected content. | May 2015 |
| 8 | Preparation of lesson plans based on Advance Organizer Model. | May-June 2015 |
| 9 | Correcting the lesson notes based on Models of Teaching by Experts. | July 2015 |
| 10 | Preparation of lesson plans based on Concept Attainment Model. | August-Sept 2015 |
| 11 | Correcting the lesson notes based on Models of Teaching by Experts. | Oct-2015 |
| 12 | Preparation of lesson plans based on Inductive Thinking Model. | Nov-Dec 2015. |
| 13 | Correcting the lesson notes based on Models of Teaching by Experts. | January 2016 |
| 14 | Finalizing all lesson notes as per the suggestions given by experts. | Feb –March 2016 |
| 15 | Preparation of CAI program. | April–June 2016 |

| Sr. No. | Activity | Time ( From-To) |
|---|---|---|
| **16** | Pilot study | June 2016 |
| **17** | Gave letter to seek permission from Abhinav English Medium school, Ambegaon. | July 2016 |
| **18** | Conducted pre-test on 8th standard , division A,B,C,D. | July 2016. |
| **19** | Teaching by using Models of Teaching to experimental groups and by traditional method to control group. | July-October 2016. |
| **20** | Conducted Post-test on all 4 groups. | October 2016. |
| **20** | Evaluation of papers of Post-test of all 4 divisions. | November 2016 |
| **21** | Analysis of data with the help of expert | December 2016 |
| **22** | Report Writing | Jan-May 2017 |
| **23** | Checking and finalizing of chapters. | June- 2017 |

### 3.16 Closure:

In this chapter the detail plan and procedure of the research is discussed as follows.

- The nature of present research is an applied research.
- The researcher has used multi method i.e. Survey + product Development+ experimental method.
- Mixed method was used for data analysis.
- The flow chart depicts the research work at a glance.
- The methods used to fulfill each objective are explained in detail.

❑❑❑

# CHAPTER - IV

## DATA ANALYSIS AND INTERPRETATION

### 4.1 Introduction:

The analysis of data requires a number of closely related operations such as establishment of categories, the application of these categories to raw data through coding, tabulation and then drawing statistical inferences. (Kothari 1985:15)

After the data have been collected the researcher turns to task of analysis them. The researcher should classify the raw data into some purposeful and usable categories. For this the data should necessarily be condensed into a few manageable groups and tables for further analysis.

A good research is characterised by care taken in the analysis and in interpretation of data. It includes the selection of appropriate statistical and other techniques to be used for processing the data collected for the study. (kaul 1984:181)

In the present research this chapter deals with data analysis, interpretation, observation and testing etc. It is divided into two parts.

**A.** Analysis of data collected during the survey. The data collected from questionnaire is converted into percentage for further discussion.

**B.** Analysis of data collected during the experiment- The marks of the students in the pre- post-test for control and experiment group were obtained and the difference between the means of the two independent sample groups were found out.

### 4.2 Analysis of Data:

#### 4.2.1 Analysis of Data Collected During the Survey:

For the fulfilment of objective number 1 the researcher had prepared a questionnaire under the guidance of guide and school Science teacher. The questionnaire was given to the teachers, who teach Science to $8^{th}$ standard. Some teachers were from English medium schools(19) and some were from Marathi medium schools(5) but teaching to semi-English classes.

The questionnaires contain18 questions, including some personal and professional information, teaching of Science subject and awareness about Models of Teaching.

Question No. 1&2 was related to name of teacher and school.

Question No. 3, 4&5 were related to Academic qualifications and experience of Science teacher.

Further questions were related to teaching method in Science and awareness and use of Models of Teaching.

After the analysis of data collected from questionnaire the researcher got the following results.

**Frequency Distribution: Experience**

1. **Experience**: - Responders were asked to express their teaching experience in years. The ratio scale was converted to ordinal variable using visual binning option in IBPMSPSS-21. The newly created ordinal variables had 5 response options

   **1** = Less than 5 years.

   **2** = 5and Less than 10 years.

   **3** = 10 and Less than 15 years.

   **4** = 15 and Less than 20 years.

   **5** = 20 years and more.

**Table No. 4.1**

**No. of Experiences in years.**

| | Frequency | Percent |
|---|---|---|
| less than 5 years | 20 | 37.0 |
| 5 and less than 10 years | 19 | 35.2 |
| 10 and less than 15 years | 10 | 18.5 |
| 15 and less than 20 years | 3 | 5.6 |
| 20 years and more | 2 | 3.7 |
| **Total** | **54** | **100.0** |

**Figure No. 4.1**

**No. of Experience in Years**




From the above frequency distribution table and bar chart it can be seen that 37% respondents have less than5 years of experience. 35.2% have experience between 5 to 10 years. 18.52% teachers have experience between 10 to 15 years. 5.6% respondents have 15 to 20 years of experience and 3.7% teachers have experience 20

years and more. The aim to ask this question was that, the researcher wanted to know that if the experience is more then there is possibility that the teacher may not have learnt the Models of Teaching during their B.Ed. course. But if the experience is less, then it is possible that the teacher have learnt Model of Teaching during their B.Ed. course.

- **Interpretation:**

  Majority of the respondents have the experience of less than 5 years.

**Q.2. Have you completed your B.Ed. course?**

- **Introduction:** The researcher has asked this question because sometimes it is possible that a teacher who is teaching Science to 8th standard , may not have completed his/her teacher's training course, which is an essential degree for teaching profession. Sometimes it is possible that those teachers who have done their D.Ed. course are teaching Science to 8th standard. Ideally it is expected that the teacher teaching Science subject to 8th standard should have the degree of B.Sc. B.Ed. The results are summarised as follows.

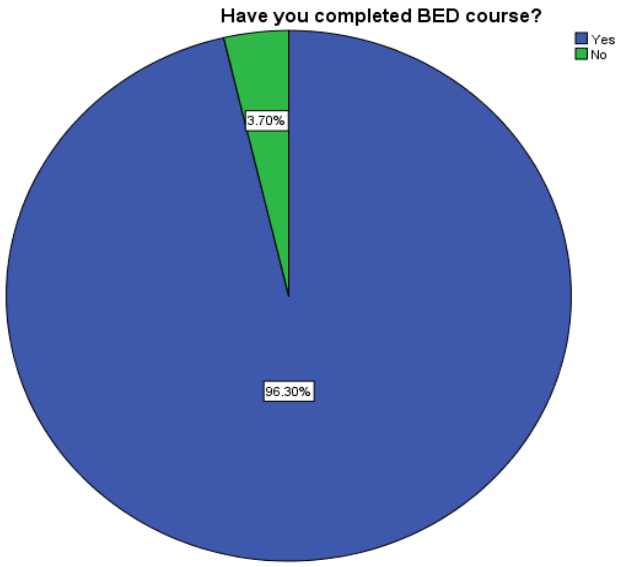
**Table No. 4.2**

**Teachers who have completed B.Ed. course**

| | Frequency | Percent |
|---|---|---|
| Yes | 52 | 96.3 |
| No | 2 | 3.7 |
| **Total** | **54** | **100.0** |

**Figure No. 4.2**

**Have you completed B.Ed. course?**




- **Interpretation**: It is found that maximum teachers have completed their B.Ed. course. Only 2 out of 54 teachers were untrained.

**3. From which university you have completed your B.Ed. course?**

- **Introduction**: The aim to ask this question was to verify the answer of the earlier question and the researcher also wanted to know further that in which Universities Models of Teaching are included in their B.Ed. curriculum.

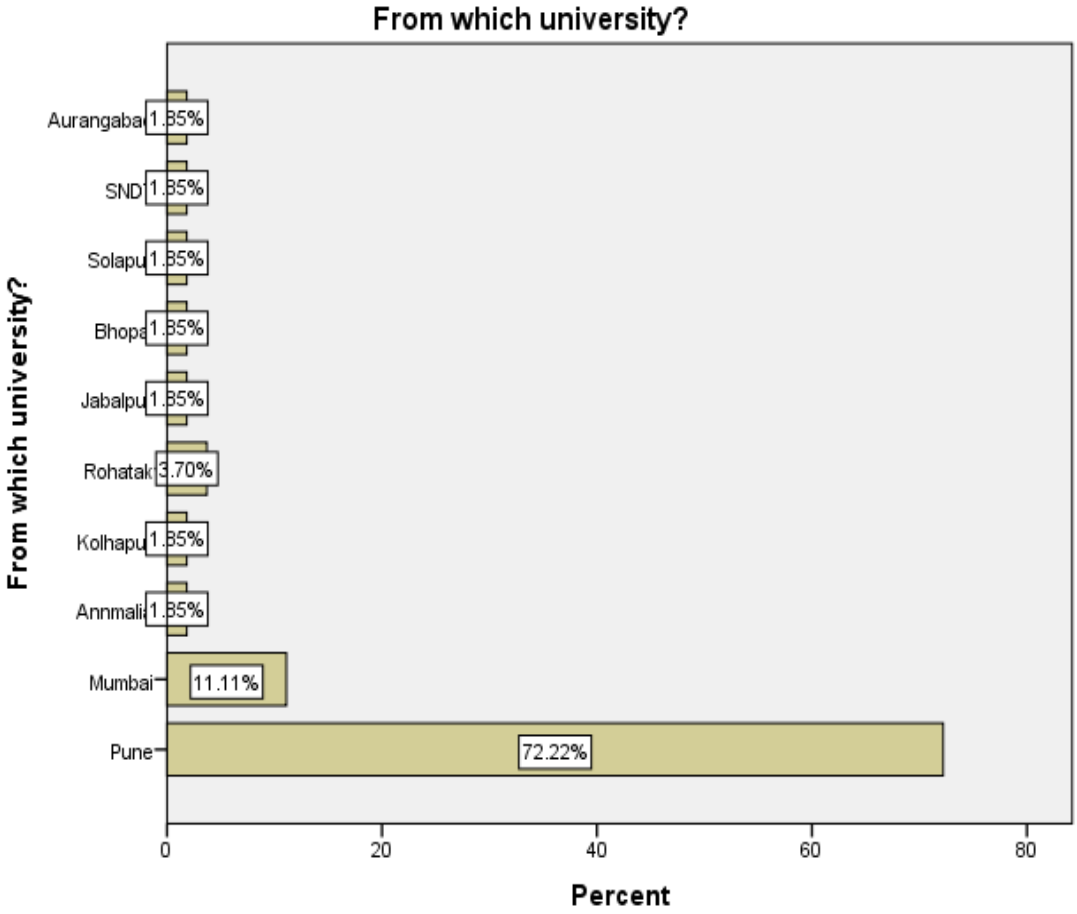
**Table No. 4. 3**

**List of Universities**

| | Frequency | Percent |
|---|---|---|
| Pune | 39 | 72.2 |
| Mumbai | 6 | 11.1 |
| Annmalia | 1 | 1.9 |
| Kolhapur | 1 | 1.9 |
| Rohatak | 2 | 3.7 |
| Jabalpur | 1 | 1.9 |
| Bhopal | 1 | 1.9 |
| Solapur | 1 | 1.9 |
| SNDT | 1 | 1.9 |
| Aurangabad | 1 | 1.9 |
| **Total** | **54** | **100.0** |

**Figure No. 4.3**

**List of Universities**




- **Interpretation**:

  There was a big variety of universities from where the respondents had completed their B.Ed. course. Some were from Maharashtra and some were from out of Maharashtra. Maximum 39 teachers (72.22%) have completed their B.Ed. course from Pune University. After that 11.11% teachers (6) have completed their B.Ed. course from Mumbai University.

**4. Have you studied Models of Teaching during your B.Ed. course**?

- **Introduction**: -This question was asked because Models of Teaching were included in B.Ed. curriculum at different time in different universities. If the respondent says 'Yes' then it is clear that in his/her university Models of Teaching were included in the B.Ed. curriculum. If the respondent says 'No' it means it is not included in their B.Ed. course or perhaps it was not in the curriculum when he/she has completed his/her B.Ed. course.

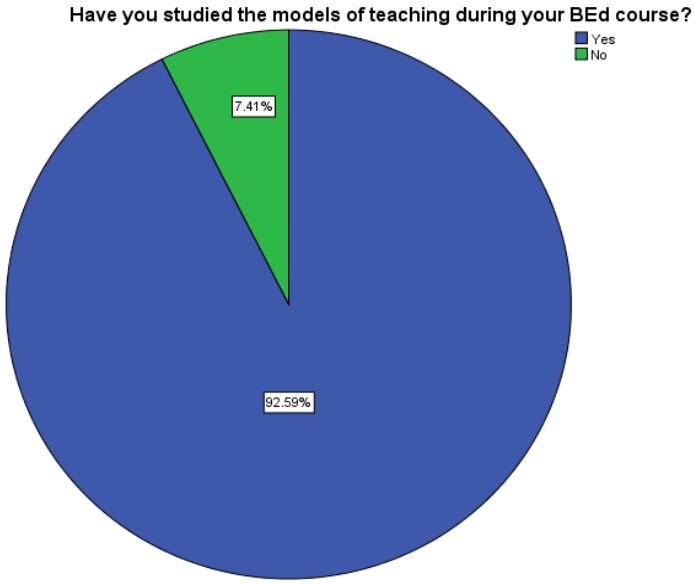
**Table No. 4.4**

**Studied the Models of Teaching during your B. Ed. course?**

| | Frequency | Percent |
|---|---|---|
| Yes | 50 | 92.6 |
| No | 4 | 7.4 |
| **Total** | **54** | **100.0** |

**Figure No. 4.4**

**Have you studied the models of teaching during your B. Ed?**




- **Interpretation:** - From the above table and graph it is seen that most of the teachers have learnt Models of Teaching during their B.Ed. course. Only 4 out of 54 teachers have not studied it.

**5. If yes, do you use Models of Teaching in your Teaching process?**

- **Introduction:** - This question was framed to check the previous answer. It is expected that if they have learnt it during their B.Ed. course they should use it.

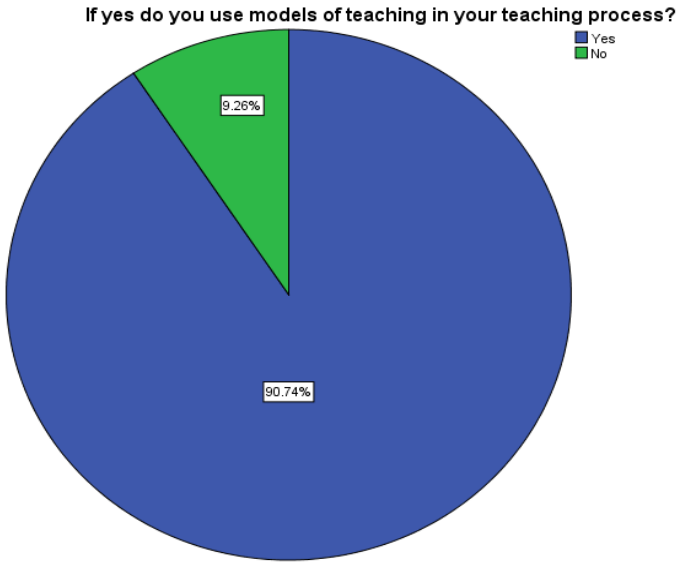
**Table No. 4.5**

**Use of Models of Teaching in teaching process.**

| | Frequency | Percent |
|---|---|---|
| Yes | 49 | 90.7 |
| No | 5 | 9.3 |
| **Total** | **54** | **100.0** |

**Figure No. 4.5**

**If yes, do you use Models of Teaching in your teaching process?**




- **Interpretation:** It is observed that out of 54 respondent 49 teachers said that they use Models of Teaching in their teaching process. 5 teachers said that they do not teach by using Models of Teaching.

**6. Which Models do you use for teaching?**

The options were given as--

A. Concept Attainment Model.

B. Advance Organizer Model

C. Inductive Thinking Model and

D. Others

This question was framed to check the previous answer. In this question respondents were asked to tell Which Models of Teaching they were using, for that they were asked to choose as many options as applicable. Hence the question was a multiple choice question and data was analysed using multiple response analysis option in IBM-SPSS-21

The responses of teacher are tabularised as follows.

**Table No. 4.6**

**Models of Teaching Frequencies**

| | | Responses | | Cumulative Percent |
|---|---|---|---|---|
| | | N | Percent | |
| Models of Teaching | Concept attainment model | 42 | 63.6% | 89.4% |
| | Advance Organizer model | 13 | 19.7% | 27.7% |
| | Inductive thinking model | 10 | 15.2% | 21.3% |
| | Others | 1 | 1.5% | 2.1% |
| **Total** | | **66** | **100.0%** | **140.4%** |

- **Interpretation:** from the above frequency distribution table it can be seen that out of 66 Yes responses 63.6% accounted for Concept Attainment Model, 19.7% uses Advance Organizer Model, 15.2% accounted for Inductive Thinking Model and 1.5% accounted for other. Hence the most preferred model is Concept Attainment Model.

**7. Do you find any difference in teaching by using Models of Teaching and teaching by using traditional teaching methods?**

- **Introduction:** The aim behind asking this question was to test whether the respondents are having the knowledge of teaching Models and teaching methods or not. It was also expected that the respondents should be able to differentiate between teaching Models and teaching methods. If they have learnt the Models of Teaching during their B.Ed. course they are aware of how to implement Models of Teaching and achieve the objectives. For interpretation of data the Yes answer is counted as 1 and the No answer is counted as 2.

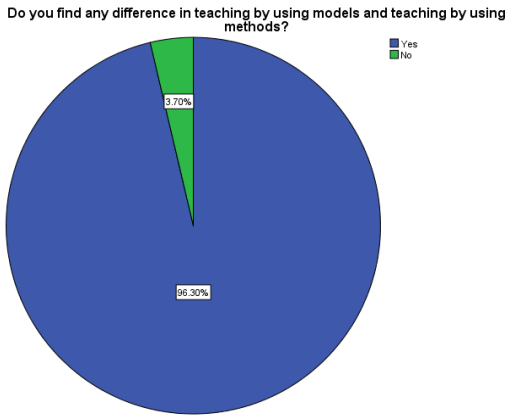
**Table No. 4.7**

**Do you find any difference in teaching by using models of Teaching and teaching by using traditional teaching methods?**

| | Frequency | Percent |
|---|---|---|
| Yes (1) | 52 | 96.3 |
| No (2) | 2 | 3.7 |
| **Total** | 54 | 100.0 |

**Figure No- 4.6**

**Difference between Models of Teaching and Traditional teaching methods?**




- **Interpretation:** The maximum responders answered the option 'Yes'. Only 2 teachers said 'No'.

**8. Do you think that teaching by using models of teaching requires more planning?**

- **Introduction:** It is true that teaching by using Models of Teaching need extra preparation by the teacher as compared to traditional method. Here the researcher wanted to know that which extra efforts are taken by the teacher to teach any topic by using Models of Teaching.

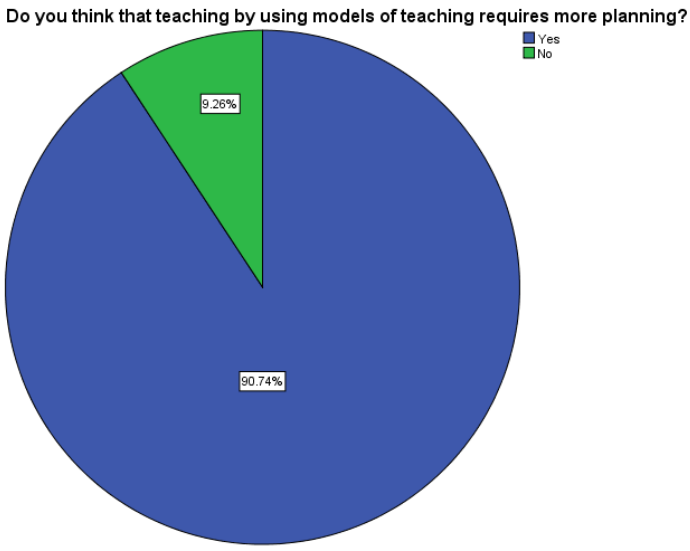
**Table No. 4.8**

**More planning for teaching by using Models of Teaching**

| | Frequency | Percent |
|---|---|---|
| Yes (1) | 49 | 90.7 |
| No (2) | 5 | 9.3 |
| **Total** | **54** | **100.0** |

**Figure No. 4.7**

**More planning for teaching by using Models of Teaching**




- **Interpretation:** Out of 54 responders only 5 responders says that there is no need of extra planning for teaching by using Models of Teaching. While 49 teachers agree that use of Models of Teaching need extra planning.

**9. Do you think that constructivism is based on Models of teaching.**

- **Introduction:** Now a day's constructivism got importance in teaching – learning process. Basically constructivism means the learner constructs his/her own knowledge based on mental activity. It is a philosophy of learning and teaching. Some text books are also framed according to constructivism. In Models of Teaching also learner develops his/her own knowledge based on experience and mental activities. In Advance Organizer Model the relation between each sub point is explained properly in the beginning and it is linked with previous knowledge. So learner can construct the knowledge in well manner. In Concept Attainment Model teacher gives examples having similar and dissimilar characteristics, here student identifies the similarities and differences and can categorise the examples. They further add their own similar examples also. The student themselves form (construct) the Concept.

  In Inductive Thinking Model the teacher shows many examples and asks students to classify them. Categorising the things indicates the high level thinking. In this Model the student forms the concept and also applies the acquired knowledge in appropriate condition. In short in Models of Teaching also the principles of constructivism are applied. Basically Models are evolved and practiced before constructivism is getting importance in teaching – learning process in India. By asking this question the researcher wanted to check whether the teachers were aware about Models of Teaching and constructivism or not.

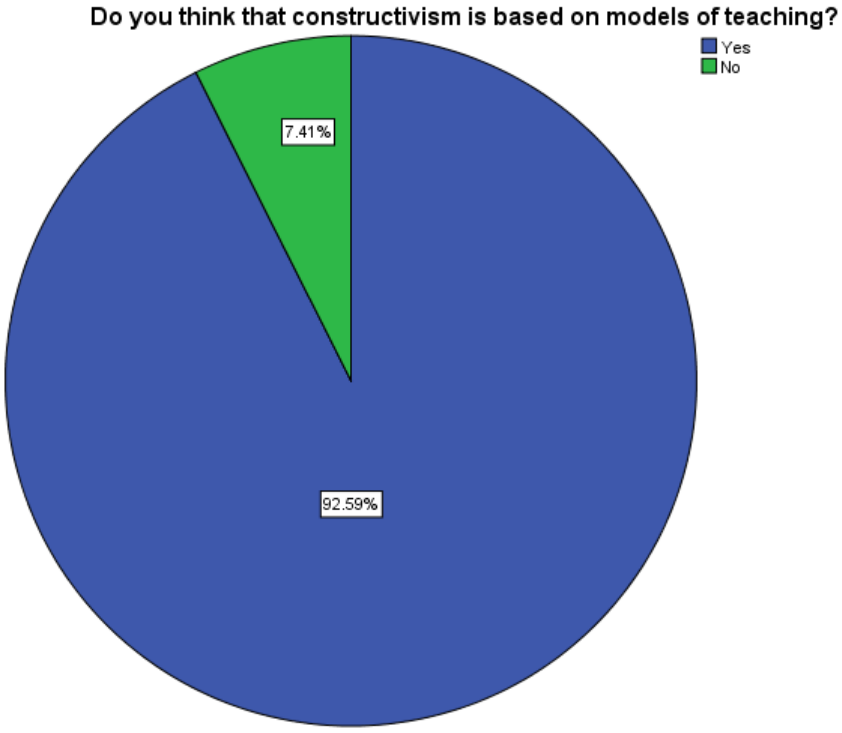
**Table No. 4.9**

**Do Constructivism based on Models of Teaching?**

| | **Frequency** | **Percent** |
|---|---|---|
| Yes (1) | 50 | 92.6 |
| No (2) | 4 | 7.4 |
| **Total** | **54** | **100.0** |

**Figure No. 4.8**

**Do Constructivism based on Models of Teaching?**




- **Interpretation:-** The analysis and graph shows that most of the respondents think that Constructivism is based on Models of Teaching. Models of Teaching are discovered and used before the rise of constructivism.

**10. Can Science subject be taught by using Models of Teaching?**

- **Introduction:** The intention behind asking this question was that, the researcher wanted to know the opinion of science teacher about the use of teching Science subject by using Models of Teaching**.**

  The responses are summarised below-

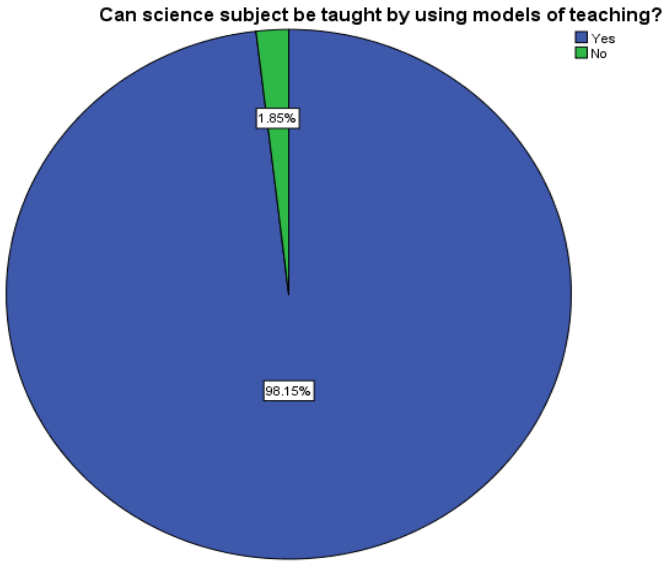
**Table No. 4.10**

**Teaching of Science subject by using Models of Teaching?**

| | **Frequency** | **Percent** |
|---|---|---|
| Yes | 53 | 98.1 |
| No | 1 | 1.9 |
| **Total** | **54** | **100.0** |

**Figure No. 4.9**

**Teaching of Science subject by using Models of Teaching?**




- **Interpretation** - Almost all respondents replied that –Yes- Science can be taught by using Models of Teaching. All the Models of Information Processing Family are suitable and fruitful for teaching Science subject at any level. In fact all subjects can be taught effectively by using Models of Teaching.

**11. Do you believe that teaching objectives can be fulfilled by using Models of Teaching?**

- **Introduction:** Before selecting any content for a particular standard, the objectives are framed, and to achieve those objectives the content is introduced in the textbook. The same content can be taught by using different methods. The method depends on previous knowledge of student, available materials and facilities, maturity of students and their experience. The acquisition of knowledge depends on the way of teaching. Here the researcher wanted to know the opinion of Science teacher whether the teaching goals can be achieved by using Model of Teaching or not?

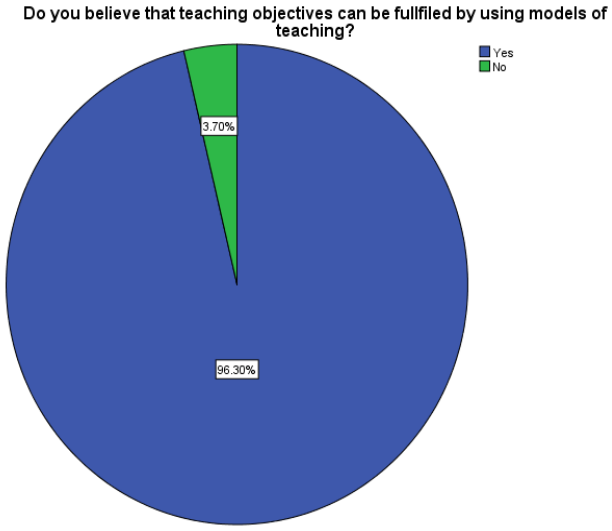
**Table No. 4.11**

**Teaching objectives fulfilled by using Models of Teaching?**

| | Frequency | Percent |
|---|---|---|
| Yes | 52 | 96.3 |
| No | 2 | 3.7 |
| **Total** | **54** | **100.0** |

**Figure No. 4.10**

**Teaching objectives fulfilled by using Models of Teaching?**




- **Interpretation**: Most of the teachers believe that Models of Teaching can fulfil the teaching objectives. Only 2 teachers out of 54 do not think like this.

**12. Suggest the name of topics from 8th standard's Science textbook which can be taught by using Models of Teaching?**

- **Introduction:** The researcher wanted to teach some units of 8th standard Science subject by using models of Teaching and test its effectiveness. For this she wanted the subject teachers to suggest some units which can be teach effectively by using Models of teaching. The response of teacher would be very much helpful for selection of the units. The advice of experienced subject teacher will be a guideline for the researcher. It was one of the important questions in the questionnaire.

  There were varieties of responses which are tabularised as below.

**Table No. 4.12**

**Statistics**

| | Stars and Our Solar System | Biological Diversity | Atmospheric Pressure | Magnetism | The Structure of an Atom |
|---|---|---|---|---|---|
| Valid | 19 | 18 | 18 | 19 | 21 |
| Missing | 34 | 35 | 35 | 34 | 32 |

| | Chemical Reactions and Their Types | The Structure of a Cell and Micro Organism | Diseases | Reflection of Light | Sources of Energy |
|---|---|---|---|---|---|
| Valid | 19 | 18 | 18 | 19 | 18 |
| Missing | 34 | 35 | 35 | 34 | 35 |

| | Electric Current | Properties Of Substances | Metals And Non Metals | Carbon And Carbon Compounds | Air |
|---|---|---|---|---|---|
| Valid | 17 | 18 | 20 | 17 | 17 |
| Missing | 36 | 35 | 33 | 36 | 36 |

| | Soil | Agriculture | Animal Husbandry. |
|---|---|---|---|
| Valid | 17 | 17 | 17 |
| Missing | 36 | 36 | 36 |

- **Interpretation:** It is observed that out of 53 valid responses, many teachers have not responded to all topics. Many teachers kept it as blank. The number of missing response is much greater than the valid response. Whatever the response they have given, it is systematically tabularised as follows-

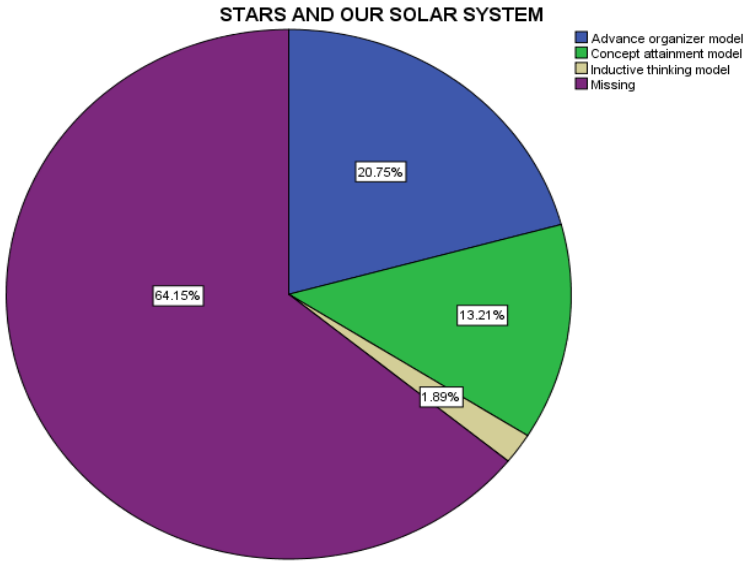
**Table No. 4.13**

**STARS AND OUR SOLAR SYSTEM**

| | Frequency | Percent |
|---|---|---|
| Advance Organizer Model | 11 | 20.8 |
| Concept Attainment Model | 7 | 13.2 |
| Inductive Thinking Model | 1 | 1.9 |
| **Total** | **19** | **35.8** |
| Missing System | 35 | 64.2 |
| **Total** | **54** | **100.0** |

**Figure No. 4.11**

**STARS AND OUR SOLAR SYSTEM**




- **Interpretation:** For the unit 'Stars and Our Solar System 'out of 19 valid responses, 11 teachers accounted for Advance Organizer Model, 7 for Concept Attainment Model and 1 for Inductive Thinking Model. Out of 54 responses 35 teachers have not given any response to this question.

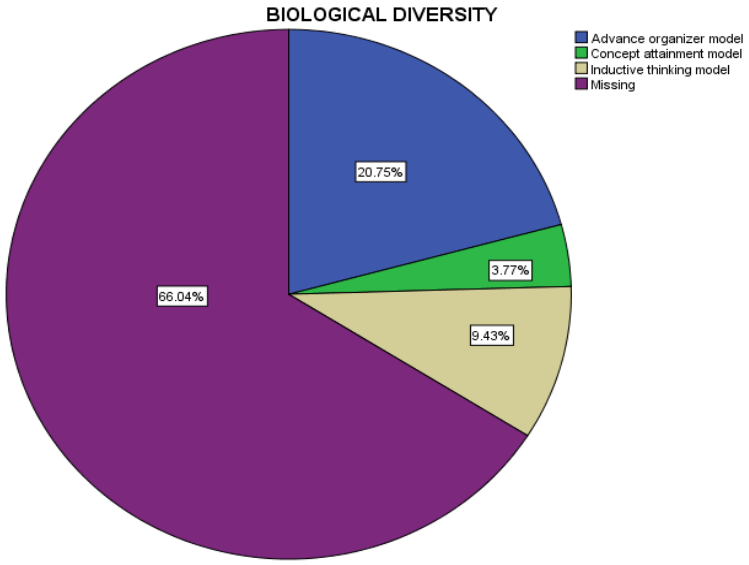
**Table No. 4.14**

**BIOLOGICAL DIVERSITY**

| | Frequency | Percent | Valid Percent |
|---|---|---|---|
| Advance organizer model | 11 | 20.8 | 61.1 |
| Concept attainment model | 2 | 3.8 | 11.1 |
| Inductive thinking model | 5 | 9.4 | 27.8 |
| **Total** | **18** | **34.0** | **100.0** |
| Missing System | 36 | 66.0 | |
| **Total** | **54** | **100.0** | |

**Figure No. 4.12**

**BIOLOGICAL DIVERSITY**




- **Interpretation:** For the Unit 'Biological Diversities' total 18 teacher suggested the Models which are Advance Organiser =11, Concept Attainment=2, and Inductive Thinking=5 . But still 36 teachers did not suggest any Model fosssr this unit.

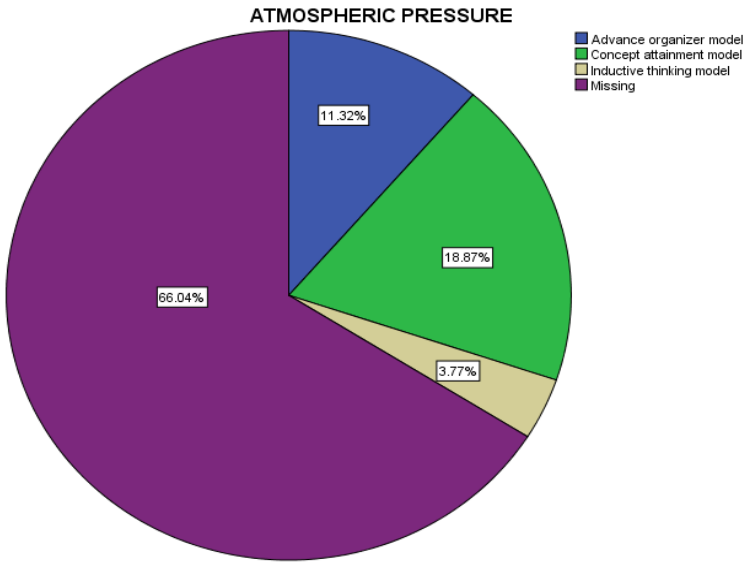
**Table No. 4.15**

**ATMOSPHERIC PRESSURE**

| | | Frequency | Percent |
|---|---|---|---|
| | Advance organizer model | 6 | 11.3 |
| | Concept attainment model | 10 | 18.9 |
| I | Inductive thinking model | 2 | 3.8 |
| | **Total** | **18** | **34.0** |
| | Missing System | 36 | 66.0 |
| | **Total** | **54** | **100.0** |

**Figure No. 4.13**

**ATMOSPHERIC PRESSURE**




- **Interpretation:** For the unit 'Atmospheric Pressure' out of 18 valid responses 06 teachers accounted for Advance Organizer Model, 10 for Concept Attainment Model and 2 for Inductive Thinking Model. Out of 54 responses 36 teachers have not given any response to this question. It is shown graphically.

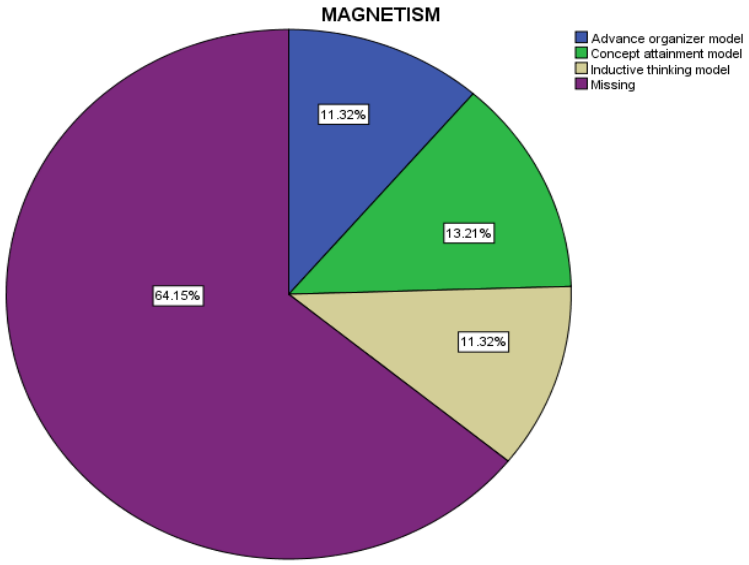
**Table No. 4.16**

**MAGNETISM**

| | Frequency | Percent |
|---|---|---|
| Advance organizer model | 6 | 11.3 |
| Concept attainment model | 7 | 13.2 |
| Inductive thinking model | 6 | 11.3 |
| **Total** | **19** | **35.8** |
| Missing System | 35 | 64.2 |
| **Total** | **54** | **100.0** |

**Figure No. 4.14**

**MAGNETISM**




- **Interpretation:** Out of 19 valid responses 06 teachers accounted for Advance Organizer Model, 07 for Concept Attainment Model and 6 for Inductive Thinking Model. Out of 54 responses 35 teachers have not given any response to this question for the unit 'Magnetism'. It is shown graphically.

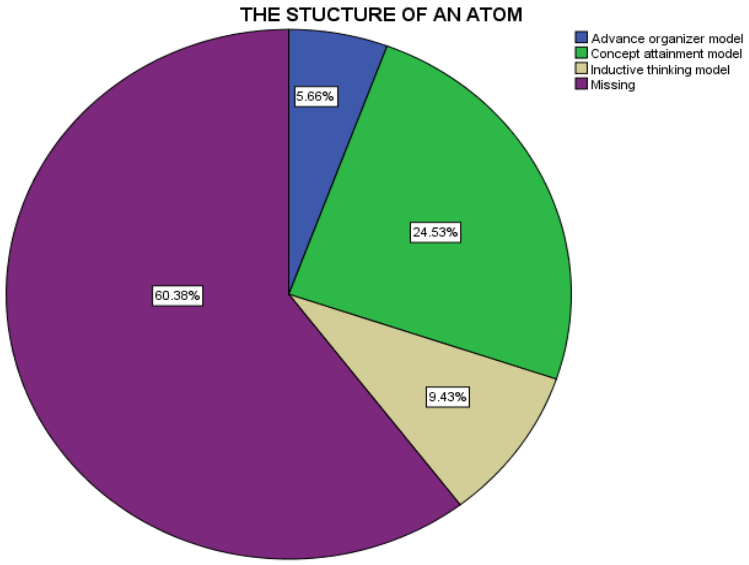
**Table No. 4.17**

**THE STUCTURE OF AN ATOM**

| | Frequency | Percent |
|---|---|---|
| Advance organizer model | 3 | 5.7 |
| Concept attainment model | 13 | 24.5 |
| Inductive thinking model | 5 | 9.4 |
| **Total** | **21** | **39.6** |
| Missing System | 33 | 60.4 |
| **Total** | **54** | **100.0** |

**Figure No. 4.15**

**THE STUCTURE OF AN ATOM**




- **Interpretation:-** For the unit 'The Structure of an Atom' out of 21 valid responses 03 teachers accounted for Advance Organizer Model, 13 for Concept Attainment Model and 5 for Inductive Thinking Model. Out of 54 responses 33 teachers have not given any response to this question.

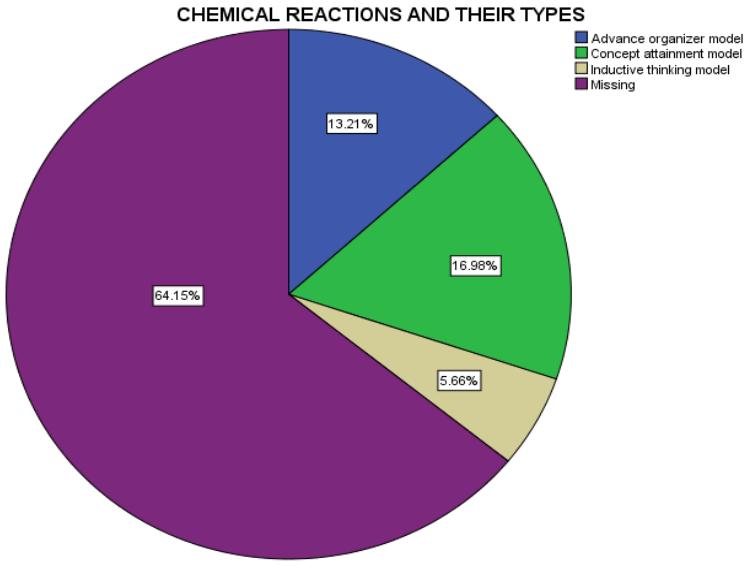
**Table No. 4.18**

**CHEMICAL REACTIONS AND THEIR TYPES**

| | Frequency | Percent |
|---|---|---|
| Advance organizer model | 7 | 13.2 |
| Concept attainment model | 9 | 17.0 |
| Inductive thinking model | 3 | 5.7 |
| **Total** | **19** | **35.8** |
| Missing System | 35 | 64.2 |
| **Total** | **54** | **100.0** |

**Figure No. 4.16**

**CHEMICAL REACTIONS AND THEIR TYPES**




- **Interpretation:** For the unit 'Chemical Reactions and Their Types' out of 19 valid responses 07 teachers accounted for Advance Organizer Model, 09 for Concept Attainment Model and 03 for Inductive Thinking Model. Out of 54 responses 35 teachers have not given any response to this question.

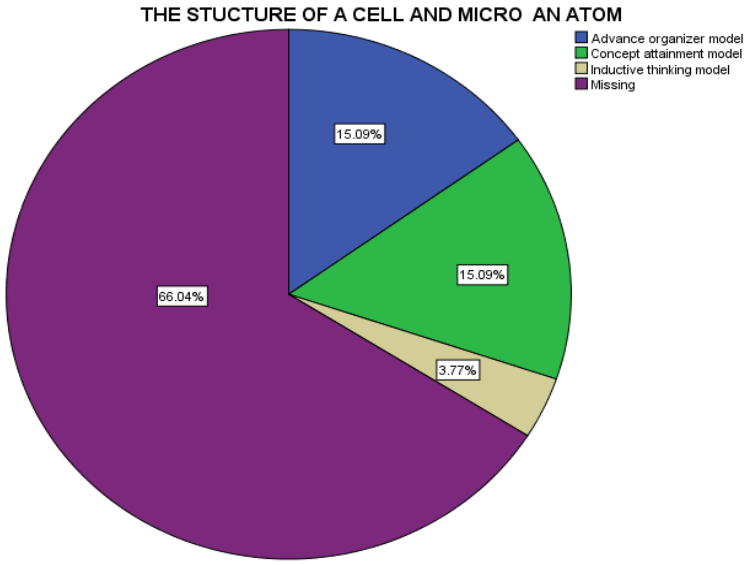
**Table No. 4.19**

**THE STUCTURE OF A CELL AND MICRO ORGANISM**

| | Frequency | Percent | Valid Percent |
|---|---|---|---|
| Advance organizer model | 8 | 15.1 | 44.4 |
| Concept attainment model | 8 | 15.1 | 44.4 |
| Inductive thinking model | 2 | 3.8 | 11.1 |
| **Total** | **18** | **34.0** | **100.0** |
| Missing System | 36 | 66.0 | |
| **Total** | **54** | **100.0** | |

**Figure No. 4.17**

**THE STUCTURE OF A CELL AND MICRO ORGANISM**




- **Interpretation:** For the unit 'Structure of a Cell and Micro-organism' out of 18 valid responses 08 teachers accounted for Advance Organizer Model, 08 for Concept Attainment Model and 02 for Inductive Thinking Model. Out of 54 responses 36 teachers have not given any response to this question.

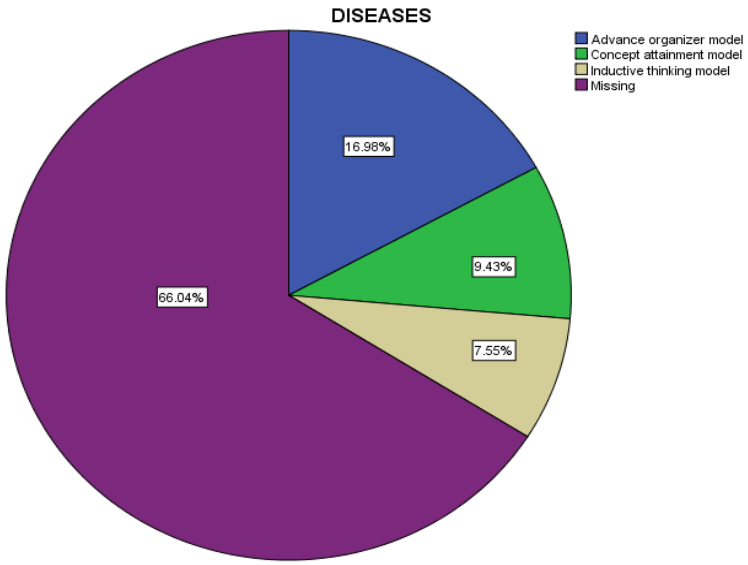
**Table No. 4.20**

**DISEASES**

| | Frequency | Percent | Valid Percent |
|---|---|---|---|
| Advance organizer model | 9 | 17.0 | 50.0 |
| Concept attainment model | 5 | 9.4 | 27.8 |
| Inductive thinking model | 4 | 7.5 | 22.2 |
| **Total** | **18** | **34.0** | **100.0** |
| Missing System | 36 | 66.0 | |
| **Total** | **54** | **100.0** | |

**Figure No. 4.18**

**DISEASES**




- **Interpretation:** For the unit 'Diseases' Out of 18 valid responses 09 teachers accounted for Advance Organizer Model, 5 for Concept Attainment Model and 4 for Inductive Thinking Model. Out of 54 responses 36 teachers have not given any response to this question.

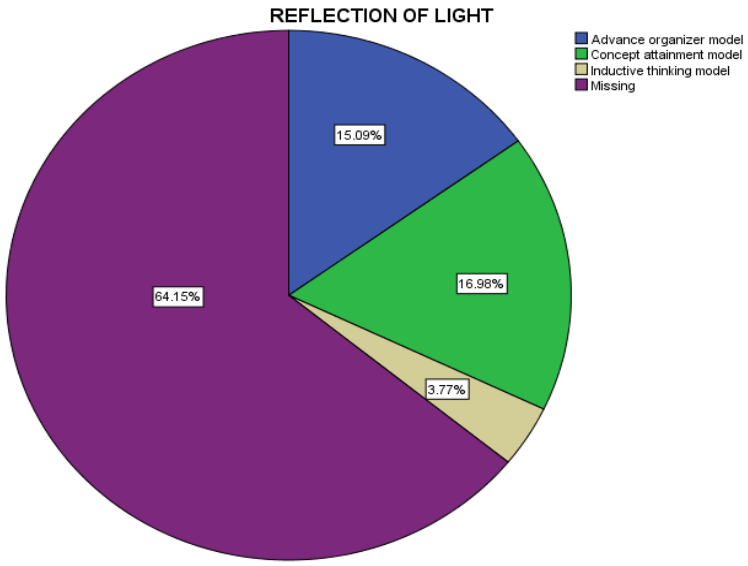
**Table No. 4.21**

**REFLECTION OF LIGHT**

| | Frequency | Percent | Valid Percent |
|---|---|---|---|
| Advance organizer model | 8 | 15.1 | 42.1 |
| Concept attainment model | 9 | 17.0 | 47.4 |
| Inductive thinking model | 2 | 3.8 | 10.5 |
| **Total** | **19** | **35.8** | **100.0** |
| Missing System | 35 | 64.2 | |
| **Total** | **54** | **100.0** | |

**Figure No. 4.19**

**REFLECTION OF LIGHT**




- **Interpretation:** for the unit 'Reflection of Light' out of 19 valid responses 08 teachers accounted for Advance Organizer Model, 09 for Concept Attainment Model and 02 for Inductive Thinking Model. Out of 54 responses 35 teacher have not given any response to this question. It is shown by chart as follows.

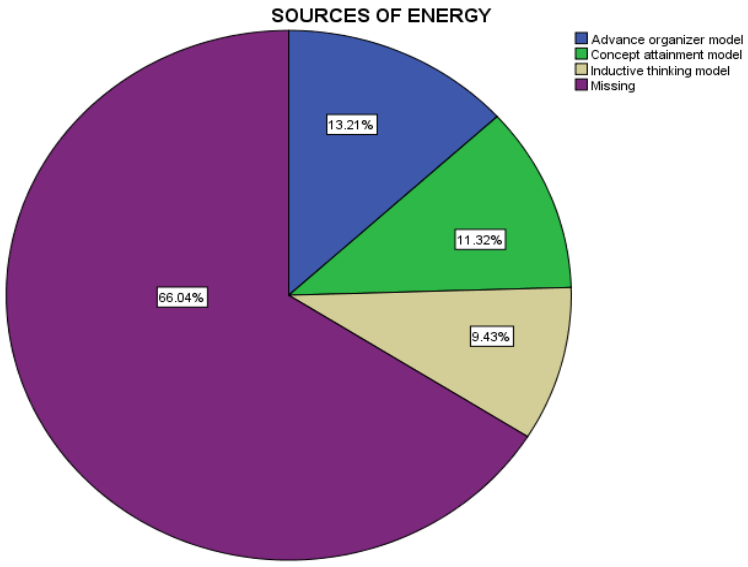
**Table No. 4.22**

**SOURCE OF ENERGY**

| | Frequency | Percent | Valid Percent |
|---|---|---|---|
| Advance organizer model | 7 | 13.2 | 38.9 |
| Concept attainment model | 6 | 11.3 | 33.3 |
| Inductive thinking model | 5 | 9.4 | 27.8 |
| **Total** | **18** | **34.0** | **100.0** |
| Missing System | 36 | 66.0 | |
| **Total** | **54** | **100.0** | |

**Figure No. 4.20**

**SOURCE OF ENERGY**




- **Interpretation:** For the unit 'sources of Energy' Out of 18 valid responses 07 teachers accounted for Advance Organizer Model, 6 for Concept attainment Model and 5 for Inductive Thinking Model. Out of 54 responses 36 teachers have not given any response to this question.

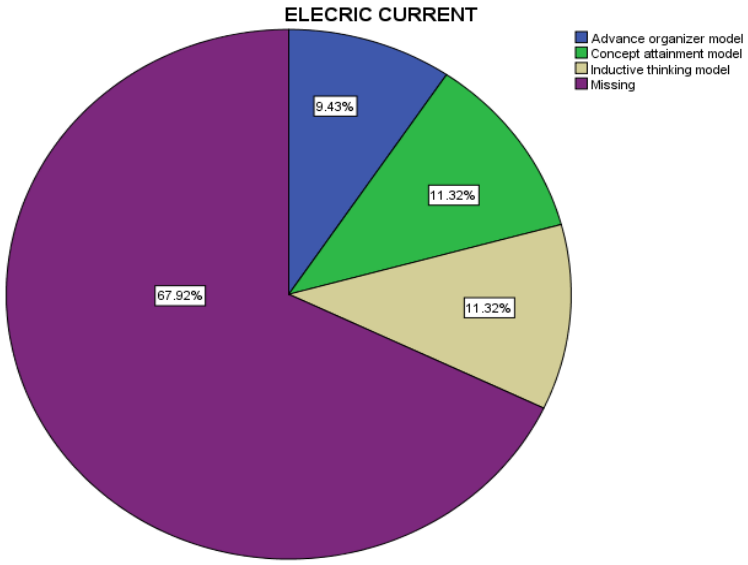
**Table No. 4.23**

**ELECRIC CURRENT**

| | Frequency | Percent | Valid Percent |
|---|---|---|---|
| Advance organizer model | 5 | 9.4 | 29.4 |
| Concept attainment model | 6 | 11.3 | 35.3 |
| Inductive thinking model | 6 | 11.3 | 35.3 |
| **Total** | **17** | **32.1** | **100.0** |
| Missing System | 37 | 67.9 | |
| **Total** | **54** | **100.0** | |

**Figure No. 4.21**

**ELECRIC CURRENT**




- **Interpretation:** For the unit' Electric Current, out of 17 valid responses 05 teachers accounted for Advance Organizer Model, 06 for Concept attainment Model and 06 for Inductive Thinking Model. Out of 54 responses 37 teachers have not given any response to this question.

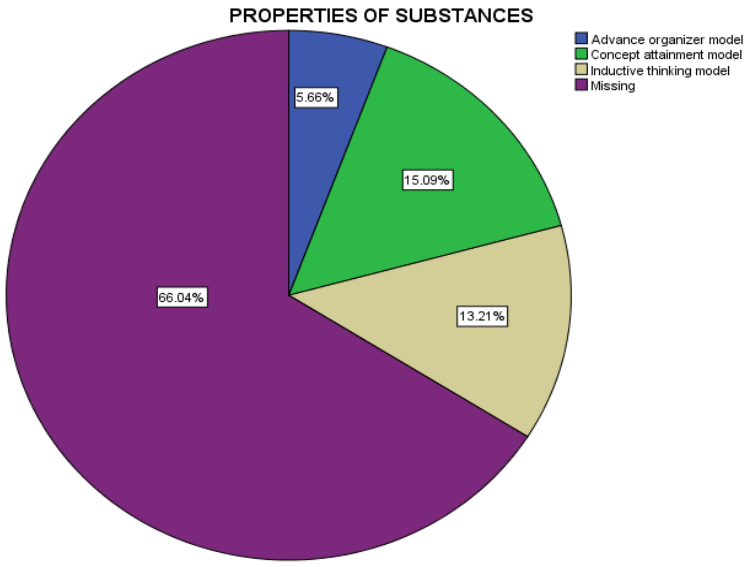
**Table No. 4.24**

**PROPERTIES OF SUBSTANCES**

| | Frequency | Percent | Valid Percent |
|---|---|---|---|
| Advance organizer model | 3 | 5.7 | 16.7 |
| Concept attainment model | 8 | 15.1 | 44.4 |
| Inductive thinking model | 7 | 13.2 | 38.9 |
| **Total** | **18** | **34.0** | **100.0** |
| Missing System | 36 | 66.0 | |
| **Total** | **54** | **100.0** | |

**Figure No. 4.22**

**PROPERTIES OF SUBSTANCES**




- **Interpretation:** For the unit 'Properties of Substances' Out of 18 valid responses 03 teachers accounted for Advance Organizer Model, 08 for Concept Attainment Model and 07 for Inductive Thinking Model. Out of 54 responses 36 teachers have not given any response to this question.

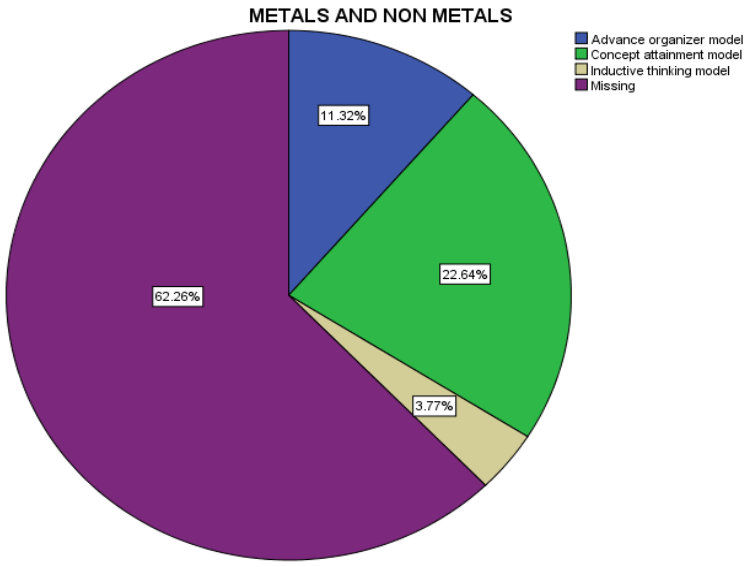
**Table No. 4.25**

**METALS AND NON METALS**

| | Frequency | Percent | Valid Percent |
|---|---|---|---|
| Advance organizer model | 6 | 11.3 | 30.0 |
| Concept attainment model | 12 | 22.6 | 60.0 |
| Inductive thinking model | 2 | 3.8 | 10.0 |
| **Total** | **20** | **37.7** | **100.0** |
| Missing System | 33 | 62.3 | |
| **Total** | **53** | **100.0** | |

**Figure No. 4.23**

**METALS AND NON METALS**




- **Conclusion:** For the unit 'Metals and Non-Metals ' Out of 20 valid responses 06 teachers accounted for Advance Organizer Model, 12 for Concept Attainment Model and 02 for Inductive Thinking Model. Out of 54 responses 34 teachers have not given any response to this question.

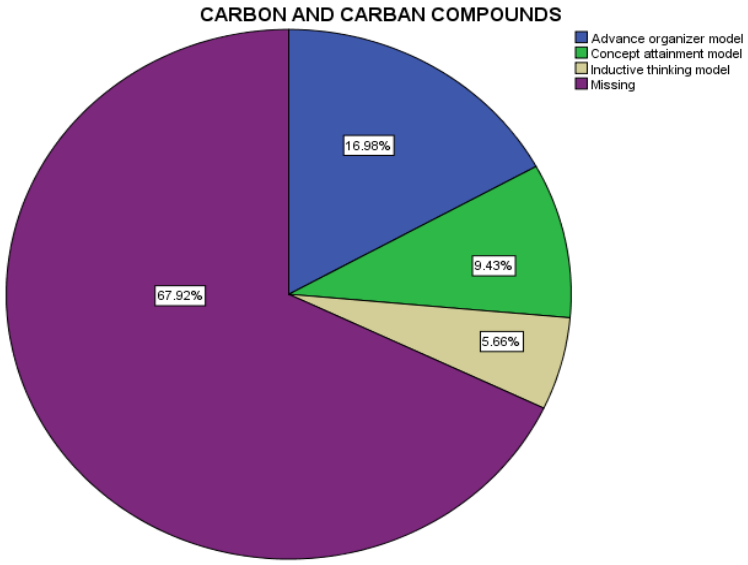
**Table No. 4.26**

**CARBON AND CARBON COMPOUND**

| | Frequency | Percent | Valid Percent |
|---|---|---|---|
| Advance organizer model | 9 | 17.0 | 52.9 |
| Concept attainment model | 5 | 9.4 | 29.4 |
| Inductive thinking model | 3 | 5.7 | 17.6 |
| **Total** | **17** | **32.1** | **100.0** |
| Missing System | 37 | 67.9 | |
| **Total** | **54** | **100.0** | |

**Figure No. 4.24**

**CARBON AND CARBON COMPOUND**




- **Interpretation:** For the unit 'Carbon and Carbon Compounds ' Out of 17 valid responses 09 teachers accounted for Advance Organizer Model, 05 for Concept Attainment Model and 03 for Inductive Thinking Model. Out of 54 responses 37 teachers have not given any response to this question.

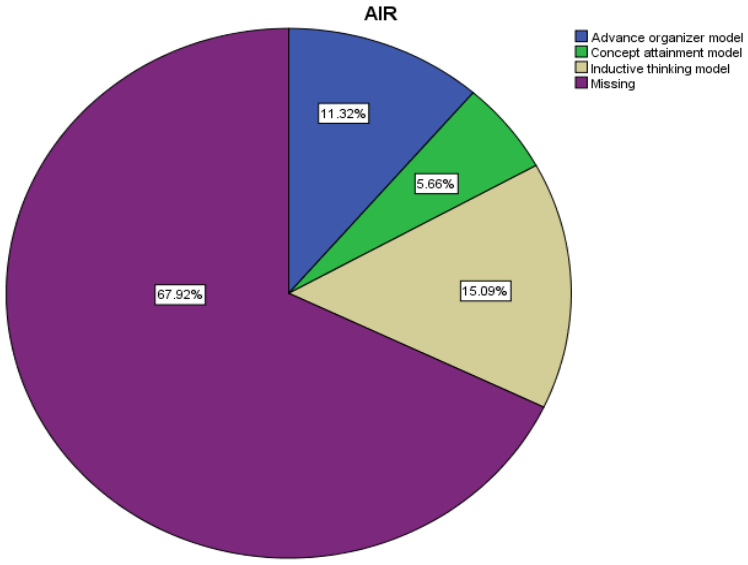
**Table No. 4.27**

**AIR**

| | Frequency | Percent | Valid Percent |
|---|---|---|---|
| Advance organizer model | 6 | 11.3 | 35.3 |
| Concept attainment model | 3 | 5.7 | 17.6 |
| Inductive thinking model | 8 | 15.1 | 47.1 |
| Total | 17 | 32.1 | 100.0 |
| Missing System | 37 | 67.9 | |
| Total | 54 | 100.0 | |

**Figure No. 4.25**

**AIR**




- **Interpretation:** For the unit 'Air' Out of 17 valid responses 06 teachers accounted for Advance Organizer Model, 3 for Concept Attainment Model and 08 for Inductive Thinking Model. Out of 54 responses 37 teachers have not given any response to this question.

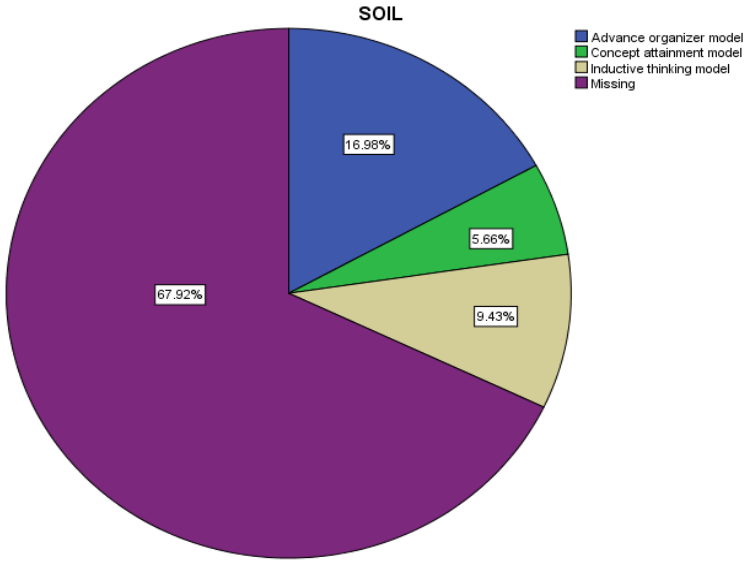
**Table No. 4.28**

**SOIL**

| | Frequency | Percent | Valid Percent |
|---|---|---|---|
| Advance organizer model | 9 | 17.0 | 52.9 |
| Concept attainment model | 3 | 5.7 | 17.6 |
| Inductive thinking model | 5 | 9.4 | 29.4 |
| **Total** | **17** | **32.1** | **100.0** |
| Missing System | 37 | 67.9 | |
| **Total** | **54** | **100.0** | |

**Table No. 4.26**

**SOIL**




- **Interpretation:** For the unit 'Soil' Out of 17 valid responses 09 teachers accounted for Advance Organizer Model, 03 for Concept Attainment Model and 05 for Inductive Thinking Model. Out of 54 responses 37 teachers have not given any response to this question.

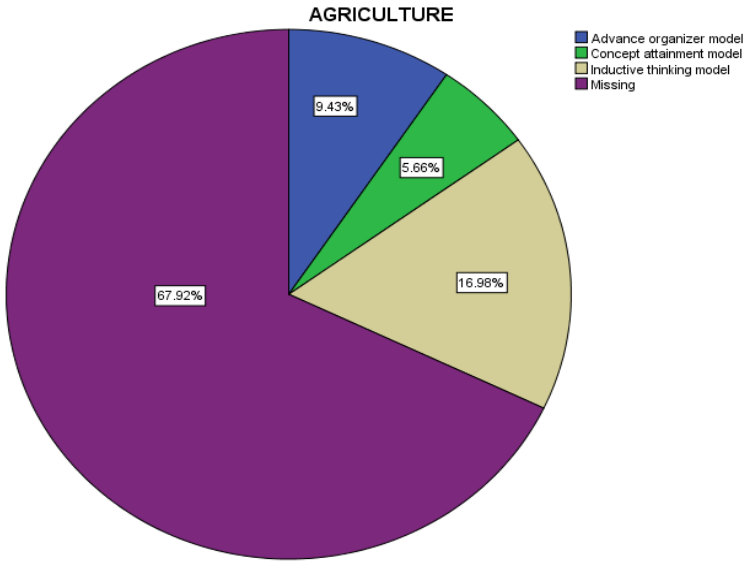
**Table No. 4.29**

**AGRICULTURE**

| | Frequency | Percent | Valid Percent |
|---|---|---|---|
| Advance organizer model | 5 | 9.4 | 29.4 |
| Concept attainment model | 3 | 5.7 | 17.6 |
| Inductive thinking model | 9 | 17.0 | 52.9 |
| **Total** | **17** | **32.1** | **100.0** |
| Missing System | 37 | 67.9 | |
| **Total** | **54** | **100.0** | |

**Figure No. 4.27**

**AGRICULTURE**




- **Interpretation:** For the unit 'Agriculture' Out of 17 valid responses 05 teachers accounted for Advance Organizer Model, 03 for Concept Attainment Model and 09 for Inductive Thinking Model. Out of 54 responses 37 teachers09 have not given any response to this question.

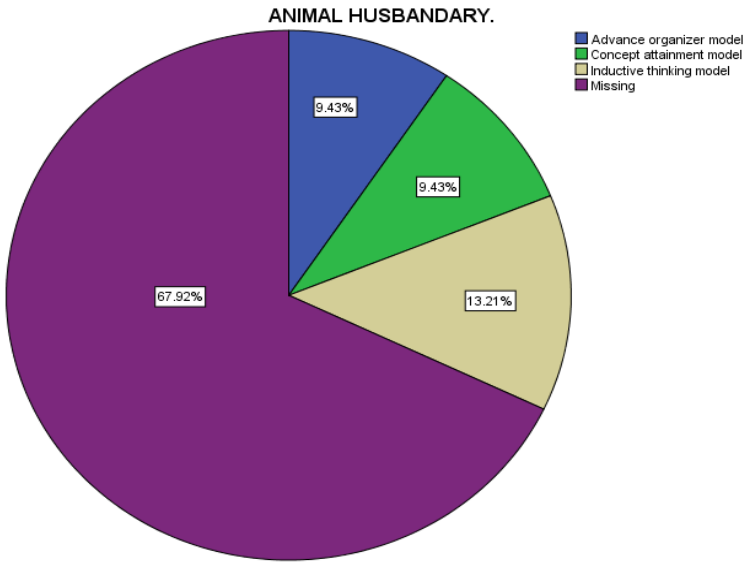
**Table No. 4.30**

**ANIMAL HUSBANDRY**

| | Frequency | Percent | Valid Percent |
|---|---|---|---|
| Advance organizer model | 5 | 9.4 | 29.4 |
| Concept attainment model | 5 | 9.4 | 29.4 |
| Inductive thinking model | 7 | 13.2 | 41.2 |
| **Total** | **17** | **32.1** | **100.0** |
| Missing System | 37 | 67.9 | |
| **Total** | **54** | **100.0** | |

**Figure No. 4.28**

**ANIMAL HUSBANDRY**




- **Interpretation:** For the unit 'Animal Husbandry' Out of 17 valid responses 05 teachers accounted for Advance Organizer Model, 05 for Concept Attainment Model and 07 for Inductive Thinking Model. Out of 54 responses 37 teacher have not given any response to this question.

- **Qualitative Analysis of descriptive question:**

Q. **Do you think that Language teaching and Science teaching need different Models of Teaching? Why?**

- Here varieties of answers were given by the respondents. Those who have understood the meaning of Models of teaching answered properly. Some said that as Language is more theoretical whereas Science is more practical. So different Models should be used according to content. Language is basically for communication and in Science the knowledge useful for day today life is given. Grammar topics can be taught well by using the Models like Concept Attainment Model, Advance Organiser Model. Some prose and poetry can be taught effectively by using role play model.

The next question was…

Q. **How can you compare the traditional method of teaching for Science subject and Models of Teaching? Comment on similarities and dissimilarities?**

The answers were given as –

- Traditional method is teacher centred method whereas Models are student centred. In Traditional method one way communication occurs mostly and in Models two way communication is there.
- In traditional method no special preparation is required but for Models it is required, even the teacher has to think about support system, syntax of model, its instructional effect and nurtarant effect should also be considered.
- Teacher–Student interactions are more meaningful in Models.

While analysing the questionnaire it is observed that maximum teachers considered Models of Teaching as different models used as teaching aids in teaching Science. There was a question in questionnaire that-- suggest the Models of Teaching for the units included in $8^{th}$ standards Science textbook. Below that the list of topics was also given but it was found that many teachers kept it as blank and some wrote the reply as - charts, models of solar system, actual model, soil samples, magnets,

solar cells, experiments, e- learning, practical etc. These responses clearly indicates that most of the teachers took the meaning wrongly.

- **Major Findings from Survey ….**

1. Most of the teachers are not aware about Models of Teaching.
2. All the teachers use lecture method as the main method to teach concept of Science.
3. Majority of Science teachers said that ineffective teaching method and inadequate use of teaching aids makes it difficult for students to understand the concepts.

It is observed while analyzing that, many teachers did not understand the meaning of Models of Teaching. Even those teachers who have learnt Models in their B.Ed. curriculum were not using Models in their teaching process. They were still using the regular traditional method, not a single topic is being taught by using Models of Teaching.

### 4.2.2 Analysis of data collected during the experiment:

The marks of the students in the pre-test and post-test for control and experiment group were obtained and the differences between the means of the two independent sample groups were found out.

## 4.3 Hypothesis Testing

### 4.3.1 Hypothesis Testing For Advance Organiser Model.

**A. For Advance Organizer Model.**

**Objective No. 2 -** To find out the effectiveness of Advance Organizer Model on achievement of 8$^{th}$ standard students.

**Hypothesis: -**

- **Research Hypothesis:-** Marks of Post-test will be improved as compared to Pre-test for Advance Organizer Model.
- **Null Hypothesis:** - Marks of Post-test will not be improved as compared to Pre-test for Advance Organizer Model.

  Level of Significance $\alpha = 0.05$
- **Paired sample t-test**: - Advance Organizer Model (Pre-test)

  Variables and Measurement:
- **Independent Variable** – Pre –test group & Post-test group.
- **Dependant Variable** – Marks.
- **Procedure of Experiment:** - The students in Abhinav English Medium School 8th standard 'A' division were taught the selected content by using Advance Organizer Model. Before teaching the content all students were given an achievement test called as Pre-test. After teaching the content students were given the same achievement test as Post-test. The Pre-test and Post-test results are given as follows.

**Table No. 4.31**

**Paired sample Statistics (AOM)**

| | **Mean** | **N** | **Standard Deviation** | **Std. Error Mean** |
|---|---|---|---|---|
| Div. A -pre-test | 3.6531 | 49 | 2.81033 | .40148 |
| Div. A -post-test | 29.8776 | 49 | 7.25038 | 1.03577 |

| **Paired Samples Test** | | | | | |
|---|---|---|---|---|---|
| | | Paired Differences | | | |
| | | Mean | Std. Deviation | Std. Error Mean | 95% Confidence Interval of the Difference |
| | | | | | Lower |
| Pair 1 | Div. A – pre-test<br>Div. A- post-test | -26.22449 | 7.26368 | 1.03767 | -28.31086 |

| Paired Samples Test | | | | | |
|---|---|---|---|---|---|
| | | Paired Differences | t | df. | Sig. (2-tailed) |
| | | 95% Confidence Interval of the Difference | | | |
| | | Upper | | | |
| Pair 1 | Div. A pre-test – Div. A post-test | -24.13812 | -25.273 | 48 | 0.000 |

- **Interpretation:** Since the p value (0.000) is less than level of significance (0.05), the null hypothesis is rejected. Hence it is concluded that there is significant difference in the mean values of Pre-test and Post -test for Advance Organizer Model. The mean gain score of Post-test is significantly greater than the Pre-test.

  Pre-test mean=3.65

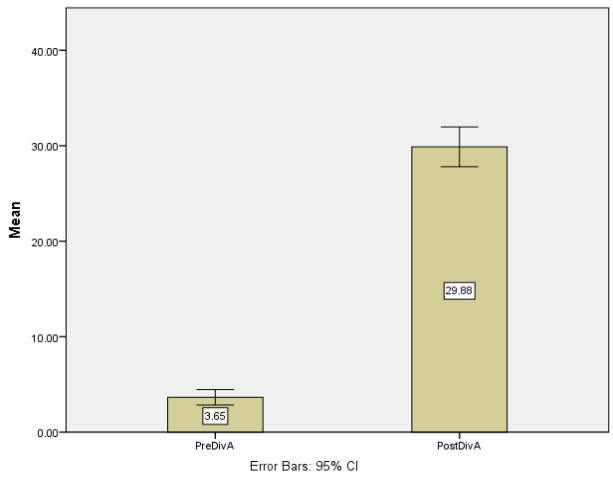
  Post-test mean= 29.87

  The difference between Mean=26.22

  t value is = -25.273

**Figure No. 4.29**

**Comparison between Pre-test and Post-test for AOM**




Performance of the students was improved in Post-test for Advance Organizer Model($\mu 1 \neq \mu 2$). Hence Advance Organizer Model is effective.

### 4.3.2 Hypothesis testing for Concept Attainment Model.

**B. For Concept Attainment Model.**

**Objective No. 3-** To find out the effectiveness of Concept Attainment Model on achievement of 8th standard students.

**Hypothesis:**

- **Research Hypothesis:-** Marks of Post-test will be improved as compared to Pre-test for Concept Attainment Model..
- **Null Hypothesis:** - Marks of Post-test will not be improved as compared to Pre-test for Concept Attainment Model.

  Level of Significance $\alpha = 0.05$
- **Paired sample t-test**: - Concept Attainment Model**.** (Pre-test)

  Variables and Measurement:
- **Independent Variable** – Pre –test group & Post-test group.
- **Dependant Variable** – Marks.
- **Procedure of Experiment: -** The students in Abhinav English Medium School 8th standard 'B' division were taught the selected content by using Concept Attainment Model**.** Before teaching the content all students were given an achievement test called as Pre-test. After teaching the content students were given the same achievement test as Post-test. The Pre-test and Post-test results are given as follows.

**Table No. 4.32**

**Paired Sample Statistics(CAM)**

| | | Mean | N | Standard Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| Pair 1 | Div. A -pre-test | 3.6531 | 49 | 2.81033 | .40148 |
| | Div. A -post-test | 29.8776 | 49 | 7.25038 | 1.03577 |

**Paired Sample Statistics(CAM)**

| Paired Samples Test | | | | | |
|---|---|---|---|---|---|
| | | Paired Differences | | | |
| | | Mean | Std. Deviation | Std. Error Mean | 95% Confidence Interval of the Difference |
| | | | | | Lower |
| Pair 1 | Div. B pre-test – Div. B post-test | -30.78261 | 5.02400 | 0.74075 | -32.27455 |

| Paired Samples Test | | | | | |
|---|---|---|---|---|---|
| | | Paired Differences | t | df. | Sig. (2-tailed) |
| | | 95% Confidence Interval of the Difference | | | |
| | | Upper | | | |
| Pair 1 | Div. B pre-test Div. B post-test | -29.29066 | -41.556 | 45 | 0.000 |

Pre-test Mean= 3.7

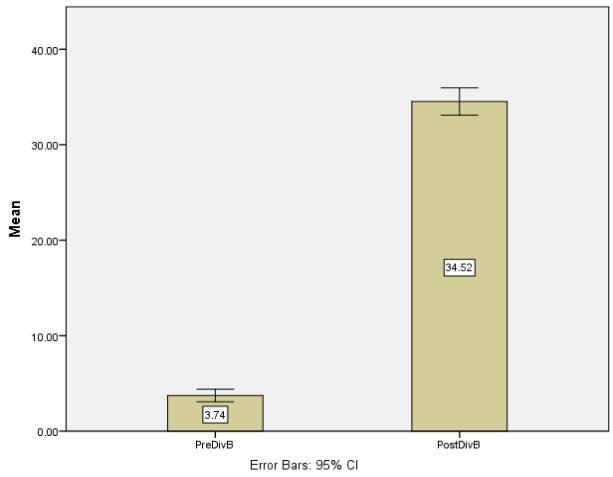
Post-test Mean= 34.5

Difference between the mean of post- test and pre-test =30.78261

t Value = - 41.556

**Figure No. 4.30**

**Comparison between Pre-test and Post-test for CAM**



- **Interpretation:** Since the p value (0.000) is less than level of significance (0.05), the null hypothesis is rejected. Hence it is concluded that there is significant difference in the mean values of Pre-test and Post -test for Concept Attainment Model. The mean gain score of Post-test is significantly greater than the Pre-test.

  Hence performance of the student was improved due to Concept Attainment Model. Hence Concept Attainment Model is effective**.**

### 4.3.3 Hypothesis Testing For Inductive Thinking Model.

**C. For Inductive Thinking Model.**

**Objective No. 4-** To find out the effectiveness of Inductive Thinking Model on achievement of 8$^{th}$ standard students

**Hypothesis: -**

- **Research Hypothesis:-** Marks of Post-test will be improved as compared to Pre-test for Inductive Thinking Model.
- **Null Hypothesis:** - Marks of Post-test will not be improved as compared to Pre-test for Inductive Thinking Model.

  Level of Significance $\alpha = 0.05$
- **Paired Sample t-test**: - Inductive Thinking Model**.** (Pre-test)

  Variables and Measurement:
- **Independent Variable** – Pre –test group & Post-test group.
- **Dependant Variable** – Marks.
- **Procedure of Experiment**: - The students in Abhinav English Medium School 8$^{th}$ standard 'C' division were taught the selected content by using Inductive Thinking Model. Before teaching the content all students were given an achievement test called as pre-test. After teaching the content students were given the same achievement test as post-test. The pre-test and post-test results are given in appendices.

**Table No. 4.33**

**Paired Samples Statistics (ITM)**

| | | Mean | N | Standard Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| Pair 1 | Div. C pre-test | 4.7708 | 48 | 2.09599 | 0.30253 |
| | Div. C post-test | 31.6458 | 48 | 5.48301 | 0.79140 |

**Paired Sample Statistics(ITM)**

| **Paired Samples Test** | | | | | |
|---|---|---|---|---|---|
| | | Paired Differences | | | |
| | | Mean | Std. Deviation | Std. Error Mean | 95% Confidence Interval of the Difference |
| | | | | | Lower |
| Pair 1 | Div. C – Pre-test<br>Div. C- Post-test | -26.87500 | 5.69668 | .82224 | -28.52914 |

| **Paired Samples Test** | | | | | |
|---|---|---|---|---|---|
| | | Paired Differences | t | df. | Sig. (2-tailed) |
| | | 95% Confidence Interval of the Difference | | | |
| | | Upper | | | |
| Pair 1 | Div. C pre-test<br>Div. C post-test | -25.22086 | -32.685 | 47 | .000 |

Pre- test Mean=4.7

Post-test Mean=31.6

Difference between the mean =26.875

t value = -32.685

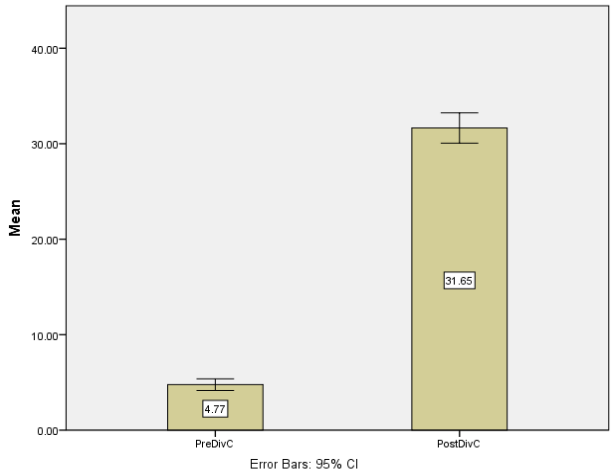
- **Interpretation:** Since the p value (0.000) is less than level of significance (0.05), the null hypothesis is rejected. Hence it is concluded that there is significant difference in the mean values of Pre-test and Post -test for Inductive Thinking Model. The mean gain score of Post-test is significantly greater than the Pre-test.

**Hence performance of the student is improved in Inductive Thinking Model.**

Hence Inductive thinking Model is effective.

**Figure No. 4.31**

**Comparison between Pre-test and Post-test for ITM**




### 4.3.4 Hypothesis Testing for Traditional Teaching.

**D. For Traditional Teaching Method**

- To find out the effectiveness of Traditional Teaching method on achievement of 8th standard students

**Hypothesis:**

- **Research Hypothesis:-** Marks of Post-test will be improved as compared to Pre-test for Traditional Teaching method
- **Null Hypothesis:** - Marks of Post-test will not be improved as compared to Pre-test for Traditional Teaching method.

  Level of Significance $\alpha = 0.05$
- **Paired sample t-test**: Traditional Teaching method**.** (Pre-test)

  Variables and Measurement:
- **Independent Variable** – Pre –test group & Post-test group.
- **Dependant Variable** – Marks.

- **Procedure of Experiment**: - The students in Abhinav English Medium School 8th standard 'D' division were taught the selected content by using Traditional Teaching Method. Before teaching the content all students were given an achievement test called as pre-test. After teaching the content students were given the same achievement test as post-test. The pre-test and post-test results are given in appendices.

**Table No. 4.34**

Paired Sample Statistics(Traditional Teaching)

| | | Mean | N | Standard Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| Pair 1 | Div. D pre-test | 5.7609 | 47 | 2.41463 | 0.35602 |
| | Div. D post-test | 21.7826 | 47 | 6.45639 | 0.95194 |

| **Paired Samples Test** | | | | | |
|---|---|---|---|---|---|
| | | Paired Differences | | | |
| | | Mean | Std. Deviation | Std. Error Mean | 95% Confidence Interval of the Difference |
| | | | | | Lower |
| Pair 1 | Div. D. pre-test<br>Div. D post-test | -16.02174 | 6.59120 | 0.97182 | -17.97908 |

| **Paired Samples Test** | | | | | |
|---|---|---|---|---|---|
| | | Paired Differences | t | df. | Sig. (2-tailed) |
| | | 95% Confidence Interval of the Difference | | | |
| | | Upper | | | |
| Pair 1 | Div. D pre-test– Div. D post-test | -14.06439 | -16.486 | 45 | 0.000 |

Pre-test Mean=5.7

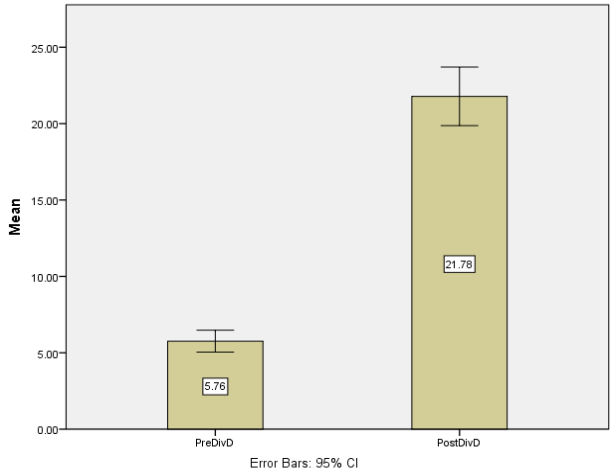
Post-test Mean= 21.7

Difference between mean=16.02174

t value = -16.486

**Figure No. 4.32**

**Comparison between Pre-test and Post-test for traditional teaching**




- **Interpretation**: Hence performance of students is not that much improved in regular Traditional Teaching. Hence traditional teaching method was not that much effective as Models of Teaching.

### 4.3.5 Hypothesis Testing by ANOVA

**Objective-5:** To compare the effectiveness of Models of Teaching with Traditional Method on achievement of $8^{th}$ standard students.

**4.3.5.1Test of Normality**:- Normality was tested using the criteria suggested by Darren George and Paul Mallory. According to Darren George and Paul Mallory variables whose skewness value is ±1 and kurtosis values between ±2, indicates normality.

**Table No. 4.35**

**Skewness and Kurtosis**

| | N | Skewness | Kurtosis |
|---|---|---|---|
| | **Statistic** | **Statistic** | **Statistic** |
| Pre Div. A | 49 | .753 | .242 |
| Post Div. A | 49 | -.952 | .295 |
| Pre Div. B | 46 | -.153 | -1.087 |
| Post Div. B | 46 | -1.289 | .615 |
| Pre Div. C | 48 | .332 | -.263 |
| Post Div. C | 48 | -.484 | -.832 |
| Pre Div. D | 47 | -.570 | .477 |
| Post Div. D | 47 | .099 | -.341 |
| Valid N (list wise) | 45 | | |

From the above table it can be seen that all the variable have Skewness and kurtosis values within the threshold range ±1,except post div-B Skewness which is marginally above threshold. Hence **normality supported.**

### 4.3.6 Test of Normality

**One Way ANOVA**

- **Purpose-**To study whether the performance of students differs across Advance Organizer Model, Concept Attainment Model, Inductive Thinking Model and regular Traditional method.
- Variables and Measurements: -
- Independent Variable -Teaching Methodology.

Four teaching Methodologies were used to judge performance of students (1: Advance Organizer Mode, 2:=Concept Attainment Model, 3=Inductive Thinking Model and 4= Regular Traditional Teaching.)

- Dependant variable- Marks scored.

**$H_0$**:- Mean scores of the four methodologies do not differ.[$\mu1=\mu2=\mu3=\mu4$].

**$H_{1=}$** One of the mean value is different from the rest.

Level of significance $\alpha = 0.05$

**Table No. 4.36**

**Descriptive Statistics**

| Marks | | | | | | |
|---|---|---|---|---|---|---|
| **Model** | | **N** | **Mean** | **Std. Deviation** | **Std. Error** | **95% Confidence Interval for Mean** |
| | | | | | | **Lower Bound** |
| Advanced Organizer Model | | 49 | 29.8776 | 7.25038 | 1.03577 | 27.7950 |
| Concept Attainment Model | | 46 | 33.9149 | 6.31709 | .92144 | 32.0601 |
| Inductive Thinking Model | | 48 | 31.6458 | 5.48301 | .79140 | 30.0537 |
| Regular Classroom Teaching | | 47 | 21.7826 | 6.45639 | .95194 | 19.8653 |
| Total | | 190 | 29.3632 | 7.80989 | .56659 | 28.2455 |
| Model | Fixed Effects | | | 6.41224 | .46519 | 28.4454 |
| | Random Effects | | | | 2.61003 | 21.0569 |

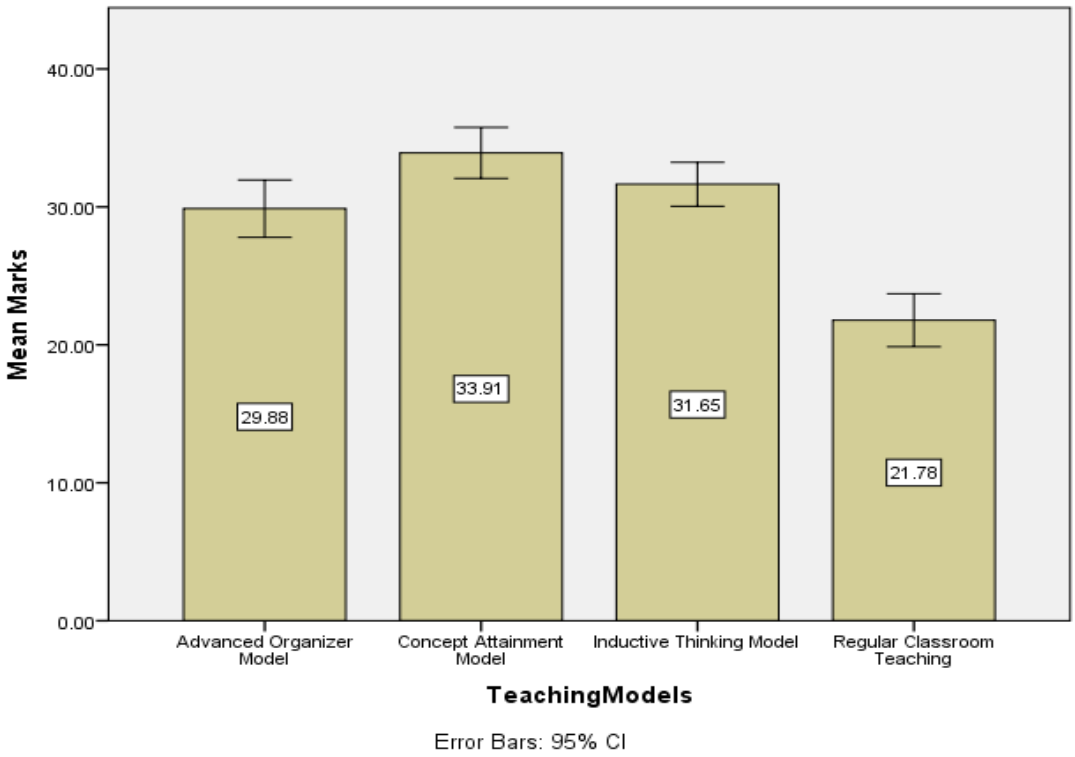
From the above table it can be seen that Advance Organizer Model has mean= 29.8, Concept Attainment Model has mean= 33.9, Inductive Thinking Model has mean=31.6 and Regular classroom Teaching has the mean= 21.7

**ANOVA**

| Marks | | | | | |
|---|---|---|---|---|---|
| | **Sum of Squares** | **Df** | **Mean Square** | **F** | **Sig.** |
| Between Groups | 3880.212 | 3 | 1293.404 | 31.457 | .000 |
| Within Groups | 7647.730 | 186 | 41.117 | | |
| **Total** | **11527.942** | **189** | | | |

**Figure No. 4.33**

**Teaching Models**




From the ANOVA table it can be seen that p value is less than 0.05 and the 'f' test is significant, hence it is concluded that there is significant difference in mean values of teaching methodologies. Further from the descriptive statistics table it can be seen that Advance Organizer Model has mean= 29.87, Concept Attainment Model has mean= 33.91, Inductive Thinking Model has mean=31.64 and Regular classroom Teaching has the mean= 21.78, hence the most effective teaching method is Concept Attainment Model.

To find out where the difference lies, we refer to multiple comparison tables.

#### 4.3.6.1 Multiple Comparisons

**Dependent Variable: Marks**

**Gabriel**

| (I) Teaching Models | (J) Teaching Models | Mean Difference (I-J) | Std. Error | Sig. |
|---|---|---|---|---|
| Advanced Organizer Model | Concept Attainment Model | -4.03734* | 1.30918 | .014 |
| | Inductive Thinking Model | -1.76828 | 1.30220 | .684 |
| | Regular Classroom Teaching | 8.09494* | 1.31642 | .000 |
| Concept Attainment Model | Advanced Organizer Model | 4.03734* | 1.30918 | .014 |
| | Inductive Thinking Model | 2.26906 | 1.31584 | .415 |
| | Regular Classroom Teaching | 12.13228* | 1.32991 | .000 |
| Inductive Thinking Model | Advanced Organizer Model | 1.76828 | 1.30220 | .684 |
| | Concept Attainment Model | -2.26906 | 1.31584 | .415 |
| | Regular Classroom Teaching | 9.86322* | 1.32304 | .000 |
| Regular Classroom Teaching | Advanced Organizer Model | -8.09494* | 1.31642 | .000 |
| | Concept Attainment Model | -12.13228* | 1.32991 | .000 |
| | Inductive Thinking Model | -9.86322* | 1.32304 | .000 |

| Multiple Comparisons | | | |
|---|---|---|---|
| **Dependent Variable: Marks**<br>**Gabriel** | | | |
| **(I) Teaching Models** | **(J) Teaching Models** | **95% Confidence Interval** | |
| | | **Lower Bound** | **Upper Bound** |
| Advanced Organizer Model | Concept Attainment Model | -7.5170* | -.5576 |
| | Inductive Thinking Model | -5.2296 | 1.6930 |
| | Regular Classroom Teaching | 4.5962* | 11.5936 |
| Concept Attainment Model | Advanced Organizer Model | .5576* | 7.5170 |
| | Inductive Thinking Model | -1.2285 | 5.7666 |
| | Regular Classroom Teaching | 8.5973* | 15.6672 |
| Inductive Thinking Model | Advanced Organizer Model | -1.6930 | 5.2296 |
| | Concept Attainment Model | -5.7666 | 1.2285 |
| | Regular Classroom Teaching | 6.3467* | 13.3798 |
| Regular Classroom Teaching | Advanced Organizer Model | -11.5936* | -4.5962 |
| | Concept Attainment Model | -15.6672* | -8.5973 |
| | Inductive Thinking Model | -13.3798* | -6.3467 |

The mean difference is significant at the 0.05 level.

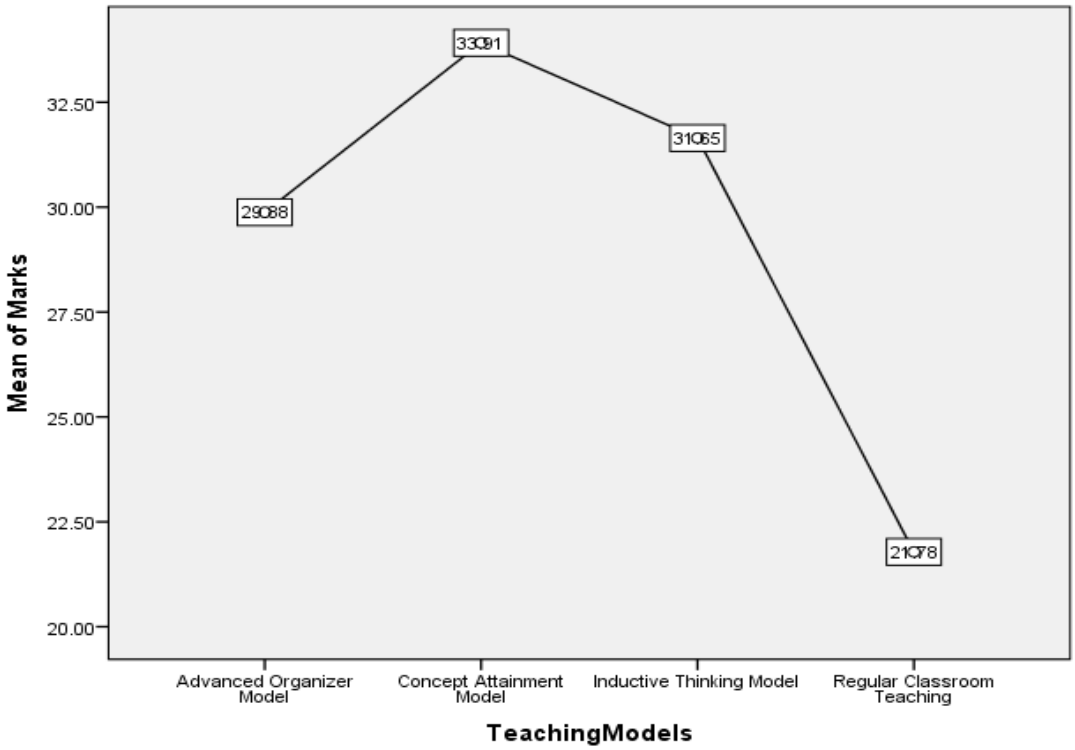
From the above tables it can be seen that mean score of Advance organizer Model and Inductive Thinking Model do not differ from each other, similarly mean score of Concept Attainment Model and Inductive Thinking Model do not differ from each-other. However mean score of Concept Attainment Model and regular classroom teaching significantly differ from each-other. Mean score of Advance Organizer Model and regular classroom teaching significantly differ from each other. Mean score of Inductive Thinking Model and regular classroom teaching significantly differ from each other. Hence it can be concluded that Advance Organizer Model, Concept Attainment Model and Inductive Thinking Model produces better performance than regular classroom teaching and Concept

Attainment Model is better than Advance Organizer Model and Inductive Thinking Model.

### 4.3.6.2 Means Plots

**Figure No. 4.34**

**Teaching Models bar graph**




## 4.4 Closure:

Thus in the present chapter the researcher has…

- Analyzed the data collected though Survey and experiment.
- Analysis was done by tabularizing the data and supported it with graphs.
- Meaning was given to the quantitative information and interpreted it.
- Tested the hypothesis statistically based on the collected numerical data.
- The details of testing of hypothesis with respect to objectives are given.

The data analysis was done with the help of expert by using SPSS software.

❑❑❑

# CHAPTER - V

## SUMMARY, CONCLUSION AND RECOMMENDATION

### 5.1 Introduction:

To deal with new changes, we need to improve the core technology which is 'teaching'. The interaction between the teachers and students is the most important part of Education. A teacher makes a significant difference in what a student learns. The old method of teaching may not work effectively with today's kids; therefore, we must mould our teaching to accommodate the ways they learn.

We are teaching for the lowest two levels i.e. knowledge and comprehension. The higher order thinking skills the very ones our students in this computer society are often left out. Therefore the new millennium teachers need to have exact and sound teaching strategies that will help to brain out learning outcomes in all levels of Cognitive, Affective and Psychomotor domain.

Joyce and Weil developed more than 20 Models of Teaching, which were grouped on the basis of their chief emphasis- the way they approached educational goals and means. Each of these Models is available for teachers to use and each produces useful results. Each of these models has substantial research base demonstrating its effect on learners.

The Models of Teaching are grouped into 4 families.

A. Information Processing Family of Models of Teaching.

B. Personal Family of Models of Teaching.

C. Social Family of Models of Teaching.

D. Behavioral Family of Models of Teaching.

### 5.2 Need of the study:

Physics, Chemistry and Biology are very important branches of science, which introduces many concepts at secondary level. These needs to be mastered and the students should be able to apply them in their day to day situation. If one looks at

present scenario of science teaching, one can easily observe that most of the students are not able to grasp the basic principles, concepts and cannot apply them in their life.

- Students become passive listeners instead of active learners. The teachers are in a hurry to complete their portion in a limited time, so they stick to simple method which is nothing but lecture method and use the textbook to the maximum.
- No extra information, teaching methods or teaching aids are used in the teaching. Because of the present nature of Science teaching in our schools the students do not understand Science concepts, laws and principles in proper manner.
- Many learners do find it difficult to understand concepts, especially if they are explained it in a difficult way.

Therefore the researcher felt that the teaching methods which are used in science teaching are not effective to teach Science concepts. Many concepts of Science subject remains unclear and sometimes misconceptions also occurs .So the researcher decided to teach Science subject by using three different Models of teaching for std. $8^{th}$ standard students.

This study proposes to find out which Model is most effective among the three, after comparing with traditional teaching method.

## 5.3 Review of Related Literature:

In any field related literature forms the foundation upon which all further work is to be built and repetition of knowledge can be avoided. Present research has been designed keeping in mind the research gap identified through this review.

For the present study the researcher has studied various reference books which gave the theoretical knowledge about the Models of Teaching. The researcher also studied many researches done at Ph.D. level, M. Phil. level, M. Ed. level etc. She also referred online researches; read article in various journals. It is found that no one has done research on this topic, so the researcher finalised this title.

## 5.4 Title:

Comparative Study of Models of Teaching on Achievement of 8th Standard Students.

## 5.5 Statement of Problem:

To compare the effectiveness of Models of Teaching with Traditional Teaching method for Science subject on 8th standard students of Abhinav Education society's English Medium School. Ambegaon (bk) Pune -46.

## 5.6 Definition of Key words:

### 5.6.1 Conceptual Definitions:

- **Effectiveness:** It is the degree to which something is successful in producing a desired result; success. (Oxford Dictionary)
- **Models of Teaching:** Models of Teaching are the instructional designs**.** They describe the process of specifying and producing particular environment situation which causes the student to interact in such a way that specific change occurs in his behavior. –Joyce and Weil.
- **Traditional Teaching Method:** A teaching method comprises the principles and methods used for instructions to be implemented by teachers to achieve the desired learning by students.
- **Science Subject**: Study of the natural world based on facts learnt through experiments and observations.
- **8th standard students**: The highest class of primary Education in India.

### 5.6.2 Operational Definitions:

- **Effectiveness**: The effectiveness of teaching learning method will be determined on the basis of significant difference in marks obtained in post-test and pre-test. Also the difference between the mean of post test scores of

controlled group and experimental group will be considered as the effectiveness of the teaching by using Models of teaching.

- **Models of Teaching:** The Models of Teaching given by Joyce and Weil. The three Models from Information Processing family are selected for the present research. The Models are **Advance Organizer Model, Concept Attainment model and Inductive Thinking Model.**
- **Traditional Teaching Method:** Teaching method following Herbart's steps.
- **Science:** A subject in the curriculum of $8^{th}$ std. prepared by S.C.E.R.T (Maharashtra State) which includes the content from basics of Physics, Chemistry and Biology
- **$8^{th}$ standard students:** Students studying in $8^{th}$ standard of S.S.C. board schools.

## 5.7 Objectives of the Study:

1. To find out the present status about the use of Models of teaching in classroom teaching.
2. To find out the effectiveness of Advance Organizer Model on achievement of $8^{th}$ std. students in Science subject.
3. To find out the effectiveness of Concept Attainment Model on achievement of $8^{th}$ std. students in Science subject.
4. To find out the effectiveness of Inductive Thinking Model on achievement of $8^{th}$ std. students in Science subject.
5. To compare the effectiveness of Models of Teaching with Traditional method on achievement of $8^{th}$ std. students in Science subject.

## 5.8 Assumption:

- Models of Teaching are effective for learning.
- Students have the previous knowledge about the selected topics (Metals And Non-metals, Air, Soil and Diseases).

## 5.9 Research Question:

What is the existing status of use of Models of teaching in classroom teaching?

- Which units of Science can be taught by using Models of Teaching to std.8$^{th}$?
- What is the effect of Advance Organization Model of Teaching on achievement of 8$^{th}$ standard student in Science subject?
- What is the effect of Concept Attainment Model of Teaching on achievement of 8$^{th}$ standard student in Science subject?
- What is the effect of Inductive Thinking Model of Teaching on achievement of 8$^{th}$ std. student in Science subject?
- Which is the most effective model of teaching among the three?

## 5.10 Hypothesis:

### 5.10.1 Hypothesis: -1

**$H_1$**: There will be difference in achievement in pre-test and post-test of 8$^{th}$ standard students in Science subject.

**$H_0$:** There will be no significant difference in achievement in pre-test and post-test of 8$^{th}$standard students in Science subject.

### 5.10.2 Hypothesis-2

**$H_{2:-}$**: There will be difference in achievement of 8$^{th}$standard students of models of teaching as compared to traditional method in Science subject.

**$H_0$:** There will be no significant difference in achievement of 8$^{th}$standard students of models of teaching as compared to traditional method in Science subject.

## 5.11 Scope:

The program developed is applicable for all the students of 8$^{th}$ std. of S.S.C. board school.

- The program is useful to teach the selected units of Science prescribed by any board.
- The lesson plan of Models of Teaching is an example for Science teachers and also to B.Ed. students for how to write lesson plan.

### 5.12 Limitations:

- Interest and attention of students in Science subject was out of researcher's control.
- Administration of school posed some limitations on teaching Program.
- The Infra structure was out of researcher's control.

### 5.13 Delimitations:

- The program was conducted in one school from Pune city.
- The research was delimited for 8$^{th}$ standard. English medium school of S.S.C. Board only.
- The content was "Metals and non-metals, Diseases, Air, and Soil" From 8$^{th}$ standard, Science textbook.
- The program was in English language only.
- The program was implemented only in three divisions of the selected school.

### 5.14 Research Design:

- True Experimental design.
- Pretest- Posttest Equivalent Group Design.

### 5.15 Research Methodology:

The research was carried out by multiple method i.e. Survey method, Product development method and Experiment method.

- Before taking Survey, a questionnaire was prepared to check the present status about the use of Models of Teaching. Questionnaire was given to 54 school teachers who teach Science to $^{8th}$ std. students. ( for objective no.1)
- Lesson plans were prepared according to the Models of Teaching.
- Pretest was given to all four groups.
- Teaching was done by using Models of Teaching.
- The controlled group was taught by using Traditional Teaching method.
- All the four groups were Post tested.

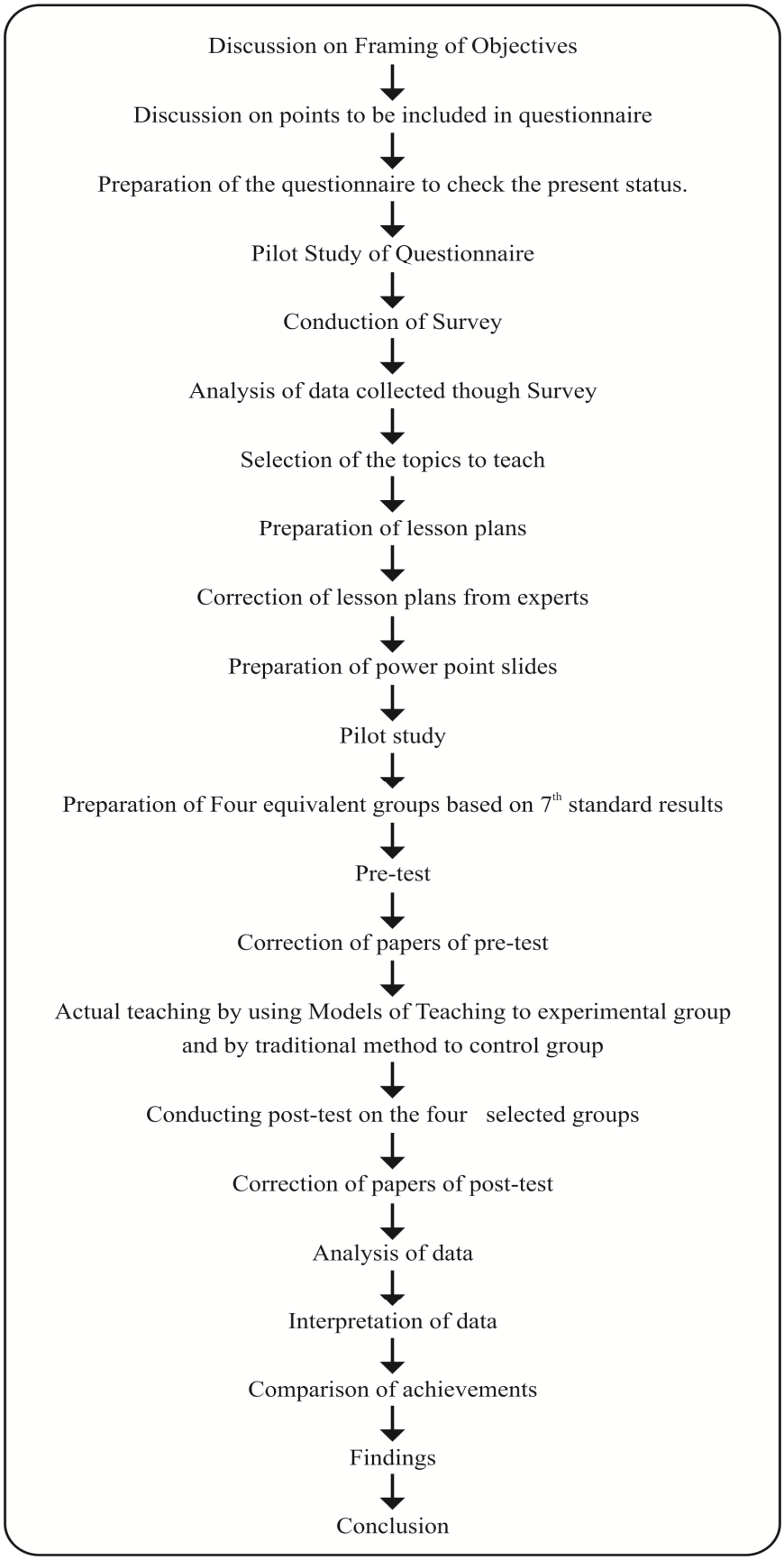
## 5.16 Variable:

- **Independent variables** : Use f Models of Teaching.
- **Dependent variables** : Achievement of the students.
- **Controlled variables** : Subject and Units.
  Time duration of teaching.
  Students from same school.
  Age group of students (14-15 years old)
- **Extraneous Variable** **:** Interest of students in Science subject.
  Administration of school.

## 5.17 Detail plan and Procedure of Research Work.

**Figure No. 5.1**

**Flow Chart of the Study**



## 5.18 Sample Size:

Non probability- purposive sample.

For the research the 8th std. students from Abhinav Education Society's English Medium school, Ambegaon.Pune-4 were selected. Three equal groups, each of 50 students were prepared according to their grades in $7^{th}$ standard and the fourth group was taught by traditional method. The researcher has conducted the program in three divisions. So for final result only those students were selected who have given Pre-test and Post-test. Here out of 200 students 10 students got drop out. So total 190 students were remained.

**Table No. 5.1**

**Sample Size**

| No. | Division | Model of Teaching | No. of Students |
|---|---|---|---|
| 1 | A | Advance Organizer Model | 49 |
| 2 | B | Concept Attainment Model | 46 |
| 3 | C | Inductive thinking Model. | 48 |
| 4 | D | Traditional Teaching Method. | 47 |

## 5.19 Data Collection Tool:

- **A Questionnaire:-**To check the present status about the use of Model of Teaching in day today classroom teaching.
- **An Achievement test**:- The effectiveness of Models of Teaching was determined on the basis of marks obtained in an achievement test.

## 5.20 Statistical Tools:

The role of statistics in research is to function as a tool in designing research, analysing its data and drawing conclusion there from. (Kothari1985:162).

Most research studies result in a large volume of raw data which must be suitably reduced so that the same can be read easily and can be used for further analysis.

The statistical tools used for the further analysis were….

**5.20.1 Mean:** Mean was used to find the average of each experimental and control group and they were compared.

**5.20.2 Standard Deviation:** It was used to know the spread of scores.

**5.20.3 Standard Errors of the Difference between the Means: -** It was used to find out the deviation of the sample mean from the population mean.

**5.20.4 t-test:** It was used to compare mean scores of controlled and experimental groups in post- test.

**5.20.5 Kurtosis:** It was used to test Normality of controlled and experimental group data during post-test.

**5.20.6 Skewness:** It was used to test Normality of controlled and experimental group data during post-test.

**5.20.7 Levene's Test of Equality:** It was used to ascertain homogeneity of variance between control group and experimental group data in post-test**.**

**5.20.8 ANOVA:** ANOVA was used to find to the significance of the difference between the mean.

## 5.21 Major Findings and Conclusion: -

**From Survey -**

1. Most of the teachers are not aware about Models of Teaching.
2. All the teachers use lecture method as the main method to teach concept of Science.
3. Majority of Science teachers said that good concept teaching bring understanding to the students and make the concept clear.
4. Majority of Science teachers said that ineffective teaching method and inadequate use of teaching aids makes it difficult for students to understand the concepts.

While analysing the questionnaire it is observed that maximum teachers considered Models of Teaching as different models used as teaching aids in teaching

Science. There was a question in questionnaire that-- suggest the Models of Teaching for the units included in 8th standards Science textbook. Below that the list of topics was also given but it was found that many teachers kept it as blank and some wrote the reply as - charts, models of solar system, actual model, soil samples, magnets, solar cells, experiments, e- learning, practical etc. These responses clearly indicates that most of the teachers took the meaning wrongly.

It is observed while analysing that many teachers did not understood the meaning of Models of Teaching. Even those teachers who have learnt Models in their B.Ed. curriculum were not using Models in their teaching process. They were still using the regular traditional method, not a single topic is being taught by using Models of Teaching.

- **Major Findings of Experiment: -**

**Hypothesis -** There will be significant difference in achievement in pre-test and post-test of 8th standard students in Science subject for Advance Organizer Model.

### 5.21.1 Hypothesis Testing For Advance Organiser Model.(for Objectibve-2)

**Table No. 5.2**

**Hypothesis Testing For Advance Organiser Model.**

| | Mean | N | Standard deviation | Std. Error Mean |
|---|---|---|---|---|
| Div. A -pre-test | 3.6531 | 49 | 2.81033 | .40148 |
| Div. A -post-test | 29.8776 | 49 | 7.25038 | 1.03577 |

| | | Paired Differences | t | df | Sig. (2-tailed) |
|---|---|---|---|---|---|
| | | 95% Confidence Interval of the Difference | | | |
| | | Upper | | | |
| Pair 1 | Pre Div A – Post Div A | -24.13812 | -25.273 | 48 | .000 |

Pre-test mean=3.65

Post-test mean= 29.87

The difference between Mean=26.22

t value is = -25.273

**Performance of the students in pre-test was improved than the performance in post-test for Advance Organizer Model (μ1≠μ2). Hence advance Organizer Model was effective**.

- **Interpretation:** Since the P value (0.000) is less than level of significance (0.05), the null hypothesis is rejected. Hence it is concluded that there is significant difference in the mean values of pre-test post -test for Advance Organizer Model. The mean gain score of post-test is significantly greater than the Pre-test.

### 5.21.2 Hypothesis testing for Concept Attainment Model.

- **Hypothesis Testing (Objective-3)**

**Research Hypothesis:** There will be significant difference in achievement in pre-test and post-test of 8th standard students in Science subject for Concept Attainment Model.

**Table No. 5.3**

**Hypothesis testing for Concept Attainment Model.**

| | | Mean | N | Standard deviation | Std. Error Mean |
|---|---|---|---|---|---|
| Pair 1 | Div. B pre-test | 3.7391 | 46 | 2.22546 | .32813 |
| | Div.-test. B Post | 34.5217 | 46 | 4.80620 | .70863 |

**Paired Samples Test**

| | | Paired Differences | t | df | Sig. (2-tailed) |
|---|---|---|---|---|---|
| | | 95% Confidence Interval of the Difference | | | |
| | | Upper | | | |
| Pair 1 | PreDivB - PostDivB | -29.29066 | -41.556 | 45 | .000 |

Pre-test Mean= 3.7

Post-test Mean= 34.5

Difference between the mean of post- test and pre-test =30.78261

t value is = -41.556

**Hence performance of the student was improved in Concept Attainment Model. Hence Concept Attainment Model was effective.**

### 5.21.3 Hypothesis Testing For Inductive Thinking Model.

- **Hypothesis Testing (Objective-4)**

**Research Hypothesis: -** There will be significant difference in achievement in pre-test and post-test of 8th standard students in Science subject for Inductive Thinking Model.

Level of Significance $\alpha = 0.05$

**Table No. 5.4**

**Hypothesis Testing For Inductive Thinking Model.**

| | | Mean | N | Standard deviation | Std. Error Mean |
|---|---|---|---|---|---|
| Pair 1 | Div. C pre-test | 4.7708 | 48 | 2.09599 | 0.30253 |
| | Div. C post-test | 31.6458 | 48 | 5.48301 | 0.79140 |

**Paired Samples Test**

| | | Paired Differences | t | df | Sig. (2-tailed) |
|---|---|---|---|---|---|
| | | 95% Confidence Interval of the Difference | | | |
| | | Upper | | | |
| Pair 1 | Div. C pre-test – Div. C post-test | -25.22086 | -32.685 | 47 | .000 |

Pre- test Mean=4.7

Post-test Mean=31.6

Difference between the mean =26.875

t value is =-32.685

**Hence performance of the student is improved in Inductive Thinking Model. Hence Inductive thinking Model was effective.**

### 5.21.4 Hypothesis Testing for Traditional Teaching.

**Hypothesis -** There will be significant difference in achievement in pre-test and post-test of 8th standard students in Science subject for Traditional Teaching method.

**Table No. 5.5**

**Hypothesis Testing for Traditional Teaching**

| | | Mean | N | Standard deviation | Std. Error Mean |
|---|---|---|---|---|---|
| Pair 1 | Div. D pre-test | 5.7609 | 47 | 2.41463 | 0.35602 |
| | Div. D post-test | 21.7826 | 47 | 6.45639 | 0.95194 |

**Paired Samples Test**

| | | Paired Differences | t | df | Sig. (2-tailed) |
|---|---|---|---|---|---|
| | | 95% Confidence Interval of the Difference | | | |
| | | Upper | | | |
| Pair 1 | Div. D pre-test– Div. D post-test | -14.06439 | -16.486 | 45 | 0.000 |

Pre-test Mean=5.7

Post-test Mean= 21.7

Difference between mean=16.02174

t value is = -16.486

**Hence performance of students is not that much improved in regular traditional teaching. Hence traditional teaching method was not that much effective.**

Dependant variable- Marks scored.

$H_0$:- Mean scores of the four methodologies do not differ.[$\mu1=\mu2=\mu3=\mu4$].

$H_{1=}$ One of the mean value is different from the rest.

Level of significance $\alpha = 0.05$

## 5.22 Descriptive statistics

**Table No. 5.6**

**Descriptive Statistics**

| Marks | | | | | | |
|---|---|---|---|---|---|---|
| **Model** | | **N** | **Mean** | **Std. Deviation** | **Std. Error** | **95% Confidence Interval for Mean** |
| | | | | | | **Lower Bound** |
| Advanced Organizer Model | | 49 | 29.8776 | 7.25038 | 1.03577 | 27.7950 |
| Concept Attainment Model | | 46 | 33.9149 | 6.31709 | .92144 | 32.0601 |
| Inductive Thinking Model | | 48 | 31.6458 | 5.48301 | .79140 | 30.0537 |
| Regular Classroom Teaching | | 47 | 21.7826 | 6.45639 | .95194 | 19.8653 |
| Total | | 190 | 29.3632 | 7.80989 | .56659 | 28.2455 |
| Model | Fixed Effects | | | 6.41224 | .46519 | 28.4454 |
| | Random Effects | | | | 2.61003 | 21.0569 |

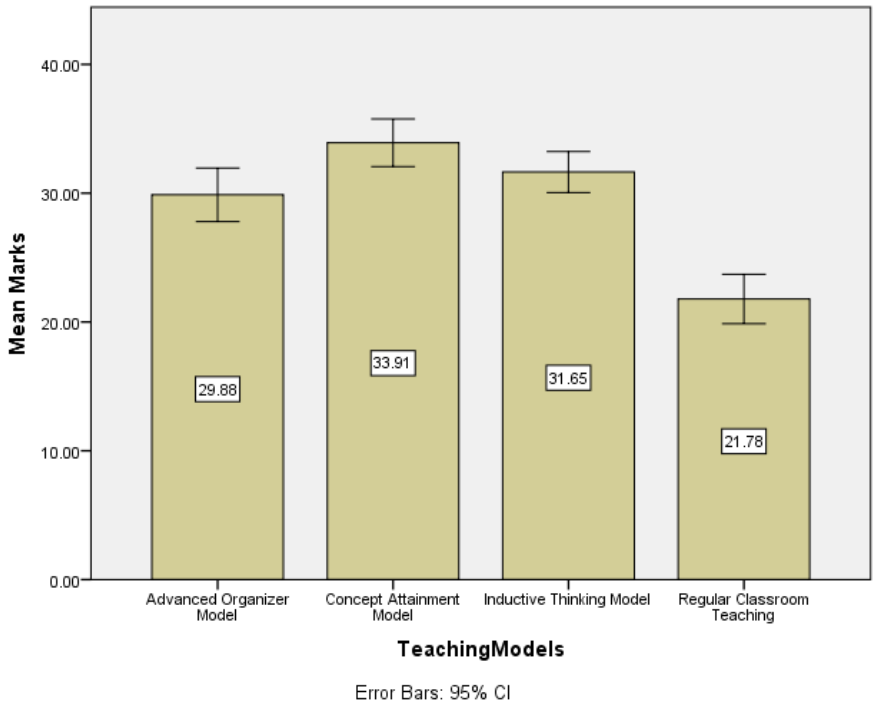
From the above table it can be seen that Advance Organizer Model has mean= 29.8, Concept Attainment Model has mean= 33.9, Inductive Thinking Model has mean=31.6 and Regular classroom Teaching has the mean= 21.7.

From the above tables it can be seen that mean score of Advance organizer Model and Inductive Thinking Model do not differ from each other, similarly mean score of Concept Attainment Model and Inductive Thinking Model do not differ from each-other. However mean score of Concept Attainment Model and regular

classroom teaching significantly differ from each-other. Mean score of Advance Organizer Model and regular classroom teaching significantly differ from each other. Mean score of Inductive Thinking Model and regular classroom teaching significantly differ from each other. Hence it can be concluded that Advance Organizer Model, Concept Attainment Model and Inductive Thinking Model produces better performance than regular classroom teaching and Concept Attainment Model is better than Advance Organizer Model and Inductive Thinking Model.

**Figure No. 5.2**

**Hypothesis Testing for Models of Teaching**




## 5.23 Conclusions:

1. Performance of the students was improved in Post-test for Advance Organizer Model. Hence Advance Organizer Model was effective.
2. Performance of the students was improved due to Concept Attainment Model. Hence Concept Attainment Model was effective.
3. Performance of the students was improved in Inductive Thinking Model. Hence Inductive thinking Model was effective.

4. Performance of students was not that much improved in regular Traditional Teaching. Hence traditional teaching method was not that much effective as Models of Teaching.

5. Advance Organizer Model, Concept Attainment Model and Inductive Thinking Model produced better performance than traditional teaching method and Concept Attainment Model was better than Advance Organizer Model and Inductive Thinking Model.

We can- not get the same results every time, if we compare among these three Models of Teaching. The result may vary. The effectiveness depends on the preparation of teacher, selection of particular Model of Teaching for particular unit, implementation of Model, interaction between teacher-students and student-student. It also depends on use of teaching aids as a support system. So we cannot generalize the findings. But, it is sure that Models of Teaching are always effective than that of traditional teaching method.

## 5.24 Contribution of the Research:-

In the present study the researcher has taken the topic–**Study of Effectiveness of Models of Teaching on Achievement of 8$^{th}$ Standard Students.** To conduct this research the researcher has used Survey method, Product Development method and Experimental method. Followings are the contribution to the field of Education by this research.

1. **The Questionnaire Prepared for Survey:** From the questionnaire one can understand that how the questions should be framed while preparing a questionnaire. The structure, sequence of questions, open ended and closed ended questions format can be considered.

2. **The Lesson Notes Based on Models of Teaching:** Writing a lesson note based on the syntax of Models of Teaching is a big challenge for B.Ed. students. In this research the researcher has prepared 12 lesson notes based on 3 Models. The same content was used for all the 3 Models. So students can understand that the same content can be taught by using different Models. The lesson notes can be a sample for B.Ed. students and also for the in service

teachers. They can understand how to prepare the lesson plan and teach by using Models of Teaching.

3. **Evaluation sheet for the Lessons based on Models of Teaching:** The Researcher has prepared the lesson notes based on Models. She has checked each lesson note from 4 experts. For Evaluation of lesson plan she has prepared evaluation sheet for Advance Organizer Model, Concept Attainment Models and for Inductive Thinking Model. This can also be referred.

## 5.25 Recommendations:

Following are the recommendations based on the present study.

1. While framing the text books some lessons can be purposely arranged according to the syntax of any one Models of Teaching. So that all the subject teachers can use it. Even they can try to use this Model for teaching another unit also.
2. Workshops should be arranged to give proper training to in service teachers about how to teach by using models of Teaching, how to prepare lesson plans based on it.
3. To motivate the pre-service teachers to use Models of Teaching during their practice lessons and Internship program.
4. Audio and Video CD's can be prepared and show it to the teachers that how to teach by using Models of Teaching in class.
5. Lessons based on Models of Teaching taken by Experts can be telecasted on television so that maximum teachers can take benefit of it.
6. In schools the principal should motivate the teachers to use Models of teaching and should observe such lessons.

## 5.26 Suggestions for Further Research: -

1. Any two or three Models can be compared for achievement.
2. Two or three Models can be used in combination.

3. Models of Teaching can be used to teach special children.
4. A Comparative study can be done that effect of a particular model on special children and on gifted students.
5. Models of Teaching can be used to teach any subject.
6. Models of Teaching can be used to teach at any class.
7. Models of Teaching can be used to teach any subject of any board.
8. Apart from Information Processing Model, other Models can also be useful for academic achievement.

## 5.27 Closure:

In the present chapter the researcher has explained all about the research work. This chapter compiles about the proposal of research, plan and procedure of the research. She also explained about the findings and results gained after the experiment. The detail explanation about contribution to the field of Education, recommendations and suggestion for further research are also given.

Teachers are the backbone of all the education system. They are the best source of change in Education system. It is required that teaching should be very effective. Teachers should be ready to take some extra efforts to implement such different teaching approaches. It will not be only useful for grasping the content but also develops the higher order thinking skills also; which is the need of this generation. They will explore knowledge and construct it in a meaningful way. The teachers are not replaceable; nobody can take the place of teacher. But if teacher takes the initiative the teaching –learning will be more easy and meaningful.

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# APPENDICES

## 1. QUESTIONNAIRE

Hello friends,

I Mrs. Aarti Prashant Gangurde, working as an Assistant Professor in Abhinav Education society's College of Education, Ambegaon , Pune-46 and pursuing my Ph.D. from Tilak Maharashtra Vidyapeeth, Pune under the guidance of Dr. Dattatreya Tapkeer.

Kindly fill up the questionnaire and I assure you that all the information you provide will not be disclosed and will be used for the research work only. Hoping for good co-operation.

Thank you.

---

**1.** Name of the teacher:----------

**2.** Name of the School:----------

**3.** Experience : ----------

**4.** Have you completed your B.Ed. course?

☐ Yes ☐ No

**5.** If Yes, from which university? ----------

**6.** Have you studied the Models of teaching during your B.Ed. course?

☐ Yes ☐ No

**7.** If Yes, do you use Models of Teaching in your teaching process?

☐ Yes ☐ No

**8.** Which Model of Teaching do you use?

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**9.** Do you find any difference in teaching by using Models of Teaching and teaching by using regular classroom method?

☐ Yes ☐ No

**10.** If yes, what is the difference? ----------

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**11.** Do you think that teaching by using Models of teaching requires more planning?

☐ Yes ☐ No

**12.** Do you think that constructivism is based on Model of Teaching?

☐ Yes ☐ No

**13.** Can Science subject be taught by using Models of Teaching?

☐ Yes ☐ No

**14.** Do you believe that teaching objectives can be fulfilled by using Models of teaching?

☐ Yes ☐ No

**15.** Which topics of 8th standard Science subject can be taught by using Models of Teaching?

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**16.** Which Models of Teaching would you suggest for teaching following topics?

1. Stars and Our Solar System ----------
2. Biological Diversity. ----------
3. Atmospheric Pressure ----------
4. Magnetism. ----------
5. The Structure of an Atom ----------

6. Chemical Reactions and their Types ----------

7. The Structure of a Cell and Micro-Organism ----------

8. Diseases ----------

9. Reflection of Light ----------

10. Source of Energy ----------

11. Electric Current ----------

12. Properties of Substance ----------

13. Metals and Non-Metals ----------

14. Carbon and Carbon Compounds ----------

15. Air ----------

16. Soil ----------

17. Agriculture ----------

**17.** Animal Husbandry ----------

**18.** Do you think that Language teaching and Science teaching need different Models of teaching? Why?----------
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**19.** How can you compare the traditional method of teaching and Models of Teaching? Comment on similarities and dissimilarities .----------
---
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THANK YOU.

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## 2. NAME OF SCHOOL SURVEYED AND NUMBER OF TEACHERS

| Sr. No. | Name of the School | Number of respondents |
|---|---|---|
| 1 | Panditrao Lagash School, Law College Road. Pune. | 3 |
| 2 | Huzurpaga Highschool, Laxmi Road, Pune. | 6 |
| 3 | Balshikshan Vidyamandir, Mayur Colony, Kothrud , Pune. | 4 |
| 4 | Shanu Patel, Highschool, Warje Naka. Pune. | 1 |
| 5 | M.E.S. Bhave School, Peru Gate. Pune. | 6 |
| 6 | Renuka Swarup Prashala, Sadashiv Peth, Pune. | 2 |
| 7 | Bharati Vidyabhavan's Paranjape School, Kothrud, Pune. | 1 |
| 8 | Ramchandra Rathi Vidyalaya, Law college Road. Pune. | 1 |
| 9 | Silver Crest High School, Sinhagad Road, Pune. | 3 |
| 10 | Abhinav English Medium School, Ambegaon. Pune. | 4 |
| 11 | Huzurpaga High School, Rajas Society, Katraj, Pune. | 2 |
| 12 | Seva Sadan High School, Erandavana, Pune. | 2 |
| 13 | Pirangut English Medium School, Pirangut. | 1 |
| 14 | Haji Abdul Kader Memon English Medium School, Pune. | 1 |
| 15 | Dnyanganga English Medium School, Sinhagad Road, Pune. | 1 |
| 16 | Pride English Medium School, Ambegaon Pathar, Pune. | 1 |
| 17 | Nalanda English Medium School, Dhayari | 1 |
| 18 | Horizon English Medium School, Narhe, Ambegaon, Pune. | 3 |
| 19 | Abhinav Vidyalaya , Nallstop, Pune. | 2 |
| 20 | Pushadevi Dugad School, Katraj. Pune. | 1 |
| 21 | Mahesh Vidyalaya, Kothrud, Pune. | 2 |
| 22 | Shamrao Kalmadi School, Erandavana, Pune. | 2 |
| 23 | MIT School, Kothrud, Pune. | 1 |
| 24 | Symbiosis School, Prabhat Road, Pune. | 3 |
| | Total | 54 |

## 3. BLUEPRINTS

### Blueprint for Achievement Test

### Weightage according to chapters.

| Chapters | Short Answer | Long Answer | Total | Percentage |
|---|---|---|---|---|
| Diseases | 5(1) | 3(3) | 14 | 35 |
| Metals and Non-Metals | 2(1) | 2(3) | 8 | 20 |
| Air | 7(1) | 2(3) | 13 | 32.5 |
| Soil | 2(1) | 1(3) | 5 | 12.5 |
| | | **Total** | **40** | **100** |

### Blueprint according to Objectives

| Chapters | No. of Questions | Objectives | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | knowledge | | Comprehension | | Application | | Total | Percentage |
| | | S.A | Obj. | S.A | Obj. | S.A | Obj. | | |
| Diseases | 8 | | 3(1) | | 2(1) | 3(3) | | 14 | 35 |
| Metals and Non-Metals | 4 | | 1(1) | | 1(1) | 2(3) | | 8 | 20 |
| Air | 9 | | 1(1) | | 6(1) | 2(3) | | 13 | 32.5 |
| Soil | 2 | | 1(1) | | 1(1) | 1(3) | | 5 | 12.5 |
| | | | | | | | **Total** | **40** | **100** |

### Blueprint according to types of Questions

| Sr. No. | Types of Question | Total No. of Questions | Marks allotted | Percentage |
|---|---|---|---|---|
| 1 | Fill in the blanks | 6 | 6 | 15 |
| 2 | Match the following | 5 | 5 | 12.5 |
| 3 | State true or false | 5 | 5 | 12.5 |
| 4 | Give scientific reasons | 4 | 12 | 30 |
| 5 | Answer the following questions | 4 | 12 | 30 |
| | | **Total** | **40** | **100** |

## 4. ACHIEVEMENT TEST

**Standard -8th**

**Sub- General Science**

**Unit No. 8, 13, 15, 16** **Time-60 Min.** **[40 Marks]**

**Q1. Fill in the blank.** **[6 Marks]**

1. AIDS is the acronym for ----------.
2. ----------helps to prevent an epidemics.
3. The government has started the ----------project to protect forests.
4. Solid carbon dioxide is called as ----------.
5. Bronze contains the metals ---------- and ----------.
6. ----------disease is caused by the bite of an affected dog, monkey or rabbit.

**Q2. Match the followings.** **[5 Marks]**

| **'A'** | **'B'** |
|---|---|
| **1.** Potassium Chlorate | a. catalyst |
| **2.** Micro-organisms | b. Nitrogen |
| **3.** Green- house effect | c. Carbon dioxide |
| **4.** Fertilizers | d. Oxygen |
| **5.** Manganese dioxide | e. Nitrogen fixation |

**Q.3. State true or false.** **[5 Marks]**

1. Diseases are caused by the anger of God.
2. Give all pet animals the anti-rabies vaccine.
3. Soil is formed by the fast flowing current of water.
4. Oxygen does not itself burn but support burning.
5. Metals react chemically with acid to form compounds of metals.

**Q.4 Give Scientific reason. (Any 4) [12 Marks]**

1. Copper is used for electrical wiring in our houses.
2. People suffering from communicable diseases should avoid going to public places.
3. The wound caused by a dog bite should be flushed, clean with soap and water.
4. The dangers from greenhouse are increasing.
5. When a bottle of an aerated drink is opened, the drink inside the bottle gushes out in a stream of bubbles.

**Q.5 Answer the following questions. (Any 4) [12 Marks]**

1. What steps to be taken to prevent erosion of soil?
2. What is meant by Nitrogen fixation? How does it happen?
3. What is meant by communicable diseases?
4. What is meant by corrosion?
5. What are the symptoms and preventive measures of Tuberculosis?

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## 5. Model answer of Achievement test

**Standard -8th**

**Sub- General Science**

**Unit No. 8, 13, 15, 16** **[40 Marks]**

**Q1. Fill in the blank.** **[6 Marks]**

1. AIDS is the acronym for Acquired Immuno Deficiency Syndrome.
2. Vaccinations help to prevent an epidemic.
3. The government has started the Social Forestry project to protect forests.
4. Solid carbon dioxide is called as dry ice.
5. Bronze contains the metals Copper and Tin.
6. Rabies disease is caused by the bite of an affected dog, monkey or rabbit.

**Q2. Match the followings.** **[5 Marks]**

| **'A'** | **'B'** |
|---|---|
| **1.** Potassium Chlorate | a. Catalyst |
| **2.** Micro-organisms | b. Nitrogen |
| **3.** Greenhouse effect | c. Carbon dioxide |
| **4.** Fertilizers | d. Oxygen |
| **5.** Manganese dioxide | e. Nitrogen fixation |

Answers. 1-d, 2-e,3-c,4-b,5-a

**Q.3. State true or false.** **[5 Marks]**

1. Diseases are caused by the anger of God.-- False
2. Give all pet animals the anti-rabies vaccine--True
3. Soil is formed by the fast flowing current of water.-- False
4. Oxygen does not burn itself but support burning--True
5. Metals react chemically with acid to form compounds of metals. –False

**Q.4 Give scientific reason. (Any 4)** **[12 Marks]**

**1. Copper is used for electrical wiring in our houses.**

- Copper is a good conductor of electricity.
- Copper has least resistance than other metals.

- Copper is available easily, and reasonable
- Copper has the property of ductility.

  …. So Copper is used for electrical wiring in our houses.

2. **People suffering from communicable diseases should avoid going to public places.**
   - Communicable diseases can spread through sharing of space.
   - If diseased person goes in public places the disease producing germs can enter in the healthy person's body
   - Many people can get infected by the disease.

     ….So People suffering from communicable diseases should avoid going to public places.
3. **The wound caused by a dog bite should be flushed, clean with soap and water.**
   - Any pet when bite it secrete the saliva which contains bacteria.
   - If the bacteria enter in the person's body it can cause the disease called as Rabies.
   - The bite can cause infection.

     ….so the wound caused by a dog bite should be flushed, clean with soap and water.
4. **The dangers from greenhouse are increasing.**
   - Global warming due to re-emission of sun's energy absorbed by the earth followed by its absorption by $CO_2$ molecule and $H_2O$ vapour present near the earth's surface and then its radiation back to earth is called **green- house effect**.
   - At present, the proportion of carbon dioxide in the air has risen. This rising proportion of carbon dioxide increases the temperature of earth.

     ….so the dangers from greenhouse are increasing.
5. **When a bottle of an aerated drink is opened, the drink inside the bottle gushes out in a stream of bubbles.**
   - Carbon dioxide dissolves only sparingly in water.
   - It has to be dissolved in water under pressure.
   - When the cap of the bottle is praised open, the pressure is released and the carbon dioxide gas gushes out.

**Q.5 Answer the following questions. (Any 4) [12 Marks]**

**1. What steps to be taken to prevent erosion of soil?**

**Ans.** To prevent soil erosion

- Soil must be kept covered. Allow the grass to grow, crops grown on the land and trees planted on it reduce the soil erosion.
- By arranging soil horizontally, across the line of the slope soil erosion can be reduced.
- By building bunds.

**2. What is meant by Nitrogen fixation? How does it happen?**

**Ans.** The conversion of atmospheric nitrogen into compounds like ammonia and nitrates which can be used by living things is called nitrogen fixation.

This is brought about by biological and atmospheric process.

Biological fixation- The micro-organisms in the nodules present on the roots of leguminous plants absorbs the nitrogen from the air and converts it into nitrogen compound. The micro- organisms present in the soil convert atmospheric nitrogen into ammonia, nitrous acid and nitric acid and finally into nitrates.

Atmospheric fixation- when there is lightening in the sky atmospheric nitrogen and oxygen combine to form nitric oxide. This nitric oxide is oxidized again and nitrogen dioxide is formed. It dissolves in rain water and finally forms nitric acid. This nitric acid falls to earth, dissolved in rain water. There it reacts with the salt in the soil to form nitrates for the growth of plants.

Thus nitrogen in the air becomes available to living things after biological and atmospheric fixation.

**3. What is meant by communicable diseases?**

**Ans.** A disease that is transmitted through direct contact with an infected individual is called communicable disease. It can cause by constant sharing of space with a diseased person. The disease producing germs can spread through air.

**4. What is meant by corrosion?**

**Ans.** The gases present in the air react with the metal due to moisture, to produce compounds of the metals. This action that wears the metal is known as corrosion. Oxygen gas reacts with iron, carbon dioxide gas with copper and hydrogen sulphide gas with silver.

**5. What are the symptoms and preventive measures of Tuberculosis?**

**Ans. Symptoms of Tuberculosis: -**

1. Cough.
2. Low grade fever.
3. Blood in spittle.
4. Loss of weight.
5. Pain in the chest.
6. Difficulty in breathing.

**Preventive measures**:-

1.Taking the B.C.G. vaccination.

2. Isolating the patient.

3. Medical treatment.

DOT (Direct Observation and Treatment) centres have been set up for this purpose. Excellent medicines from the World Health Organization are available free of charge.

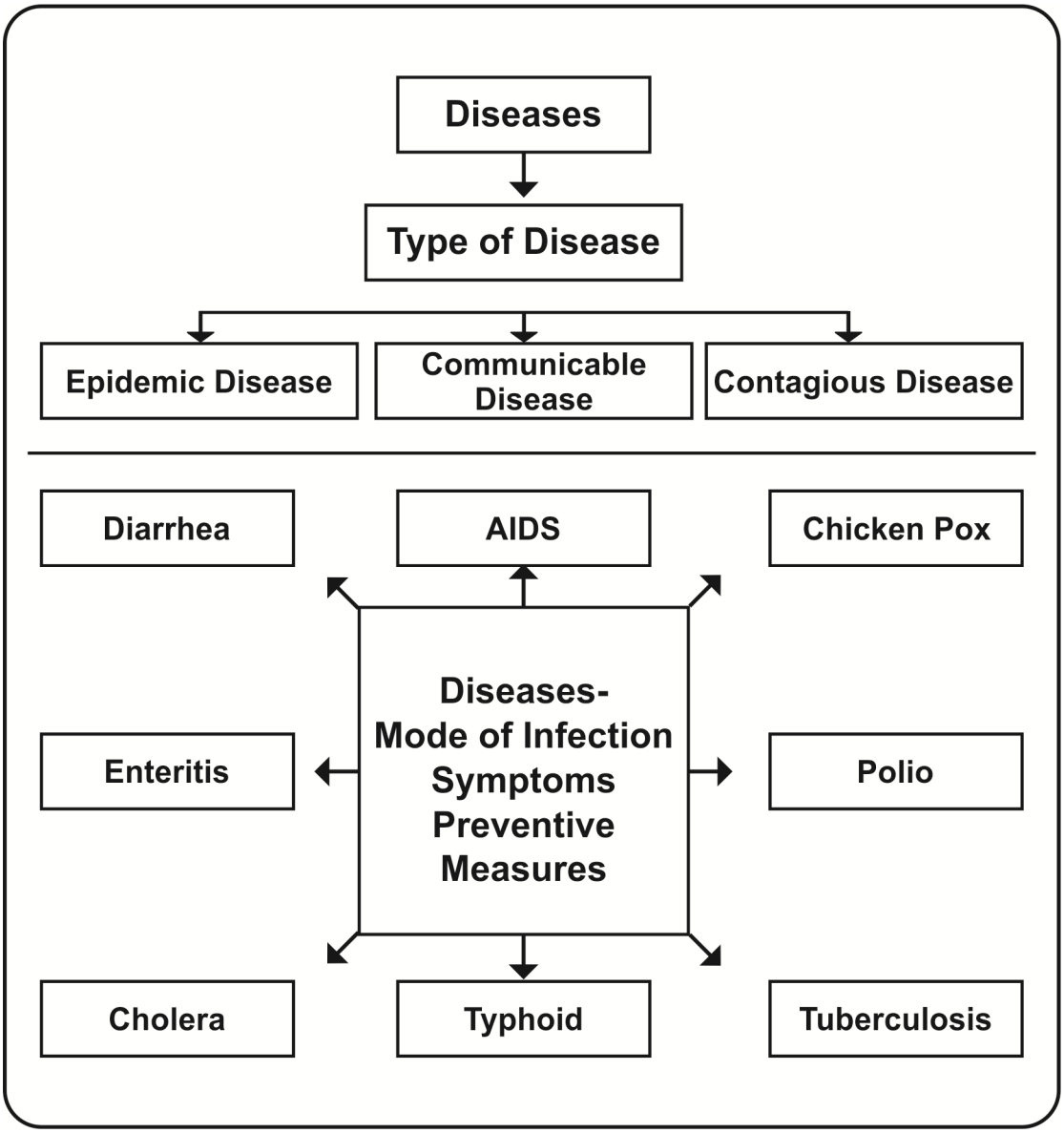
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# 6. LESSON PLANS

**A. ADVANCE ORGANIZER MODEL**

**B. CONCEPT ATTAINMENT MODEL.**

**C. INDUCTIVE THINKING MODEL**


Diseases
Type of Disease
Epidemic Disease
Communicable Disease
Contagious Disease
Diarrhea
AIDS
Chicken Pox
Diseases-
Mode of Infection
Symptoms
Preventive
Measures
Enteritis
Polio
Cholera
Typhoid
Tuberculosis

**Lesson plan – Advance Organizer Model**

**Standard- 8th**

**Subject – Science**

**Unit – Diseases**

**Objectives: - Students will learn …..**

**1.**The types of various diseases.

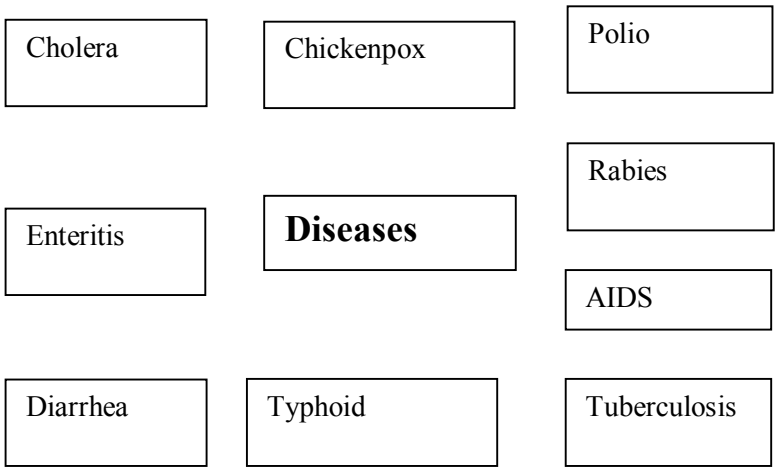
2. The symptoms of various diseases.

**3.**The preventive measures of various diseases.

| Teacher –Student Interaction | Syntax of Model |
|---|---|
| Teacher- Good morning students.<br>Students- Good morning teacher.<br>Teacher- Is everybody present today?<br>Student1- Teacher Yogesh is absent today.<br>Teacher – Why?<br>Student1- He is not feeling well. He is suffering from fever, cough and cold.<br>Student2- Teacher Smita is also absent today; she is suffering from stomachache and vomiting.<br>Teacher – Students take care of your health. What happens when you become sick?<br>Student1- Parents take care of us. Take us to the doctor.<br>Student 2- We miss the school, also lag behind in homework.<br>Student 3 -We even cannot play with our friends. We have to take rest.<br>Teacher- Yes Students, falling ill is not good. Hence we should take proper care of our health. There are micro-organisms around us, some can cause diseases. They can do us harm. They enter our body through food, water or air. If our resistance to diseases is weak, we develop the symptoms of disease. So today | **Phase-1**<br><br>Clarify the aim of the lesson |

we will learn the lesson 'Diseases'. In this lesson we will learn the modes of infection, symptoms of diseases and preventive measures of the following diseases.

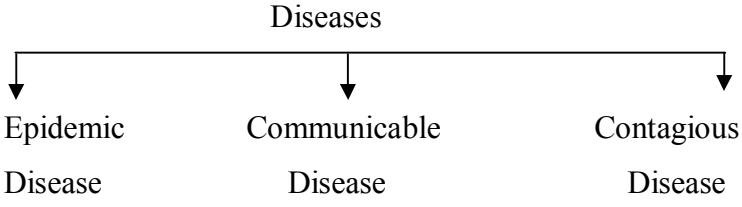
1. Chickenpox
2. Polio
3. Rabies
4. Tuberculosis
5. Typhoid
6. Cholera
7. Enteritis
8. Diarrhea and
9. AIDS




Presentation of Advance Organizer.

According to their modes of spreading, diseases can be classified into three types.

Presentation of Advance organizer.




Teacher- Students we will learn each disease in detail.

1. **Epidemic diseases**: - Certain changes in the weather, contamination of water etc. can cause many people to get the same disease simultaneously. Such dieses are called an

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| **Epidemic disease**.<br>For example, Cholera, Typhoid, Influenza (or 'flu') Diarrhea, Conjunctivitis, etc.<br>(Teacher shows some slides and explains) | Provide context |
| 2. **Communicable diseases**: - The name itself indicates that it is communicated from one person to another. Constant sharing of space with a diseased person can result in the disease producing germs to enter a healthy person's body through the air.<br>For example- Tuberculosis, Influenza etc.<br>(Teacher shows some slides and explains) | Make logical order of learning material. |
| 3. **Contagious Disease**: -Germs from the diseased person's body enter a healthy person's body through direct or close contact and they can cause the diseases. Such types of disease are called as **Contagious Disease**.<br>For example – scabies and eczema etc.<br>(Teacher shows some slides and explains)<br>Diseases like those described above are caused by the micro-organisms, bacteria and viruses.<br>Teacher – The symptoms of diseases are not seen as soon as the germs enter a person's body. They appear after a certain period. The period between the entry of virus or bacteria and the appearance of symptoms are definite. It is called the **incubation period**. Each disease has a specific incubation period.<br>In this lesson we shall study the symptoms of various diseases and the measure of their prevention. | Clarity in explanation |
| **1. Chickenpox :-**<br>(Teacher shows some slides and explains)<br>**Mode of infection:** - A person gets Chickenpox when the disease producing virus enters the body with the air, that is breathed in, or by contact with an infected person's clothes, utensils etc.<br>**Main symptoms** - | Identify defining attributes |

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| **1.** High fever<br>**2.** Headache<br>**3.** Small boils on the skin<br>**4.** They look like blisters scabs formed on them in a few days.<br>Teacher -Students we have learnt about the mode of infection, so now tell me which preventive measures we have to adapt?<br>Student1 – We should not use the clothes and utensils of infected persons.<br>Student 2- Should take proper medical treatment.<br>Teacher – Yes students. There is a vaccine available for Chickenpox. A person does not generally get chickenpox a second time. The resistance acquired the first time lasts for lifelong.<br>The next disease is Polio.<br><br>*2.* ***Polio:-***<br>(Teacher shows some slides and explains)<br>**Mode of Infection**: - The disease spreads through contaminated water, food or minute particles in the air.<br>Teacher – Students have you seen any person suffering from Polio?<br>Student 1 – Yes teacher, they cannot walk properly.<br>Student 2- They need some support to walk. Their legs seem to be very thin.<br>Teacher – Yes Students. Apart from this we will see the remaining symptoms in detail.<br>**Symptoms** :-<br>**1.** Fever<br>**2.** Throat becomes red.<br>**3.** Strain is felt in the muscles of the back and leg.<br>**4.** Weakness in the muscle of the arms or legs.<br>**5.** Growth of muscle is arrested. | Prompt awareness of learner's knowledge.<br><br>Provide context.<br><br>Make logical order of learning material. |

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| **6.** Muscles become flaccid and cause disability.<br>Teacher - Students what should be the preventive measure?<br>Student 1 – To give polio drop, the advertisement is shown on TV.<br>Student 2- Should take proper treatment.<br>Teacher – Yes Students.<br>(Teacher shows some slides of Polio and vaccination and explains)<br>The National Department of Health is at present running a campaign to administer the Polio vaccine to the maximum possible number of children less than five years of age on the same day, all over the country, every year.<br>This helps to strengthen the resistance of children of this age group to this disease. During this campaign every child in India under the age group of five is given two doses of this vaccine on two fixed days with an interval of 6 weeks between them. These two doses are booster doses and have to be taken in addition to the regular one. This campaign is expected to eradicate Polio from our country. **Salk and Sabin** were the scientists who succeeded in producing the Polio vaccines using the Polio virus.<br>Teacher – Students now we will learn about one another disease. Are you scared of dogs, monkey or rabbit?<br>Student – Yes teacher, they bite.<br>Teacher – Yes students, you are right.<br>Students now we will learn about **Rabies**.<br>(Teacher shows some slides and explains)<br><br>***3. <u>Rabies –</u>***The disease is caused by the bite of an affected dog, monkey, cat or rabbit.<br>**Symptoms: -**<br>**1.** Severe headache.<br>**2.** Fever.<br>**3.** Throat muscles become rigid and contracted. | Provide context.<br><br>Present material<br><br>Make logical order of learning material.<br><br>Identify defining attributes. |

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| **4.** Patient cannot swallow liquids or even water.<br>**5.** Fear of water (hydrophobia).<br>**6.** Patient is delirious.<br>**2.** Patient's limbs become flaccid and go into a spasm.<br>**Preventive measures**: -<br>1. Clean the wound caused by bite by flushing with soap and plenty of water.<br>2. Go to doctor at once and take the required doses of injections of the anti-rabies vaccine.<br>3. Give all pet animals in your house the anti-rabies vaccine. | Present material |
| **Remember**:-People start treatment for this disease when they have been bitten by a dog, cat, monkey etc. Sometimes, they do not take the prescribed number of injections out of fear or due to other reasons. Such incomplete inoculation may not prevent the disease.<br>Teacher- Students have you seen some person suffering from cough for a long time. Even they cannot breathe properly. It means they are having the diseases called T.B. Let's learn about it in detail. | Provide context. |
| **4.** ***<u>Tuberculosis:</u>*** **- Robert Koch** was the scientist who discovered the bacteria which causes this disease.<br>**Mode of infection: -** The germs enter the air through the spittle of the patient. The disease spreads through the air.<br>**Symptoms: -**<br>**1.** Cough.<br>**2.** Low grade fever.<br>**3.** Blood in spittle.<br>**4.** Loss of weight.<br>**5.** Pain in the chest.<br>**6.** Difficulty in breathing.<br>**Preventive measures**: - | Make organization explicit. |

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| 1. Taking the B.C.G. vaccination.<br>2. Isolating the patient.<br>3. Medical treatment.<br>At present Tuberculosis is considered to be a most easily communicable disease. In India, one T.B. patient dies every two minutes. The WHO (World Health Organization) runs a Tuberculosis eradicate campaign. DOT (Direct Observation and Treatment) centers have been set up for this purpose. Excellent medicines from the World Health Organization are available free of charge.<br>Student- Yes teacher, I have seen this advertisement on television.<br>Teacher- Students now we will learn about the next disease called Typhoid. | Critical thinking to subject matter. |
| ***5. Typhoid:-***(Teacher shows some slide and explains)<br>**Mode of infection**: -Through contaminated food, water and also through houseflies.<br>**Symptoms: -**<br>1. Fever that lasts for a definite period.<br>2. Rose colored rash on the chest.<br>4. Diarrhea<br>5. Headache.<br>Teacher – Students I have told you about the mode of infection. Now tell me What should be preventive measures?<br>Student 1- Food should be kept covered at home.<br>Student 2- Drink boiled water.<br>Student 3- Avoid eating uncovered food specially when outside.<br>Teacher –Yes Students. Also taking Typhoid vaccine, eating only clean, fresh food and maintaining public hygiene are some precautions to avoid Typhoid. | Link material to organizer.<br><br>Promote active learning. |

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| ***6.Cholera***(Teacher shows some slide and explains)<br>**Mode of infection: -**This disease spreads through water or food contaminated due to houseflies.<br>**Symptoms: -**<br>**1.** Severe diarrhea and vomiting.<br>**2.** Dehydration<br>**3.** Dry skin, sunken eyes.<br>**4.** Stomachache.<br>**5.** Cramps in the legs.<br>Teacher – Students which precautions we should take to avoid Cholera?<br>Student 1- Controlling houseflies.<br>Student 2- Not eating food left uncovered.<br>Student 3-Drinking boiled water.<br>Teacher- Very good Students. Also we should maintain hygiene at public places and should take the Cholera vaccine.<br>The Health Department has made it obligatory to take the cholera vaccine before going to places of pilgrimage or traveling abroad. Human beings themselves are carriers of the '**Vibrio Cholerae'** bacteria which causes this disease.<br>Now we will learn about the disease Enteritis | Clarity in explanation.<br><br>Prompt awareness of learner's knowledge. |
| ***7. Enteritis:-*** **(**Teacher shows some slides and explain**)**<br>The inflammation of the inner lining of the intestine due to infection by bacteria, virus, and worms or by chemical or other harmful substances is called Enteritis. 'Enteron' means 'intestines' and 'it' is –means 'inflammation'.<br>Teacher –Students which would be the modes of infection?<br>Student 1- Through contaminated water.<br>Student 2- Through contaminated food.<br>Teacher- Exactly students!<br>**Symptoms: -**<br>**1.** Stomachache | Provide context.<br><br>Presentation of |

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| **2.** Fever<br>**3.** Vomiting<br>**4.** Loss of appetite<br>**5.** Diarrhea or constipation.<br>**6.** Loss of weight<br>Teacher – Students tell the preventive measures.<br>Student1-Keep food clean.<br>Student2-Maintain personal cleanliness.<br>Student3 – Consume only safe food and water.<br>Teacher – Yes students, these all are the preventive measures to avoid Enteritis.<br>Now we will learn more about Diarrhoea. | learning material.<br><br>Critical approach to subject matter. |
| ***8. Diarrhoea:-***<br>**Mode of Infections**: - Spreads through food via houseflies and also through contaminated water and milk.<br>**Symptoms:-**<br>**1.** Dehydration due to loose motion.<br>**2.** Sunken eyes<br>**3.** Dry mouth and lips.<br>**4.** Reduced urine formation.<br>**6.** Cold hands and feet<br>**7.** Slow pulse rate.<br>Teacher- Students, what should be the preventive measures?<br>Student1- Maintain cleanliness in cooking area.( kitchen)<br>Student2- Maintain personal cleanliness.<br>Student3- Prevent dust, flies from settling on food.<br>Teacher – Yes students. Also we should drink boiled and cooled water. Wash fruits and vegetables before use.<br>Teacher – Students we have learnt about many diseases, and in that we have seen that personal cleanliness can avoid many diseases. So tell me what must be done to maintain personal cleanliness? | Clarity in explanation.<br><br>Use principle of integrative reconciliation. |

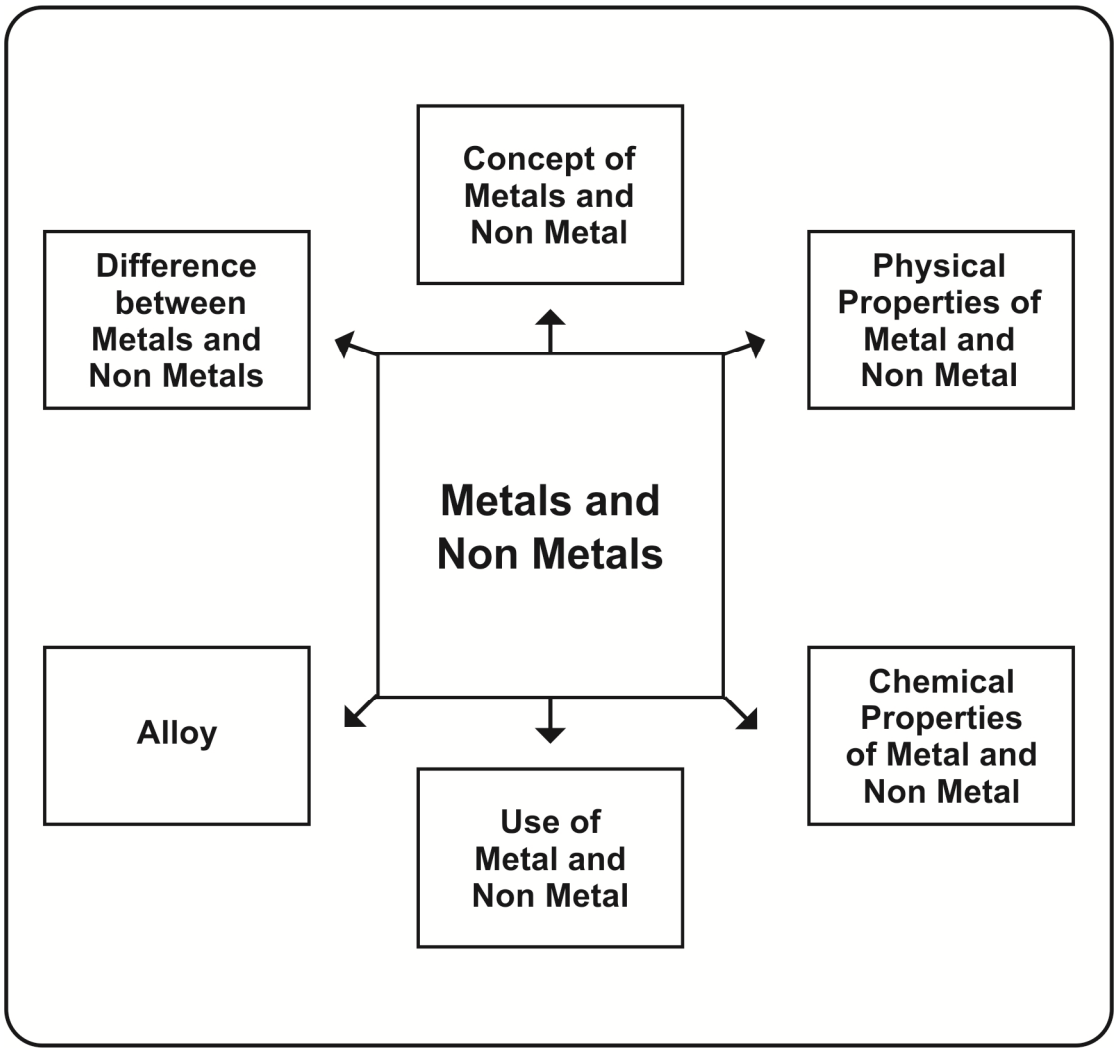
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| Student1- We should brush our teeth twice a day regularly.<br>Student2- We should clean our hands, legs with soap after we come from outside, before having food and after toilet.<br>Student3- We should take bath regularly with soap.<br>Student4- we should cut our nails and hair on time.<br>Student5-Avoid unhealthy, uncovered, stale and street food ,<br>Student6- Should eat fresh food. Have balanced diet and sufficient sound sleep.<br>Teacher- Yes students. You all gave correct answer. Also we should drink filtered and boiled water. Learning healthy habits, maintain personal hygiene as well as keeping our surrounding clean. Taking proper medical treatment immediately if symptoms of disease are seen.<br>Students always remember that diseases are caused by micro-organisms and not by the anger of God or envy of others. They are cured with proper medical treatment, not with black magic or witchcraft.<br>Students now we will learn about | Prompt awareness of learner's knowledge. |
| ***9. Dehydration:-***<br>The body becomes dry because of loss of water due to Diarrhea .This is called dehydration. To make up for the loss of water due to loose motion or diarrhea, give the patient Oral Rehydration Solution (ORS) and start medical treatment at once.<br>In case of diarrhea, the absorptive function of the intestine is disturbed. However the sugar in the ORS can be absorbed in the body. Along with sugar salt and water are also absorbed. This gives temporary relief. If medical treatment is given immediately, the possible serious outcomes can be avoided.<br>**Preventive measures:** -It is better to prevent diseases than to treat and cure diseases by medical treatment after they occur. Diseases can be prevented by vaccination.<br>Vaccinations are available for the prevention of several | Logical order of learning material<br><br>Make logical order of learning |

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| diseases. Vaccinating a person strengthens his or her resistance to disease. Thus vaccination is a preventive measure. Vaccinating people to prevent the danger in future or to prevent an epidemic is the responsibility of the Health Department. Nevertheless, each one of us must also co-operate with the Health Department by taking care of ourselves. | material explicit. |
| The government implements special programs for the vaccination of children. Various types of vaccines such as the BCG, the triple vaccine (diphtheria, whooping cough, tetanus) polio, measles, double vaccine (diphtheria, tetanus) hepatitis-B are given to every child from time to time. | Principle of integrative reconciliation. |
| Students now we will learn about the disease AIDS. | |
| ***10. AIDS:-***AIDS is the acronym for **Acquired Immuno Deficiency Syndrome** | Present |
| (Teacher shows some slides and explains ) | material. |
| In 1986, it became clear that the virus of this disease discovered by **Dr. Monteniere** in Franc and **Dr. Gallo** in America were same kind. It was named as the Human Immuno – deficiency Virus or HIV. Infection by the HIV virus causes AIDS. When someone gets AIDS he/she loses his/her ability to fight disease. So, they attract diseases frequently. However, treatment can extend an AIDS affected person's life considerably. | |
| We must not shun people With AIDS. In fact, we should extend a helping hand to them. | |
| • In 1986 the World Health Organization (WHO) started the worldwide AIDS control program. | |
| • In 1987, the National AIDS Control Program was started in India. | Present material. |
| Through WHO, excellent medicines are available in government hospitals free of cost. | |
| So students in this lesson we have learnt about the modes of | |

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| infection, symptoms of diseases and preventive measures of the diseases. We should have some healthy habits. Take proper care and treatment, have scientific attitude. Vaccination helps in preventing diseases. Be aware of these diseases. Now I will ask you some questions. Answer these questions.<br>**Qu.1** Why should a person suffering from tuberculosis avoid going to public places?<br>Student- Tuberculosis spreads through the air. The germs enter the air through the spittle of the patient. So a person suffering from tuberculosis should avoid going to public places.<br>**Qu.2** Why the wound caused by a dog bite should be flushed clean with soap and water?<br>Student- For dog bite we should clean the wound by running water and be sure to clean and disinfect the wound thoroughly , because all animal bites can transmit bacteria<br>Good students, In next class we will start a new lesson. Thank you. | |

- **Instructional effects:-**
  1. Meaningful assimilation of information about diseases.
  2. Conceptual structure of all information about diseases.
- **Nurtarant effects: -**
  1. Student will take care of his/her health.
  2. Student will follow the preventive measures and vaccination.
  3. Student will educate family members about disease.

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Concept of Metals and Non Metal
Difference between Metals and Non Metals
Physical Properties of Metal and Non Metal
Metals and Non Metals
Alloy
Chemical Properties of Metal and Non Metal
Use of Metal and Non Metal

**Lesson plan –Advance Organization Model**

**Std.-8th**

**Subject- Science**

**Unit –Metals and Non-metal**

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- **Objectives:-**

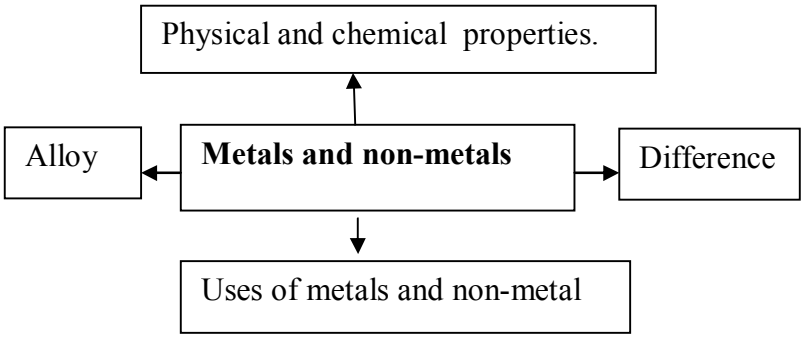
  **1.** To teach the concept of metals and non-metal.

  **2.** To teach physical and chemical properties of metals and non-metal.

  **3.** To teach the concept of alloy.

| **Teacher- Student interaction.** | **Syntax of Model** |
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| Teacher - Good morning students. Students in ancient time the stone age man was using various types of tools made up of stones. It was used for collecting food, for defense and many other purposes. Later on there was progress of this generation, and it was known as bronze age and iron age man respectively.<br>In our India we people like to wear jewelries on various occasions. Do you know of what the jewelry is made up of?<br>Student 1:- Of Gold. Platinum<br>Student 2:- Of copper.<br>Students3 :- Of silver<br>Teacher – Yes students. very good<br>We have previously learnt about elements. We see some objects and substances in our surroundings. They are all made from elements. Substances are in solid, liquid or gaseous state. Some solids are shiny, hard, while some are soft, brittle and do not shine. For example, silver, copper, gold are shiny they are called as **Metals;** while wood, soil, or chalk do not shine. They are called **Non- metals**. So today we are going to learn the chapter | Phase -1<br>Clarify the aim of lesson. |

**Metals and Non –Metals**. In this lesson we will learn about the following points.




Presentation of Advance Organizer.

- Concept of metals and Non-metals.
- Physical properties of metals and Non-metals.
- Difference between metals and Non-metals.
- Chemical properties of metals and Non-metals.
- Uses of metals and nonmetals. And
- Alloy.

Look at the table below .what do you notice?

| Substance/object | Luster | hardness | Elements |
|---|---|---|---|
| 1. Copper vessel | √ | √ | Copper |
| 2.Sulpher powder | × | × | Sulphur |
| 3.An Aluminum can | √ | √ | Aluminium |
| 4 .Coal powder | × | × | Carbon |
| 5. A Silver box. | √ | √ | Silver |

Phase-2

Presentation of learning task or material.

Substances like Copper, Aluminum and Silver have a shiny surface. They are hard. Coal and Sulphur do not shine can be powdered easily.

Elements can be divided into two kinds – Metals and Non Metals. Metals and nonmetals have different properties.

Identify defining attributes.

Teacher- Students let's see some physical properties of Metals

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| and Non- metals.<br>• **Malleability**<br>Malleability is the ability of a solid to be formed into a thin sheet on beating.<br>Take an iron nail. Beat it with hammer and flatten it. If you continue to hammer it, it becomes a thin flat sheet. Malleability is a property of metals.<br>Try hammering a piece of coals. It does not flatten into a sheet.<br>Teacher- Students can you give more examples of Malleability of metals?<br>Student1:- Silver or Gold plates.<br>Student2:- Iron pan used in kitchen<br>Teacher – Yes students.<br>Now let's see the next property called Ductility<br>▪ **Ductility**<br>Ductility is the property of a material. It is its ability of being drawn into a wire. Metals can be drawn into wires. Platinum, Gold is well known as highly ductile metals.2.5 Km of Platinum wire is known to have been drawn from 1.27g of Platinum. Can we draw coal into a wire? Can we beat it into a sheet? Coal is nothing but a carbon. Carbon is a non –metal. Non-metal are neither malleable nor ductile.<br>Teacher – Students can you add some examples of ductile elements?<br>Student1:- Copper wires used in electric wires.<br>Student2:- Golden jewelry, Silver jewelry<br>Teacher- Yes students. In electricity Copper wires are used. Why not Iron, Gold or Silver.<br>Students think but unable to answer. | Provide context.<br>Give examples<br>Identifying attributes |

Teacher- Students copper is the best conductor of electricity having least resistance, it is available easily and quite reasonable.

- **Conduction of heat and electricity.**

We use metal utensils for cooking food, because metals like iron and Copper are good conductors of heat. Almost all metals are good conductors of heat and electricity.

Students have you observed that electrical wiring in your house? It has Copper wires but the switchboard on the wall is made up of wood or plastic. It is because Copper is a good conductor and wood and plastic are bad conductor of electricity. Substance that allows heat and electricity to flow through them are called conductors of heat and conductors of electricity respectively.

Critical approach to subject matter.

Teacher- Students can you give some such examples?

Student 1:- Handles of tavas, and pressure cooker are made up of plastic or wood. But these things are made up of metals.

Student2-:- Handles of pan, iron are made up of plastic.

Prompt awareness of learner's relevant knowledge and experience.

Teacher- Yes student, very good observation.

Metals produce a ringing sound. Non –metals do not produce a ringing sound. You must have observed the bell in schools and temples which are made up of metals.

Teacher:- students now can you differentiate between Metals and Non Metals

| | Metals | Non -metals |
|---|---|---|
| Student1 | Metals have a luster. | Nonmetals do not have luster. |
| Student2 | Metals are malleable. They can be beaten into thin sheets. | Non –metals are brittle, They are not malleable. |

Critical approach to subject matter.

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| Student3 | Metals are ductile; they can be drawn into wires. | Non metals are not ductile. They cannot be drawn into thin wires. |
| Student4 | Metals are good conductors of heat and electricity. | Non-Metals are poor conductors of heat and electricity. |
| Student5 | At normal temperature metals are in the solid state. | At normal temperature Non- metals are in the Liquid or gaseous state. |

Teacher: - Very good students. You have considered almost all characteristics. Mercury is also a metal though it is in liquid state, it shows the unique feature of metal i.e. conduction of heat. Because of this it is used in thermometer.

Now we will learn the **chemical properties of Metals and Non-metals**

- **Reaction with Oxygen.**

When Magnesium burns in air it combines with Oxygen and forms magnesium oxide. When magnesium burns it produce a bright light.

$$2\,Mg + O_2 \longrightarrow 2MgO$$

Magnesium Oxygen Magnesium oxide

Iron when left exposed in moist air, rusts. A reddish substance is formed on its surface. This is the chemical reaction of iron with the oxygen in the air.

**Try this**.

Take an iron article that has rusted. Scrape off the rust. Add the rust to water in a test tube. Shake the test tube .Test the water in it with red and blue litmus paper. The red litmus paper terns blue. It means that, oxides of metals are alkaline in nature.

Make logical order of learning material explicit.

Link material to organizer.

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| ▪ **The action of acids on metals**<br><br>Take 4 test tubes and label them A,B,C,D. place a Magnesium ribbon in A ,a thin sheet of Aluminum in B, Iron filings in C and a Copper wire in D. now using a dropper , add 5 ml of dilute hydrochloric acid to each of the test tube. Observe the reactions carefully. If a reaction does not take place, heat the test tube slightly. Now take a burning match stick near the mouth of each of the test –tube. What do you see? You hear a little popping sound as you take the matchstick near each test-tube.<br><br>Hydrogen gas is released in the reaction of most of the metals with an acid. As hydrogen is inflammable, it burns with a pop when a burning matchstick is taken near the mouth of the test-tube.<br><br>**Test –tube A**<br><br>$Mg + 2HCl \longrightarrow MgCl_2 + H_2$<br><br>Magnesium + hydrochloric acid → Magnesium chloride + hydrogen<br><br>**Test –tube B**<br><br>$2Al + 6HCl \longrightarrow 2AlCl_3 + 3H_2$<br><br>Aluminium + Hydrochloric Acid → Aluminium chloride + Hydrogen<br><br>**Test –tube C**<br><br>$\mathbf{Fe + 2HCl \longrightarrow FeCl_2 + H_2}$<br><br>Iron + hydrochloric Acid → ferrous chloride + Hydrogen<br><br>**Test –tube D :**<br><br>Copper does not react with hydrochloric acid at normal or high temperature. It dissolves in hot concentrated sulphuric acid and produces a solution of copper sulphate and sulpher dioxide gas. | Strengthening cognitive organization.<br><br>Presentation of learning material.<br><br>Present material. |

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| $Cu + 2H_2SO_4 \longrightarrow CuSO_4 + SO_2 + 2H_2O$<br>Copper sulphuric Acid → Copper sulphate, Sulpher dioxide, water<br>**The action of bases on metals**<br>In a test-tube, take 5-10 ml of Sodium hydroxide solution. Drop a thin piece of Aluminium in it. Take a burning matchstick near the mouth of the test tube. You will hear a popping sound. It tells you that the gas that burns was hydrogen.<br>When bases react with metals, hydrogen gas released.<br>Teacher- Students we have learnt about the reactions on metal and non-metals. Now we will learn the next point. Can you tell me the uses of metals?<br>Student1:- To make ornaments and coins of Gold, Silver, Tin etc.<br>Student2:- Mercury is used in thermometer.<br>Student3:- Copper wires are mainly used as conducting wires, and in electrical gadgets, radio, refrigerator, etc.<br>Student 4:-Iron and Aluminium sheets are used to make roofs of houses.<br>Student 5:- Many of cooking utensils are made up of metals.<br>Teacher –Yes students. Very good (teacher shows some metal objects.) Apart from this we use compounds of sodium such as common salt (sodium chloride), washing soda (sodium carbonate), baking soda (sodium bicarbonate) for various purpose in everyday life.<br>Teacher -Students now we will learn about the **uses of non-metals**……<br>1. Graphite is used as the core in pencils<br>2. Graphite is used as one of electrode in an electro-chemical | Provide context<br>Prompt awareness of learner's relevant knowledge, and experience.<br>Link material with organizer |

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| cell.<br>3. Silicon dioxide, the oxide of the metalloid silicon, is used in making glass and cement.<br>4. Silicon is used in the solar cell.<br>5. Red phosphorous is of great use for various purpose such as making safety matches, crackers, germicides, explosive, etc.<br>6. Sulphur is used for producing acid and also in some medicines, gum-powder etc.<br>Teacher- Students why do Gold, Platinum, Silver are costly?<br>Student 1- They are not affected by environment.<br>Teacher- Yes student, metals like Platinum and Gold are found in nature in the form of elements. They are not affected by air, water, acids, heat etc. Hence, they are called the **noble metals**. They do not ordinarily take part in chemical reaction.<br>Teacher – Students now can you tell me the uses of noble metals?<br>Student1- Gold is used for plating Silver.<br>Student 2- Platinum is used in some medical instruments.<br>Student3- Gold and Platinum are mainly used for making ornaments.<br>Student4- Gold coins were used in olden times.<br>Teacher- Very good students. Why Gold coins are not used now a days?<br>Teacher- In ancient times there were currencies of different kings. But in our India use same currency, which is used in all over the country. So we are not using Gold coins in transaction, we use rupees.<br>Students we are observing that the rates of Gold are different. It depends on purity. It is measured in carats. Twenty | Critical approach to subject matter.<br>Make logical order of learning material explicit. |

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| –four carat gold is considered as 100% pure. The purity of Gold determines its price. However, 24 carat pure gold is very soft. Ornaments of pure gold break or bent easily. So Copper or Silver is added to gold in the necessary proportion. Ordinarily, twenty-two carat gold is used for making ornaments.<br>**Observe the percentage of gold in different purities.** | Give example. |
| Teacher- Students you must have seen that your mother use lemon or Pitambari to clean the Copper utensils. Why do she apply these things?<br>Student1- Because Copper gets some green or brown colored patches.<br>Teacher – Yes student. Also have you observed that Silver articles terns black?<br>Student- Yes teacher, we are having Lord Ganesha's statue of Silver, when it was new it was white, and now it turns blackish.<br>Teacher- Yes students, even Iron articles slowly get covered with a reddish substance, if Copper vessels remain wet, they develop yellowish green patches. Silver articles also turn black. This is called as corrosion.<br>In the entire above example, the gases present in air react with the metals Iron, Copper or Silver due to moisture, to | Make organization explicit.<br>Presentation of learning material.<br>Critical approach to subject matter.<br>Phase-3<br>Strengthening Cognitive Organization. |

| Carat | Percentage of gold |
|---|---|
| 24 | 100 |
| 22 | 91.8 |
| 18 | 75 |
| 14 | 58.5 |
| 12 | 50 |
| 10 | 42 |

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| produce compounds of the metals. This action that wears the metal is known as **Corrosion**.<br><br>Oxygen gas reacts with Iron, Carbon dioxide gas, with Copper and hydrogen sulphide gas with Silver.<br><br>To prevent the corrosion of metals, a layer of grease or oil is applied to them or they are coated with another metal that does not rust. Iron is galvanized (given a coat of zinc) to prevent rusting. Ships are coated with enamel paints to prevent the corrosion of metal sheet by the salty sea water. These paints contain metals like Zinc or Magnesium. This prevents contact between the metal surface and the surrounding air. Therefore, chemical reactions cannot take place and corrosion is prevented<br><br>**Alloys: - A homogenous mixture of two or more metals or of metals and non-metals is called as Alloy.**<br><br>Alloys contain metals in specific proportion. In the alloy physical properties change but chemical properties remains the same.<br><br>For example, when Copper and Tin are mixed we get alloy called Bronze, in the alloy, Copper loses its softness and the alloy becomes hard.<br><br>The alloy sheet is obtained from Iron and Carbon. It is a stronger material. Iron, carbon and Chromium form the alloy called stainless steel. It is more durable and clean. It does not rust.<br><br>Teacher – Students in our day today life where do we use alloys?<br><br>Student1:- Most of the utensils in kitchen are made up of steel.<br><br>Student2:- Bronze is used for medals.($3^{rd}$ rank)<br><br>Teacher –Very good students. Students in this lesson we have studied about the following points.<br><br>• Concept of metals and Non-metals. | Clarify idea.<br><br>Link material to organizer.<br><br>Use principle of integrative<br><br>Reconciliation |

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| • Physical properties of metals and Non-metals.<br>• Difference between metals and Non-metals.<br>• Chemical properties of metals and Non-metals.<br>• Uses of metals and non-metals.<br>• Alloy.<br>Now I will ask you some questions, answer it.<br>Qu. 1. What are the characteristics of metals?<br>Student- Metals are ductile, malleable, having luster, Most of the metals are solid, and good conductor of heat and electricity.<br>Qu. 2 What are the characteristics of non-metals?<br>Student- Non Metals do not have luster, .They are brittle and are not malleable. At normal temperature it is in liquid or gaseous state, they are poor conductor of heat and electricity.<br>Qu. 3 What are alloys? Give examples.<br>A homogenous mixture of two or more metals or of metals and non-metals is called as Alloy. Examples are Bronze, stainless steel,<br>Qu. 4 What are the uses of Metals?<br>For making cooking utensils.<br>Used as Conductor of electricity.<br>To make roofs of houses.<br>To make coins and ornaments.<br>Used in Thermometers.<br>Qu. 5. What are the uses of non -metals?<br>1. Graphite is used as the core in pencils<br>2. Graphite is used as one of the electrode in an electro-chemical cell. | Apply ideas effectively.<br><br>Use principles of integrative reconciliation. |

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| 3. Silicon dioxide, the oxide of the metalloid silicon, is used in making glass and cement.<br>4. Silicon is used in the solar cell.<br>5. Red phosphorous is of great use for various purpose such as making safety matches, crackers, germicides, explosive, etc.<br>6. Sulphur is used for producing acid and also in some medicines and gum-powder.<br>Teacher – Very good students. You answered very well. So today we have completed the lesson metals and non- metals. In next period we will start a new lesson. Thank you. | |

- **Instructional Effect:-**

  **1.** Students understand the concept of metals and nonmetals.

  **2.** Students understand physical and chemical properties of metals and non-metal.

  **3.** Students understand the concept of alloy.

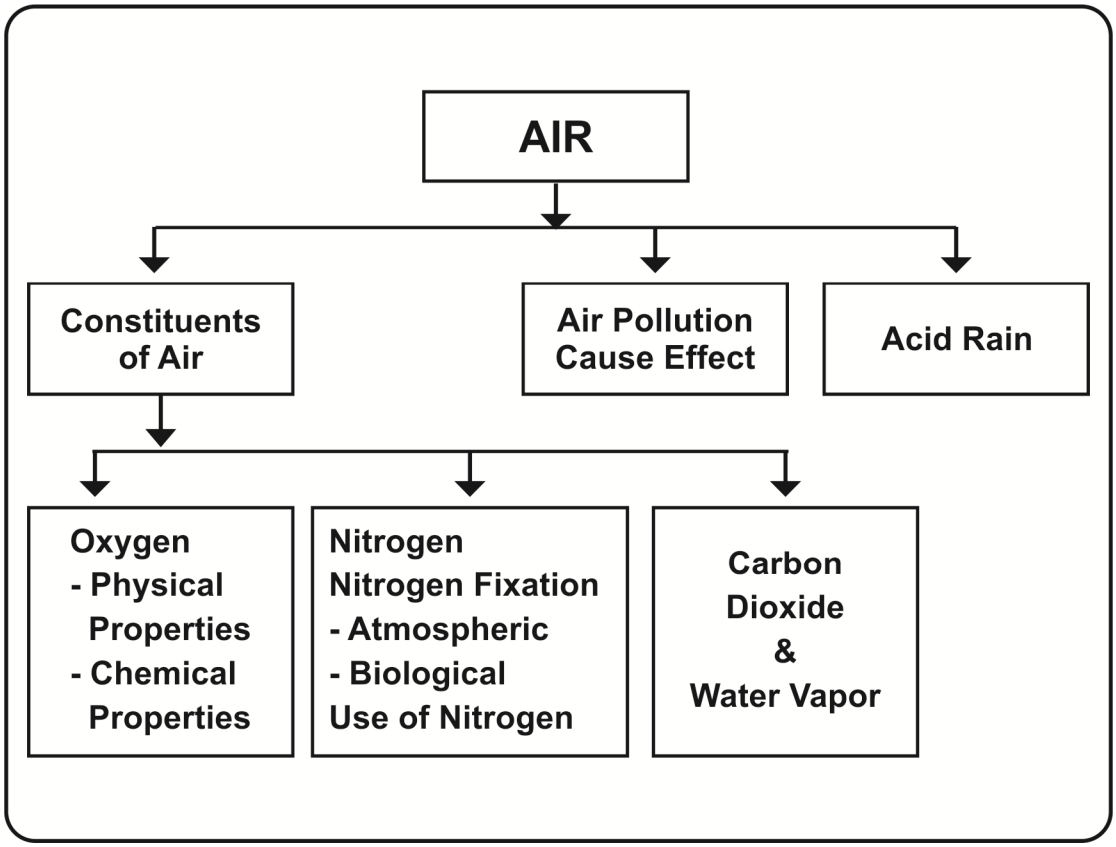
  **4.** Student links all the points properly.

- **Nurtarant effect:-**

  **1.** Student differentiates between metals and nonmetals in daily life.

  **2.** Student uses the properties of metals and nonmetals.

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AIR
Constituents of Air
Air Pollution Cause Effect
Acid Rain
Oxygen
- Physical Properties
- Chemical Properties
Nitrogen
Nitrogen Fixation
- Atmospheric
- Biological
Use of Nitrogen
Carbon Dioxide & Water Vapor

**Lesson plan – Advance Organizer Model**

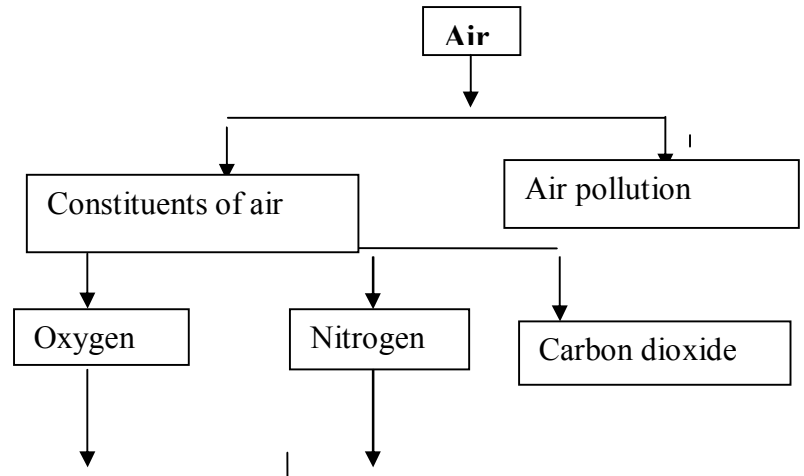
**Subject – Science**

**Standard – 8th**

**Unit – Air**

- **Objectives**: - Students will learn…..
  1. The different constituents of air.
  2. Preparation, physical and chemical properties and uses of Oxygen.
  3. The uses of Nitrogen, biological fixation of Nitrogen.
  4. The concept of soil Erosion and soil pollution.

| Student –Teacher interaction | Syntax of Model |
|---|---|
| Teacher –Students we have learnt about the basic needs of human beings. These basic needs are fulfilled by the natural resources.<br>Which are the natural resources?<br>Student1- Water.<br>Student2 –Air.<br>Students3-Soil.<br>Teacher – Yes, correct. Students which are the basic needs of human beings?<br>Student – Food, shelter and clothes.<br>Teacher – Yes. Apart from these, air and water are the important necessities. So today we are going learn the chapter 'Air'<br>Following are the main points of the lesson. | **Phase-1**<br>Clarify the aim of lesson |




Physical &Nitrogen Fixation

Chemical properties. Uses of Nitrogen

Preparation in

Laboratory.

Uses

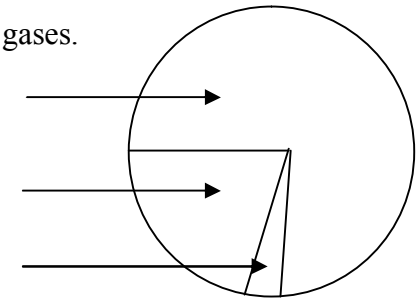
Presentation of Advance organizer.

There is a thick envelope of air all around us. We call it as the atmosphere. Air contains Oxygen, Nitrogen, Carbon dioxide, water vapour and some inert gases.

Nitrogen =78 %

Oxygen =21%

Other gases =1%



Present organizer.

About 100 years ago, The proportion of carbon dioxide in air was about 0.029%, and today it is 0.035% what is the reason?

Student1-Because of industrialization.

Student2- Excess use of vehicles.

Student3 – Increase in dust.

Teacher –Yes Students, because of these things air gets

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| polluted and the percentage of carbon dioxide increased. Nitrogen, Oxygen and other gases are the main constituents of air. We will learn one by one. | Presentation of learning material |
| **Oxygen**:- Oxygen is found in air in free state. It is also present in water in the dissolved state. The survival of living things depends on water. | |
| **Preparation of Oxygen:-** | |
| To prepare oxygen, take a mixture of Potassium chlorate and Manganese dioxide in the proportion5:1, in a test tube. Heat the test tube to 300 degree c. You will see gas bubbles rising into the water filled gas jar inverted over the water. Fill 3-4 jars with the gas. | Prompt awareness of learner's relevant knowledge and experience. |
| Oxygen takes the place of water in the gas jar. As Oxygen fills more and more of the space in the gas jar, the level of water in it keeps falling and we can come to know that the gas jar is full. Oxygen is slightly heavier than air. It is collected by the downward displacement of water. | |
| Heat 300°C<br>$2KClO_3 \longrightarrow 2KCl + 3O_2$<br>$(MnO_2)$<br>Potassium Chlorate — Potassium Chlorate — Oxygen | **Phase -2**<br>**Presentation of Learning Material.** |
| Manganese dioxide does not actually take part in this reaction. It acts as a catalyst. | Give illustration. |
| **physical properties** :-<br>1. Oxygen is a colorless, odorless, tasteless gas.<br>2. It dissolves sparingly in water. | |
| **Chemical Properties :-**<br>1. Oxygen combines readily with other elements to | |

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| produce their oxides.<br>2. Oxygen does not itself burn but supports burning.<br>(Teacher explains one activity for the property.) When the wood in the fire is burning low, blow on it with blower, the fire glares up and begins to burn vigorously. This happens because Oxygen helps burning. This property is used in blacksmith's bellows.<br>Teacher – But students why the candle snuff out when we blow air in the flame by our mouth.<br>Student – We exile Carbon dioxide, which stops burning.<br>Teacher – Correct student. In fire Extinguisher cylinder carbon dioxide gas is used.<br>**Uses of Oxygen**<br>Teacher – Students what are the uses of Oxygen?<br>Student1- For respiration<br>Student2- For combustion<br>Teacher – Yes students, all animals need Oxygen for respiration. Do plants also need Oxygen?<br>Student – Yes, at night plants take Oxygen and gives out Carbon dioxide.<br>Teacher- Yes, thus all living things need Oxygen for respiration. Oxygen is supplied artificially, if a person cannot breathe.<br>Students have you seen the mountaineers carrying oxygen cylinder? Why do they carry it?<br>Student1 – Because as we go high and high the air becomes thin, it becomes difficult to breathe, so the mountaineers get additional supply of Oxygen through gas cylinder.<br>Student2– Oxygen is also used (Ventilator) for the patients | Make logical order of learning material explicit.<br>Link material to organizer.<br>Prompt awareness of learner's knowledge.<br>Link material to the organizer.<br>Identify defining attributes. |

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| who are having trouble in respiration<br><br>Teacher – Very good student. The flames of mixture of oxy hydrogen and oxyacetylene are used for welding.<br><br>**Nitrogen :-**<br><br>Teacher – The next constituent of air is Nitrogen. It is the greatest portion of air. Nitrogen is an important constituent of protein. Hence, it is important for the growth of living things. However nitrogen cannot be used directly from the air. Nitrogen fixation is necessary before it can be used. The conversion of atmospheric nitrogen into compounds like ammonia and nitrates which can be used by living things is called **Nitrogen Fixation**. This is brought about by both biological and atmospheric factors.<br><br>**Biological Fixation** – Micro-organisms that bring about Nitrogen fixation are of two kinds. One of these types is found in the nodules on the roots of certain plants (teacher shows such plant roots having nodules and explains.) While the other types are found in the soil. The micro-organisms in the nodules absorb the nitrogen from the air and convert it into nitrogen compound.<br><br>The micro-organisms in the soil convert atmospheric Nitrogen into ammonia, nitrous acid, and nitric acid and eventually into nitrates. (Teacher shows slide of biological fixations)<br><br>**Atmospheric Fixation**:- When there is lightning in the sky, atmospheric nitrogen and oxygen combine to form nitric oxide. This nitric oxide is oxidized again and nitrogen dioxide is formed.<br><br>Nitrogen dioxide dissolves in rainwater and finally forms nitric acid. This nitric acid falls to earth, dissolved in rainwater. There it reacts with salts in the soil to form nitrates .Plants use these nitrates for their own growth. | Presentation material.<br><br>Link material to organizer.<br><br>Make logical order of learning material explicit. |

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| Thus Nitrogen in the air becomes available to living things after biological and atmospheric fixation.<br><br>Through excretion and decay of living things as well as through burning, nitrogen compounds get decomposed. Thus Nitrogen is released back into atmosphere. That is how the portion of nitrogen in the atmosphere remains constant.<br><br>Teacher – Students what are **uses of Nitrogen**?<br><br>Student1- It is useful for plants.<br><br>Student2- It is useful to produce fertilizers.<br><br>Student3- It is used to prepare ammonia and nitric acid.<br><br>Teacher- Yes students. Nitrogen is used in industry on the large scale for the production of ammonia and nitric acid. It is also used for producing fertilizers. As we just discussed Nitrogen is useful for the growth of living things. Plant issue nitrogen to produce protein acetous substances. Other living things use plants as food. This helps them to grow, too. Nitrogen is used to make thermometers for measuring very high temperature.<br><br>Teacher-Students now we will learn about another gas i.e.<br><br>**Carbon dioxide.** Plants use carbon dioxide from the air during photosynthesis and release Oxygen into air. This process takes place in the presence of sunlight. Students we have seen that the proportion of carbon dioxide is increasing causing air pollution. We have studied various causes of pollution. The rising proportion of Carbon dioxide increases the threat to greenhouse effect.<br><br>Students this natural resource is getting polluted now a days. What may be the causes of air pollution?<br><br>Student1- Excess use of vehicles<br><br>Student2– Due to burning of plastics and garbage | Make logical order of learning material<br><br>Make organization explicit |

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| Student3- Due to industrialization<br><br>Teacher – Yes student. When chemical substances collect in any place beyond a certain level, their harmful effects can be seen. This is called **Pollution.** Pollution is being caused by effluents from factories. These include contaminated water, dust, soot, chemicals especially gases released in the atmosphere by burning of Carbon and Sulphur. Lead, Aluminium, Zinc, acid, bases etc. also causes pollution. The number of factories is on the rise. The waste chemicals given out by factories are in gaseous, liquid as well as in the solid state. They are let out into the atmosphere, which pollutes water and soil.<br><br>Teacher – Students what are the ill effects of air pollution?<br><br>Student 1- Air pollution causes respiratory disease.<br><br>Student2- It leads to high blood pressure.<br><br>Student3- It also causes psychological disorder.<br><br>Teacher –( Teacher shows slides and explains) Yes students, air pollution also leads to a higher incidence of respiratory disorder, cancer of intestine, disorder of the urinary bladder, high blood pressure, night blindness, etc. It also causes palpitation, breathlessness and psychological disorders, too.<br><br>It is now accepted that pollution affects animals and plants too. The life-span of animals decreases also their capacity for producing milk is decreasing<br><br>Air pollution also harms plants. There is a fall in photosynthesis production by plants also. Other effects, like untimely falling of leaves, absence of fruiting, etc. have also been seen on plants.<br><br>Students we have seen many ill effects of air pollution. How can we minimize this pollution, can you suggest some remedies? | Prompt awareness of learner's knowledge.<br><br>Make a logical order of learning material explicit. |

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| Student 1- Avoid deforestation. Plant more and more trees.<br>Student2- Industries should be developed away from cities.<br>Student3- Motor vehicle should be serviced and maintained properly. Avoid excess use of vehicles, use public transports etc.<br>Teacher – Very good Students. Apart from these measures, the government is also taking a war footing steps to control it.<br>1. A law has been enacted making bit mandatory to treat chemical waste before letting it out of factory.<br>2. Precaution should be taken to prevent the concentration of chemicals in any one place.<br>3. To prevent the harm caused by air pollution, industrial estates should be established away from cities and the height of their chimneys should also be increased.<br>4. Engines of motor vehicle should be serviced and maintained properly to prevent them from causing pollution.<br>5. Forests should be grown to help to reduce pollution of air.<br>Teacher- Students have you heard the term acid rain?<br>Students – No teacher.<br>Teacher – Factories in big cities emit nitrogen dioxide and sulphur dioxide gases. As rain falls, these gases dissolve in it forming nitrous oxide and sulphurous acid. With the rainwater, these acids fall to the ground. This is called acid rain. This can sometimes cause trees to die and fall. Acid rain also causes yellow patches on marble. (Teacher shows some images of acid rain.)<br>Teacher – Students have you heard the word greenhouse effect? | Critical approach to subject matter.<br>Apply ideas effectively.<br>Critical approach to subject matter.<br>**Phase-3**<br>**Strengthening cognitive organization.** |

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| Student – No teacher.<br><br>Teacher- The warming of earth or global warming due to re-emission of sun's energy absorbed by the earth followed by its absorption by $CO_2$ molecule and $H_2O$ vapour present near the earth's surface and then its radiation back to earth is called **Greenhouse effect**.<br><br>The phenomenon has been named greenhouse effect because it is similar to a greenhouse for plants in cold countries. A greenhouse is a place when plants are grown on the soil but there are walls and roof made of glass. The sun's energy can enter through the glass but cannot go out of it. The energy thus absorbed by the soil and the structure of green house. The energy thus absorbed is re-emitted back into the green house. The infrared radiation (heat) is re-emitted by earth and absorbed by carbon dioxide and water vapour in lower concentration. The heat radiated back to earth by carbon dioxide and water vapour. Now a days the temperature of earth is increasing so more energy get absorbed.<br><br>Students, observations of weather are recorded every hour with the help of machines and are carried out in person once every day. An observatory records observations of atmospheric factors such as temperature, pressure, velocity of winds and humanity. It keeps a record of the changes occurring in them and forecasts the weather based on the changes observed.<br><br>Teacher - Students you must have seen the gas that gushes out of the bottle of an aerated drink when you open it. This gas is carbon dioxide. Why does it gush out like this?<br><br>Teacher -Carbon dioxide dissolves only sparingly in water. Hence, it has to be dissolved in water under pressure. When the cap of the bottle is pressed open, the pressure is released | Provide context.<br><br>Make logical order of learning material.<br><br>Present material. |

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| and the carbon dioxide gas gushes out.<br>Teacher – Students have you heard the word 'dry ice'?<br>Student – No teacher.<br>Teacher – If Carbon dioxide is cooled to -57$^{o}$C, it freezes. In this form, it is called dry ice. Dry ice is used to bring down the temperature of a substance suddenly. It is also used for preserving foodstuff.<br>Teacher –Students have you seen the drops of water on the pot which is just taken out from fridge. You can do an activity at home. Take a clean glass. Dry its outer surface. Place some pieces of ice in the glass. You will soon see little droplets of water collecting on the outer surface of the glass. The water vapour condenses and collects on the glass in the form of droplets.<br>Some deliquescent substance absorbs water vapour from the air. This too, tells of the presence of water vapour in the air. Clouds and fog are formed by the condensation of water vapour.<br>Teacher – Students tell me which gases we have studied?<br>Student1 – Oxygen<br>Student 2- Nitrogen<br>Student 3-Carbon dioxide.<br>Teacher – Yes student, apart from this some inert gases are also present in the air. The inert gases Argon, Helium and Neon, which are among the other constituent of air. It has many uses. Out of this Argon is used in electric bulbs; Helium is used to obtain very low temperature while Neon is used in the neon lights on hoardings that display advertisement.<br>Scientists of India Meteorological Department at Pune have developed a system which can accurately predict the arrival of | Phase--3<br>**Strengthening cognitive organization.**<br>Principle of integrative reconciliation |

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| the south-west monsoon. Research related to several different subjects such as atmospheric pressure, Antarctica, storms, cyclones, pollution in suburban area etc. is carried on there.<br>( teacher shows the image)<br>Teacher revises the main points of the lesson.<br>Students in this lesson we have learnt the following points.<br>Air constituents<br>• Oxygen<br>• Nitrogen<br>• Other gases<br>• Air pollution<br>• Acid rain.<br>• Observatory<br>Teacher- Students now I am going to ask you few questions based on this unit<br>Q. Name the constituents of air and its percentage.<br>Student- Nitrogen =78 %<br>Oxygen =21%<br>Other gases =1%<br>Q. What ill effects of pollution are seen?<br>Student- Air pollution causes respiratory diseases.<br>- It leads to high blood pressure.<br>- It also causes psychological disorder.<br>-Air pollution also leads to a higher incidence of respiratory disorder, cancer of intestine, disorder of the urinary bladder, high blood pressure, night blindness, etc. It also causes | |

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| palpitation, breathlessness and psychological disorders, too.<br><br>It is now accepted that pollution affects animals and plants too. The life-span of animal's decreases also their capacity for producing milk decreases<br><br>Air pollution also harms plants. There is a fall in photosynthesis production by plants also. Other effects, like untimely falling of leaves, absence of fruiting, etc. have also been seen on plants.<br><br>Teacher- So students today we have learnt about air, its constituents ,air pollution, acid rain and also the function of observatory. In next period we will start a new lesson. Thank you. | |

- **Instructional effect:-**

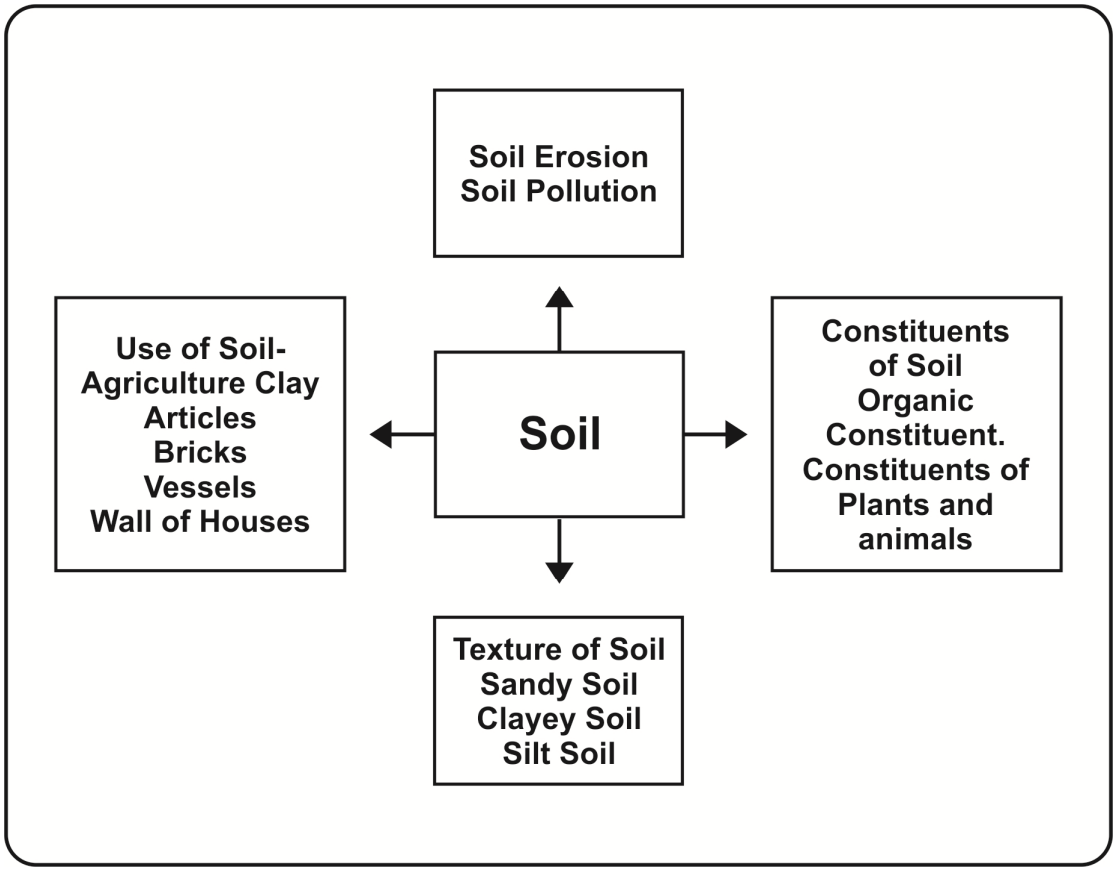
  1. Student understands the constituents of air and their proportion.
  2. Student understands the uses of all gases.
  3. Student understands the concept of air pollution and its effect.

- **Nurtarant effect:-**

  1. Student will try to minimize the air pollution and will create awareness about it.
  2. Student will collect more information about greenhouse effect and acid rain etc.

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**Soil is made up of stones, and pebbles, sand, fine soil particles as well as Organic substances.**



**Lesson plan – Advance Organizer Model**

**Subject – Science**

**Standard – 8th**

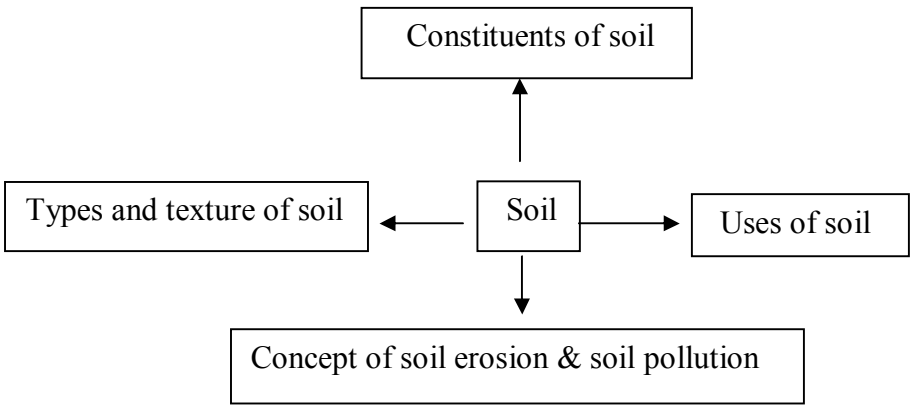
**Unit – Soil**

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**Objectives:**-Students will learn…..

1. The different types and texture of soil.
2. The uses of soil.
3. The constituents of soil.
4. The concept of soil Erosion and soil pollution.

| **Student –Teacher interaction** | Syntax of Model |
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| Teacher- Students, we have learnt some natural resources. Which are the natural resources?<br>Student –Water, air, soil are the natural resources.<br>Teacher –Our basic needs are fulfilled by these natural resources. Which are the basic needs of human beings?<br>Student –Food shelter and clothes are the basic needs of human beings.<br>Teacher – How these basic needs are fulfilled?<br>Student1 –We get food clothes from plants.<br>Students 2- Also the materials which are required for constructing shelter are given by plants.<br>Teacher - Yes students, can you tell me where plants grow?<br>Student1 – Plants grow in the soil.<br>Student2- Soil gives nourishment and support to plants. | Phase -1<br>Presentation of Advance Organizer. |

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| Teacher – Students can we grow plants without soil?<br><br>Student –No.<br><br>Teacher – Imagine that if there is no soil, what will happen?<br><br>Student1 –Without soil plants cannot grow.<br><br>Student2- The survival of all the animals, their nourishment and nurture all depends on soil.<br><br>Student3- Without soil life on earth will not be possible.<br><br>Teacher – Correct students. Soil is essential for all living organism. Hence we must know about soil in detail. So today we are going to learn about 'Soil'. (Teacher shows the advance organizer in the form of diagram.)<br><br>Teacher –Out of these natural resources 'soil' is the one of the important natural resources. Soil is the very basis of agriculture. | Clarify the aim of lesson. |
|  | Presentation of Advanced Organizer |
| Soil is made up of stones and pebbles, sand, fine soil particles as well as organic substances. The effect of various elements of nature is the cause of the wearing of rocks and formation of soil. This process of transformation of rocks into soil is called **Weathering**. Rocks and boulders also break as a result of effect of rivers, rainwater, wind and continuous change in weather. Rocky surface develops cracks. Extreme heat and cold also causes cracks in rocks water that collect in these cracks freezes in the cold. Freezing water increases in volume and results in the breaking of rocks. (Teacher shows the slides of | Provide context. |

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| weathering and explains.)<br>Teacher – Students what will happen if there is no soil?<br>Student1 – Plants cannot grow.<br>Student2- The animals, insect also depends on plants.<br>Student3- The total food chain will be disturbed.<br>Student4 –We cannot get any minerals, metals etc.<br>Student5- Water could not be stored and collected in dams.<br>Student6 –Without soil no living organism can survive.<br>Teacher- Insects and microorganisms live, grow and die in the soil. Plants too take roots, grow and die in this same soil.<br>Rodents like rats make burrow in the soil to live in them. This results in the conversion of rough earth into soil due to crumbling. Such biological process goes on in the ground continuously and adds to the effect of weathering.<br>Teacher- Roots of plants growing into cracks in rocks also help the process of weathering. The soil that is formed by weathering mainly caused by roots of plants is clay.<br>**Constituents of Soil**: - Soil has constituents of plants and animals. They are called organic constituents. The constituents of plant origin include bacteria, fungi, algae, blue –green algae, decomposed leaves, etc. The constituents of animal origin are protozoa, worms, insects, shells and the decomposed remains of dead animal.<br>(Teacher shows the relevant slides and explains in detail.)<br>Teacher –Students have you seen earthworms?<br>Student –Yes teacher.<br>Teacher –Where can we find earthworms?<br>Student- In the farms.<br>Teacher –Do you know that earthworms are called as farmer's friend? | Phase -2<br>Presentation of learning task or material.<br>Presentation of learning material.<br>Critical approach to subject matter.<br>Link material to organizer. |

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| Can you give the reason?<br><br>Student – It converts the bio waste into organic fertilizers. It ploughs the soil.<br><br>Teacher – Yes. Very good children. Soil becomes an integral factor in the life of human being. Plant grows on soil and soil provides food for animals and human beings. Plants provides us all the basic necessities i.e. Food, shelter and clothing. Various minerals and metals are also obtained from soil. Rainwater is also available because of soil. Thus without soil life on earth is not possible. Soil is a natural resource.<br><br>Now students tell me what are the **uses of soil**?<br><br>Student 1- For construction of walls of houses.<br><br>Student 2- For making bricks.<br><br>Student 3- For making articles like clay toys, lamps etc.<br><br>Student 4- For making some vessels of everyday use.<br><br>Student5- For Farming and Gardening.<br><br>Teacher- Very good Students. Soil has the property of elasticity that can give desired shape so we can make various articles and vessels (teacher shows some slides of various uses of soil and explains). Soil is an integral part of agriculture. Soil also holds water, the rain water gets collected in deep places such as ponds and wells, and this water becomes available to us all the year.<br><br>Teacher - Students have you seen various colors of soil?<br><br>Student –Yes teacher.<br><br>Teacher- Which different colors of soils have you seen?<br><br>Student 1- Brown, Black color.<br><br>Student 2-Red soil<br><br>Student 3-Yellow or copper color soil.<br><br>Teacher – Yes students .There are different colors of soil. (Teacher shows some samples and slides of different colored soil.) Color is an | Make logical order of learning material.<br><br>Link material to organizer.<br><br>Make organization explicit |

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| important property of soil. We get an idea of fertility, drainage and other such properties of soil from its color. The color of soil depends upon its texture, organic content and chemical substances like iron, quicklime, which it may contain. (Teacher shows some images of different types of soil and explains its use.) | Provide context |
| Fine particles of quarts, feldspar, and mica, carbonates of metals oxides and sulphites of iron are present in soil along with organic matter. | Linking material to organizer. |
| China clay, clay and loamy soil are the three types of soil used to make earthen pots and other articles. (Teacher shows some images of earthen pots) The soil found near the Kaolin mountain is called Kaolin or china clay. It is white in color and used to make crockery, tiles for bathrooms, tanks, laboratory, apparatus etc. | |
| Various kinds of oxides are used to decorate earth wares or porcelain article. Iron oxide is used to obtain red ochre and copper oxide to obtain the green color. | |
| Clay and loamy soil are different types of Kaolin. As loamy soil is white in color it is used to make statues, idols, etc. | Awareness of learner's relevant knowledge and experience. |
| Soil particles are of different sizes. The proportion of the particle of the different sizes determines the texture of soil. The different types of soil, based on texture are<br>**1.** Sandy soil<br>**2.** Clayey soil<br>**3.** Silt | |
| If the soil has greater portion of large particles or of sand, the soil is called as sandy sail. Clayey soil has the greatest portion of fine particles of soil while silt soil consists of fine to medium sized soil particles. Silt soil has medium capacity for holding water. While clayey soil has the greatest capacity for holding water. However soil which holds a lot of water is not well aerated. This arrests the growth of roots in the soil.(Teacher shows the types of soil) | |

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| **Erosion of Soil**: - Erosion means the change in surface by mechanical action. Soil on ground is eroted by rain water falling on it, by fast current of water flowing on it or by gusts of wind. This causes the thin layer of fertile soil on the surface to be carried away. The soil cover is reduced and the soil loses its fertility.<br>Teacher – What may be the causes of soil erosion?<br>Student 1- Flood<br>Student 2- Slope of soil<br>Student 3-Deforestration<br>Teacher –Yes students these are the main causes of soil erosion.<br>So to prevent soil erosion which activities we should implement?<br>Student 1 –Should build the bunds.<br>Student 2- Avoid deforestation. Plant more trees, it will provide cover to the soil.<br>Student 3 –Arrange the soil horizontally. Minimize the slope.<br>Teacher – Very true students. To prevent erosion, soil must be kept covered, allow grass to grow. Crops grown on land and trees planted on it provide this cover.<br>Erosion also depends upon the slope and the type of soil. Soil erosion can be reduced by arranging soil horizontally across the line of slope. The bunds also help to stop the soil erosion.<br>If soil erosion is arrested, soil is conserved, this is called soil conservation. The government department for soil conservation is located at district place.<br>**Social Forestry:-** Government schemes were started to plant trees in all possible places such as on the borders of fields, railway tracks, on the banks of streams and rivers, etc. This is called social forestry. This project was started in1976 for the first time. (teacher shows some slides of social forestry and explains.) | Link material to organizer.<br>Critical approach to subject matter.<br>Make logical order of learning material.<br>Presentation of learning |

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| This project is meant to encourage small farmers and adivasies to plant trees. They are also given financial aid for this purpose. As a result fallow and barren land has been reclaimed for agriculture. The number of this has risen and wood has become available in plenty.<br>The social forestry project of Maharashtra Government is carried out in most schools by teams called the 'Harit Sena' or the 'Green Brigade'. Now we will learn a new concept<br>Teacher - Students have you heard about pollution?<br>Students – Yes teacher.<br>Teacher –What is meant by pollution?<br>Student 1- A disturbance in the natural balance of the various factors present is called as pollution.<br>Teacher –Which types of pollutions do you know?<br>Student 1- Water pollution.<br>Student 2-Sound pollution<br>Student 3-Air pollution<br>Teacher – Yes, like these pollutions, soil also gets polluted. When chemical fertilizers are used in greater quantities than necessary, when chemicals are sprayed as pesticides, the proportion of chemicals in the soil increases. Soil is also polluted by the water let out from factories and by other causes such as acid rain. Using too much water and chemicals makes the soil saline. This is also a kind of soil pollution. Crops cannot grow in such soil. (Teacher shows the slides of soil pollution and explains.)<br>Students what can be done to prevent soil pollution?<br>Student 1 – To minimize the use of chemical fertilizer and pesticides. Instead of that should use organic fertilizers.<br>Student2- Water outlets from factory should be treated properly<br>Teacher – Yes. If we follow these steps, soil pollution can be | material.<br>Link material to organizer.<br>Presentation of learning material.<br>Link material to organizer. |

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| minimized.<br><br>**Soil testing: -**Soil testing can tell us about the good quantities and shortcomings of the soil. A farmer grows a variety crops. Often, he does not get a good harvest. Farmers also face some problems. At such time he has to take into consideration factors such as color, texture, and content of organic matter in the soil. Soil testing helps to find out these things. Students tell me What will be the **benefits of soil testing**?<br><br>Student1- The farmer can take crops as per the texture and quality of soil.<br><br>Student2- Farmer's efforts will become fruitful.<br><br>Teacher – Yes students. Soil testing is often performed by commercial labs that offer a variety of tests, targeting groups of compounds and minerals. The advantages associated with local lab are that they are familiar with the chemistry of the soil in the area where the sample was taken. This enables technicians to recommend the tests that are most likely to reveal useful information.<br><br>Laboratory tests often check for plant nutrients in three categories:<br><br>• Major nutrients: Nitrogen (N), Phosphorus (P), and Potassium (K).<br><br>Teacher –So students today we have learnt about soil.<br><br>• Uses of soil<br>• Color of soil<br>• Texture of soil<br>• Constituents of soil<br>• Erosion of soil<br>• Soil pollution.<br>• Soil testing.<br><br>Teacher - Students I am going to show you some samples of soil. You have to identify the color of soil (Teacher shows different | Awareness of learner's knowledge.<br><br>Make logical order of learning material explicit<br><br>Presentation of learning material.<br><br>Phase -3<br><br>Strengthening cognitive organization. |

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| types of soil).<br>Student1-Black soil<br>Student 2-Red copper color.<br>Teacher – Identify the type of soil.<br>Student1 –Sandy soil<br>Student2-Silt soil<br>Student3- Clayey soil.<br>Teacher – Which crops are grown in sandy soil?<br>Student- Cucumber, Muskmelon, Watermelon, Fenugreek, are some crops grown in sandy soil.<br>Teacher- Very good students. So today we have learnt the chapter Soil, and tomorrow we will learn the next chapter. Thank you. | Link material to organizer.<br>Prompt awareness of learner's relevant knowledge and experience. |

- **Instructional effects:-**
  1. Student understands the types, uses and constituent of soil.
  2. Student understands the concept of soil erosion.
  3. Student identifies the type of soil.
- **Nurtarant effect:-**
  1. Student will observe different types of soil.
  2. Student will take more information about government projects related to soil.
  3. Student will take more information about soil testing.

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**Evaluation sheet for lesson plan of Advance Organizer Model**

**Evaluation scheme**

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**Rating scale** – 1: Unsatisfactory, 2: Average, 3:- Satisfactory, 4: Good, 5: Excellent.

Name of the lesson:-

| No. | Criteria | 1 | 2 | 3 | 4 | 5 |
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| 1 | Clarity in statement of aim | | | | | |
| 2 | Presentation of Advance Organizer Model | | | | | |
| 3 | Advance Organizer relevant to the topic. | | | | | |
| 4 | Sequential arrangement of learning material. | | | | | |
| 5 | Interactions between teacher and students. | | | | | |
| 6 | Accuracy and logic in arrangement of content | | | | | |
| 7 | Explanation of key ideas. | | | | | |
| 8 | Use of steps ( Syntax ) | | | | | |
| 9 | Helpful in achieving instructional and Nurturant effects | | | | | |
| 10 | Overall effect | | | | | |
| | Total marks=50 | | | | | |

Qualitative Feedback

Suggestions for Improvement.

Name and Signature of the Expert

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**Lesson plan – Concept Attainment Model**

**Subject: - Science**

**Standard: - 8th**

**Unit: - Disease**

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**Objectives: - Students will learn …..**

1. The types of various diseases.
2. The mode of infection and symptoms of various diseases.
3. The preventive measures of various diseases.

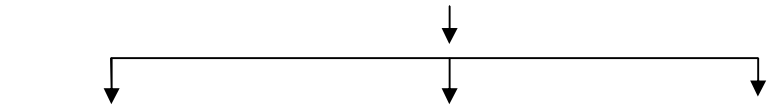
**Concepts: - Diseases, Epidemic Disease, Communicable Disease, Contagious Disease and Vaccination**

| Student –Teacher interaction | Syntax of Model |
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| Teacher – Good morning students.<br>Students today we are going to learn a new chapter. I will provide you some 'Yes' type examples and some 'No' type examples. 'Yes' type examples have some similar characteristics. You have to observe these examples and try to find out the similar characteristics. Even you can add your examples.<br>Teacher gives examples one by one.<br>Yes:-Neeta is absent in school today, as she is suffering from cough and cold.<br>No: - Geeta is absent in school today as she fell down from the swing yesterday.<br>Student1: In both the examples students are absent in school but the reasons are different.<br>Teacher gives other examples.<br>Yes: - Deepak became weak, and lost his appetite. | Phase -1<br>Presentation of data.<br>Teacher presents labeled examples. |

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| No: - Suresh lost some of his excess weight in gym.<br><br>Student: - In both the above example the person lost weight, but in first case it is affecting the health, and in second case it is done purposefully.<br><br>Teacher – You are right. In first case physical health is affected. Now again I am giving you some examples.<br><br>Yes: - Sudha is having fever and stomachache.<br><br>No: - Nikita got fracture while playing on ground.<br><br>Student: - In first case the physical health is disturbed. In second case it was an accident.<br><br>Teacher:-Yes students, observe the next example.<br><br>Yes: - John has to go to doctor to take treatment. His physical and mental condition is disturbed.<br><br>No: Michael is having stress.<br><br>Student1: In first case, the person is not feeling well. He is suffering.<br><br>Student 2:-All yes type examples are caused due to some microorganisms. In 'Yes' type example person is feeling unhealthy.<br><br>Student 3: All 'No' type examples are mostly accidents.<br><br>Teacher - Yes students, in such condition the person do not feel well. He is suffering. This condition is not easy for a person, the person do not feel ease so it is called '**Dis-ease'.** Falling ill is not good. Hence we Should take proper care of our health. There are micro-organisms around us, some can cause diseases. They can do us harm. They enter in our body through food, water or air. If our resistance to diseases is weak, we develop the symptoms of disease. So students today we are going to learn<br><br>about the lesson.' **Disease**'. In this lesson we will learn the | Students identify additional examples.<br><br>Student compare attributes in positive and negative example.<br><br>Teacher confirms hypothesis, names concept, and relates definitions according to essential attributes. |

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| modes of infection, symptoms of diseases and preventive measures of the some diseases.<br><br>According to their modes of spreading, disease can be classified into three types. I will provide you some 'Yes' type and some 'No' type examples, for the types of diseases. You have to identify it. 'Yes' type of examples have some similarities, you have to find the similarities.<br><br>Student1: Teacher can we add Swine Flu, Dengue?<br><br>Teacher –Very good students, your guess is correct Such types of diseases are spread at a time and many people get the same type of disease. Such types of diseases are called '**Epidemic disease**.'<br><br>Cholera, Typhoid, Flu Conjunctives. Diarrhea. These all are the epidemic diseases. Students this is the first type of disease. Now let's learn another type of disease.<br><br>Again I will give you 'Yes' type and 'No' type examples.<br><br>Yes:-Constant sharing of space with a diseased person can result in the disease producing germs to enter a healthy person's body through the air.<br><br>No: Cause due to heredity.<br><br>Student1:-Means we have to avoid contact with such affected persons.<br><br>Student 2 :- In no type example the person gets the disease from their parents, which cannot be communicated to other healthy person.<br><br>Teacher: Good observation and conclusion students. Now I will give some examples, you can also add your examples having similar characteristics.<br><br>Yes: Example is Tuberculosis.<br><br>No:- Example is Diabetes. | Teacher presents labeled examples<br><br>Students discuss the role of hypothesis. And attributes.<br><br>Students describe thoughts.<br><br>Teacher confirms hypothesis, name, and concept according to the essential |

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| Student1:- Can we add Influenza in 'Yes' type. As it is also communicated from diseased person to a healthy person.<br><br>Teacher: - Yes student. The diseases which are spread through constant sharing of space with a diseased person are called as **'Communicable diseases'**.<br><br>Tuberculosis, Influenza are the communicable diseases.<br><br>Students there is yet another type of disease, again I will give you 'Yes' and 'No' type examples. You have to identify the type of disease.<br><br>Yes: - Germs from the diseased person's body enter a healthy person's body through direct or close contact.<br><br>No: - Causes due to change in weather.<br><br>Student1:- Means in' Yes' type there is contact between two persons, one is infected and other is healthy.<br><br>Teacher – Yes students,<br><br>Yes:-Example is Scabies. Scabies is the disease causing intense itching caused by the mites burrowing into the skin of human and other animals. It is easily transmissible from human to human secondary skin infection may occur.<br><br>No: - Leprosy.<br><br>Yes: - Diseases are caused by the micro- organisms, bacteria and viruses.<br><br>No: - Causes due to accident.<br><br>Student: - Teacher, can Eczema be the example of such type of disease? As It is also a skin disease causing redness and itching of skin. The skin becomes scaly.<br><br>Teacher: - Yes student. This is the correct example. Such types of diseases are called '**Contagious diseases**.'<br><br>In this way there are three types of diseases. | attributes.<br><br>Students generate examples.<br><br>Teacher confirms hypothesis, name, and concept according to the essential attributes. |

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| Diseases<br>  <br>Epidem Communicable Contagious<br>Disease Disease Disease (Teacher explains the three concepts of types of diseases i.e. Epidemic disease, Communicable disease and contagious disease with suitable examples.)<br><br>Teacher: - Students can you describe the progression of your ideas during the process?<br><br>Student 1 - When you gave the first example that Neeta is suffering from cold and cough while Geeta fell down from swing. It indicated that falling down from swing was an accident, and having cough and cold means physical health was disturbed.<br><br>Student 2:- In the second example, the person lost weight, but in first case it is affecting the on health, and in second case it is done purposefully. In first case physical health was affected.<br><br>Student 3:- In most of the 'Yes' type example physical health was affected due to some changes in weather. Mental health was also disturbed. So all these examples cleared the symptoms of disease. And most of the 'No' type examples were an accidents. So the concept of 'Disease' became cleared.<br><br>Teacher- How the types of diseases you got cleared?<br><br>Student1:- In all 'Yes' type examples , the diseases are spread at a time and many people get the same type of disease. Also the diseases are Caused due to change in weather or contamination of water. In most of the 'No' type disease they were accidents or some hereditary diseases. So due to all such examples the concept of <u>Epidemic Disease</u> became very clear to us. | Teacher presents labeled examples.<br><br>Students generate examplesStudents describes thoughts. |

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| Student 2:- For Communicable disease Constant sharing of space with a diseased person can result in the disease producing germs to enter a healthy person's body through the air. It means the germs are communicated from a diseased person to the healthy person and in 'No' type examples mostly contains the heredity diseases which are transmitted from parents to their children. So the concept of Communicable disease became clear.<br><br>Student 3:- For '**Contagious diseases** germs from the diseased person's body enter a healthy person's body through direct or close contact. There is contact between two persons, one is infected and other is healthy. Teacher also gave the examples of Scabies disease which is a skin disease transmitted from human to human secondary skin infection may occur .Diseases are caused by the micro-organisms bacteria and viruses. All these characters made the concept of contagious disease very clear.<br><br>Teacher- Good students. It means that your concepts of Disease, Epidemic disease, Communicable disease, Contagious disease are now very clear. Students there are many different diseases of different types. In this chapter we are going to learn about some diseases, their cause's symptoms, and some preventive measures.<br><br>In this lesson we shall study the symptoms of various diseases and the measure of their prevention.<br><br>1. **Chickenpox** –<br><br>(Teacher shows some slides and explains)<br><br>**Mode of Infection**: - A person gets chickenpox when the disease producing virus enters the body with the air, that is breathed in, or by contact with an infected person's clothes, utensils etc. | Students describe thoughts.<br><br>Teacher explains the content.<br><br>Teacher explains the content with the help of slides. |

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| **Main symptoms** - 1. High fever<br>2. Headache<br>3. Small boils on the skin<br>4. They look like blisters scabs form on them in a few days.<br>Teacher –Students, we have learnt about the mode of infection so now tell me which preventive measures do adapt?<br>Student 1 – We should not use the clothes and utensils of infected persons.<br>Student 2- Should take proper medical treatment.<br>Teacher – Yes students. There is a vaccine available for chickenpox. A person does not generally get chickenpox a second time. The resistance acquired the first time remains lifelong.<br>The next disease is Polio.<br>**2. Polio**:- (Teacher shows some slides and explains)<br>**Mode of Infection**: - The disease spreads through contaminated water, food or minute particles in the air.<br>Teacher – Student, have you seen any person suffering from Polio?<br>Student 1 – Yes teacher, they cannot walk properly.<br>Student 2- They need some support to walk. Their legs seem to be very thin.<br>Teacher – Yes Students. Apart from this we will see the remaining symptoms in detail.<br>**Symptoms:-** 1.Fever.<br>2. Throat becomes red.<br>3. Strain is felt in the muscles of the back and leg. | Teacher explains the content with the help of slides. |

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| 4. Weakness in the muscle of the arms or legs.<br>5. Growth of muscle is arrested.<br>6. Muscles become flaccid and cause disability.<br>Teacher - Students what should be the preventive measure?<br>Student 1 – To give Polio drop, the advertisement is shown on TV.<br>Student 2- Should take proper treatment.<br>Teacher – Yes Students.<br>(Teacher shows some slides of polio vaccination and explains)<br>The National Department of Health is at present running a campaign to administer the Polio vaccine to the maximum possible number of children less than five years of age on the same day, all over the country, every year. This help to strengthen the resistance of children of this age group to this disease. During this campaign every child in India under the age group of five is given two doses of this vaccine on two fixed days with an interval of 6 weeks between them. These two doses are booster doses and have to be taken in addition to the regular one. This campaign is expected to eradicate Polio from our country. **Salk and Sabin** were the scientist who succeeded in producing the polio vaccines using the polio virus.<br>Teacher - Students do you scare dogs, monkey or rabbit?<br>Student – Yes teacher, they bite.<br>Teacher – Yes students, you are right.<br>Students now we will learn about one more disease Rabies.<br>**3. Rabies** – The disease is caused by the bite of an affected dog, monkey, cat or rabbit. | Teacher explains the content with the help of pictures on slides.<br>Teacher explains the content in more detail with the help of slides.<br>Teacher explains the content with the help of slides and pictures. |

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| **Symptoms: -** 1. Severe headache.<br>2. Fever.<br>3. Throat muscles become rigid and contracted.<br>4. Patient cannot swallow liquids or even water.<br>5. Fear of water (hydrophobia).<br>6. Patient is delirious.<br>7. Patient's limbs become flaccid and go into a spasm. The disease can be fatal.<br>**<u>Preventive measures</u>**: - 1. Clean the wound caused by bite by flushing with soap and plenty of water.<br>2. Go to doctor at once and take the required number of injections of the anti-rabies vaccine.<br>3. Give all pet animals in your house the anti-rabies vaccine.<br>**<u>Remember</u>:-** People start treatment for this disease when they have been bitten by a dog, cat, monkey etc. Sometimes, they do not take the prescribed number of injections out of fear or due to other reasons. Such incomplete inoculation may not prevent the disease. So one should take all the prescribed number of injections.<br>Students now we will learn about the next disease. i.e.<br>**4. <u>Tuberculosis: -</u> Robert Koch** was the scientist who discovered the bacteria<br>which causes this disease .<br>**<u>Mode of Infection</u>**: - The germs enter the air through the spittle of the patient. The disease spreads through the air.<br>**Symptoms**: - 1. Cough.<br>2. Low grade fever. | Teacher explains the content with the help of slides.<br><br>Teacher explains the content with the help of slides. |

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| 3. Blood in spittle.<br>4. Loss of weight.<br>5. Pain in the chest.<br>6. Difficulty in breathing.<br>**Preventive measures**: - 1.Taking the B.C.G. vaccination.<br>2. Isolating the patient.<br>3. Medical treatment.<br>At present Tuberculosis is considered to be a most easily communicable disease. In India, one T.B. patient dies every two minutes. The WHO (World health Organization) runs a tuberculosis eradicate campaign. DOT (Direct Observation and Treatment) centers have been set up for this purpose. Excellent medicines from the World Health Organization are available free of charge.<br>**5. Typhoid:-**<br>**Mode of infection**: - Through contaminated food, water and also through houseflies.<br>**Symptoms:** - 1. Fever that lasts for a definite period.<br>2. Rose colored rash on the chest.<br>3. Diarrhea.<br>4. Headache.<br>Teacher – What should be preventive measures?<br>Student 1- Food should be kept covered at home.<br>Student 2- Drinking boiled water.<br>Student 3- Avoid eating uncovered food specially when outside.<br>Teacher –Yes Students. Also taking typhoid vaccine, eating only clean, fresh food and maintaining public hygiene are | Student gives answer.<br>Teacher explains the content with the help of slides.<br>Student gives answers based on their observation and experience. |

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| some precautions to avoid typhoid.<br><br>**6**. **<u>Cholera</u>**<br><br>**Mode of Infection**: - This disease spreads through water or food contaminated due to houseflies.<br><br>**Symptoms:** - 1.Severe diarrhea and vomiting.<br>2. Dehydration.<br>3. Dry skin, Sunken eyes.<br>4. Stomachache.<br>5. Cramps in the legs.<br><br>Teacher – Students which precautions we should take to avoid Cholera?<br><br>Student 1- Controlling houseflies.<br><br>Student 2- Not eating food left uncovered.<br><br>Student 3-Drinking boiled water.<br><br>Teacher- Very good Students. Also we should maintain hygiene at public places and should take the cholera vaccine.<br><br>The Health Department has made it obligatory to take the Cholera vaccine before going to places of pilgrimage or traveling abroad. Human beings are themselves are carriers of the '**vibrio cholera'** bacteria which causes this disease.<br><br>Now we will learn about the disease Enteritis<br><br>7. **<u>Enteritis</u>**:-<br><br>The inflammation of the inner lining of the intestine due to infection by bacteria, virus, and worms or by chemical or other harmful substances is called Enteritis. 'Enter on' means 'intestines' and it is –means 'inflammation'. Teacher – Students which would be the modes of infection?<br><br>Student1- Through contaminated water. | Teacher explains the content with the help of slides.<br><br>Teacher explains the content with the help of slides. |

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| Student2- Through contaminated food.<br><br>Teacher- Exactly students! Now we will see the symptoms of the diseases.<br><br>**Symptoms**: - 1. Stomachache.<br>2. Fever.<br>3.Vomiting<br>4. Loss of appetite.<br>5. Diarrhea or constipation.<br>6. Loss of weight.<br><br>Teacher – Students tell the preventive measures.<br><br>Student 1-Keep food clean.<br><br>Student 2-Maintain personal cleanliness.<br><br>Student 3 – Consume only safe food and water.<br><br>Teacher – Yes students these all are the preventive measures to avoid Enteritis.<br><br>Now we will learn more about the disease called as Diarrhea.<br><br>**8. Diarrhoea**:-<br><br>**Mode of infections**:-Spreads through food via houseflies and also through contaminated water or milk. Let's see the symptoms.<br><br>**Symptoms:** - 1. Dehydration due to loose motion.<br>2. Sunken eyes.<br>3. Dry mouth and lips.<br>4. Reduced urine formation.<br>5. Cold hands and feet.<br>6. Slow pulse rate. | Teacher explains the content with discussion.<br><br>Teacher explains the content with the help of slides. |

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| Teacher- Students, what should be the preventive measures?<br>Student1- Maintain cleanliness in cooking area.<br>Student2- Maintain personal cleanliness.<br>Student3- Prevent dust, flies from settling on food.<br>Teacher – Yes students. Also we should drink boiled and cooled water. Wash fruits and vegetables before use.<br>Teacher – Students we have learnt about many diseases, and in that we have seen that personal cleanliness can avoid many diseases. So tell me what must be done to maintain personal cleanliness?<br>Student 1- We should brush our teeth twice a day regularly.<br>Student 2- We should clean our hands, legs with soap after we come from outside, before having food and after toilet.<br>Student 3- We should take bath regularly with soap.<br>Student 4- we should cut our nails and hair on time.<br>Student 5-Avoid unhealthy, uncovered, stale and street food ,<br>Student 6- Should eat fresh food. Have balanced diet. And sufficient sound sleeps.<br>Teacher- Yes students. You all gave correct answer. Also we should drink filtered and boiled water. Learning healthy habits, maintain personal hygiene as well as keeping our surrounding clean. Taking proper medical treatment immediately if symptoms of disease are seen.<br>Students always remember that diseases are caused by micro-organisms and not by the anger of God or envy of others. They are cured with proper medical treatment, not with black magic or witchcraft.<br>Students now we will learn about Dehydration.<br>**9**. **<u>Dehydration</u>**:- | Student gives answers based on their observation and experience.<br>Teacher presents the labeled examples. |

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| The body becomes dry because of loss of water due to diarrhea. This is called dehydration. To make up for the loss of water due to loose motion or diarrhea, give the patient Oral Rehydration Solution (ORS) and start medical treatment at once.<br><br>In case of diarrhea, the absorptive function of the intestine is disturbed. However the sugar in the ORS can be absorbed in the body. Along with sugar salt and water are also absorbed. This gives temporary relief. If medical treatment is given immediately, the possible serious outcomes can be avoided.<br><br>**Preventive Measures**:-<br><br>Teacher - It is better to prevent diseases than to treat and cure diseases by medical treatment after they occur. Teacher - Students again I will give you some 'Yes' type example and some 'No' type example.<br><br>Yes- Prevent diseases.<br><br>Yes- Strengthens resistance to diseases.<br><br>No- Treatment for diseases.<br><br>No -Physiotherapy after surgery<br><br>Student – Yes type examples indicate that it is the treatment which should be given before the disease, as it prevents the disease, and it also increases the immunity.<br><br>Teacher –Right students, your guess is correct. Observe the next examples.<br><br>Yes- Given to early child<br><br>Yes – Useful to prevent Polio, Hepatitis-B<br><br>No- Treatment after disease.<br><br>No – Follow up after surgery. | Teacher explains the content with the help of slides<br><br>Teacher presents the labeled examples |

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| Student1- Teacher we see the advertisement of Amitabh Bachhan " Do Bund Zindagi Ke" Is it related with yes type example?<br><br>Student 2- Is it oral dose?<br><br>Teacher – Yes students you are talking about Polio dose. It is called as **Vaccination.** Diseases can be prevented by vaccination. Vaccinations are available for the prevention of several diseases. Vaccinating a person strengthens his or her resistance to disease. Thus vaccination is a preventive measure. Vaccinating people to prevent the danger in future or to prevent an epidemic is the responsibility of the Health Department. Nevertheless, each one of us must also co-operate with the health by taking care of ourselves.<br><br>The government implements special programs for the vaccination of children. Various types of vaccines such as the BCG, the triple vaccine (diphtheria, whooping cough, tetanus) Polio, Measles, double vaccine (diphtheria, tetanus) hepatitis-B are given to every child from time to time.<br><br>Students now we will learn about the disease AIDS.<br><br>10. **AIDS:-** AIDS is the acronym for Acquired Immuno Deficiency Syndrome .<br><br>(Teacher shows some slides and explains )<br><br>In 1986, it became clear that the virus of this disease discovered by **Dr. Monteniere** in Franc and also **Dr. Gallo** in America were same kind. It was named as the Human Immuno deficiency Virus or HIV. Infection by the HIV virus causes AIDS. When someone get AIDS, he/she lose his/her ability to fight disease. So, they attract diseases frequently. However, treatment can extend an AIDS affected person's life considerably. We must not shun people With AIDS. In fact, we should extend a helping hand to them. | Teacher explains the content with discussion.<br><br>Teacher explains the content with the help of slides |

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| • In 1986 the World Health Organization (WHO) started the worldwide AIDS control program.<br>• In 1987, the National AIDS Control Program was started in India.<br><br>Through WHO, excellent medicines are available in government hospitals free of cost. So in this way we have learnt some diseases in detail.<br><br>So students in this lesson we have learnt about the modes of infection, symptoms of diseases and preventive measures of the diseases. We should have some healthy habits to avoid diseases. Take proper care and treatment, have scientific attitude. Vaccination helps in preventing diseases. Be aware of these diseases. Now I will ask you some questions. Answer these questions.<br><br>Qu.1 Why should a person suffering from tuberculosis avoid going to public places?<br><br>Student- Tuberculosis spreads through the air. The germs enter the air through the spittle of the patient. So a person suffering from tuberculosis avoid going to public places.<br><br>Qu.2 Why the wound caused by a dog bite should be flushed clean with soap and water?<br><br>Student- for dog bite we should clean the wound by running water and be sure to clean and disinfect the wound thoroughly, because all animal bites can transmit bacteria This can cause disease. | Teacher explains the content with the help of slides |

- **Instructional Effect:**

1. Student understands the concept of Disease and types of diseases.
2. Student tells the causes and symptoms of diseases.
3. Student tells the preventive measures for disease.

- **Nurturant Effect:**

  **1.** Student will maintain personal hygiene.

  **2.** Student will maintain public hygiene.

  **3.** Student will create awareness about the diseases in family and in society.

  **4.** Student will follow the preventive measures.

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**Lesson plan – Concept Attainment Model**

**Subject – Science**

**Standard – 8th**

**Unit -Metals and Non Metals**

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**Objectives: -**

1. To teach the concept of metals and non-metals.
2. To teach physical and chemical properties of metals and non-metals.
3. To teach the concept of alloy.

**Concepts: - Metal, Non-metal and corrosion.**

| Teacher –Student interaction | Syntax of Model |
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| Teacher – Good morning Students, today we are going to learn a new chapter. Now I will give you some 'Yes' type examples and some 'No' type examples. All Yes type examples are having some similar characteristics. You have to find the similarities in Yes type examples.<br>Teacher gives some 'Yes' type and some 'No' type examples.<br>Yes – Gold<br>No – wood<br>Student1: Both the things are hard.<br>Teacher gives other examples.<br>Yes –Silver, Iron, Aluminium.<br>No – Plastic. Rubber<br>Student1: We can make vessels of Silver, Aluminium.<br>Teacher – Yes students, we can make vessels of these things because they can transfer heat.<br>Teacher adds some more examples<br>Yes – Copper<br>No – Sulpher ,Chalk, Coal | Phase -1<br>Teacher presents labeled examples<br>Students compare attributes in positive and |

Student1-Yes type examples are hard and cannot break easily whereas No type examples are brittle.

Yes- Platinum, Bronze.

No- Diamond, Graphite.

Student2- Platinum and Diamond both are hard and having luster, then why Diamond is different?

Teacher- Very good doubt student, Silver, Gold, Iron etc. they all can transfer heat and electricity from one place to another. This is the unique character of all Yes type examples. But No type examples do not show such characteristics so all the Yes type examples are called as METALS and No type examples are NON-METALS.

Substances like Copper, Aluminum and Silver have a shiny surface. They are hard. Coal and Sulphur do not shine and can be powdered easily.

Elements can be divided into two kinds – Metals and Non-Metals. Metals and Non-Metals have different properties.

Teacher:- students now can you differentiate between Metals and Non Metals

| | **Metals** | **Non -metals** |
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| Student1 | Metals have a luster. | Non-Metals do not have luster. |
| Student2 | Metals are Malleable. They can be beaten into thin sheets. | Non –Metals are brittle, they are not Malleable. |
| Student3 | Metals are Ductile; they can be drawn into wires. | Non-Metals are not Ductile. They cannot be drawn into thin wires. |
| Student4 | Metals are good conductors of heat and electricity. | Non-Metals are poor conductors of heat and electricity. |

negative examples

Students generate and test hypothesis.

**Phase-2**

Teacher confirms hypothesis, names and concepts and relates definitions according to essential attributes.

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| Student5 | At normal temperature metals are in the solid state. | At normal temperature Non-metals are in the liquid or gaseousstate. |

Teacher – Very good students. It means that the concept of Metals and Non-Metals are clear to you. Can you describe your thoughts and process of attaining the concept?

Student 1- When you gave the examples of Gold and Silver, I tried to relate it with jewelry.

Student 2- When you gave the examples of Iron, copper, Alluminium we related it with some utensils. These all are hard, shiny, and solids. And the No type examples like, coal, graphite, Sulpher are not hard, shiny and they are brittle.

Student3- I became confused when diamond was added in No type example as it is also hard, shiny and used in making of jewelry. But when teacher explained the property of conductivity of heat and electricity shown by all Yes type examples my doubt became cleared.

Student4- It means that all the Yes type examples were hard, shiny, and used in making jewelry as they can be converted into fine thread or a fine sheet. And most important character is that they all are good conductor of heat and electricity. No type examples were bad conductor of heat and electricity. All the explanation and examples made the concept of metal and non-metal very clear.

Teacher- Very good Students, now let's see some physical properties of Metals and Non- Metals.

- **Malleability**

Malleability is the ability of a solid to be formed into a thin sheet on beating.

Take an iron nail. Beat it with hammer and flatten it. If you continue to hammer it, it becomes a thin flat sheet. Malleability is a property of metals.

Try hammering a piece of coal. It does not flatten into a

Students differentiate according to the essential attributes.

Students describe thoughts.

Students discuss role of hypothesis and attributes.

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| sheet.<br>Teacher- Students can you give more examples of Malleability of metals?<br>Student1:- Silver or Gold plates.<br>Student2:- Iron pan used in kitchen<br>Teacher – Yes students.<br>Now let's see the next property called Ductility<br>▪ **Ductility**<br>Ductility is the property of metals. It is its ability of being drawn into a wire. Metals can be drawn into wires. Platinum, Gold is well known as highly ductile metals. 2.5 Km of Platinum wire is known to have been drawn from 1.27gm. of Platinum .Can we draw coal into a wire? Can we beat it into a sheet? Coal is nothing but a carbon. Carbon is a Non –Metal. Non-Metal are neither malleable nor ductile.<br>Teacher – Students can you add some examples of ductile elements?<br>Student 1:- Copper wires used in electric wires.<br>Student 2:- Gold in making of jewelry, Silver in making of jewelry.<br>Teacher- Yes students. In electricity copper wires are used. Why not Iron, Gold or Silver.<br>Students think but are unable to answer.<br>Teacher- Students copper is the best conductor of electricity having least resistance, it is available easily and quite reasonable. And it is good conductor of heat and electricity.<br>▪ **Conduction of heat and electricity.**<br>We use Metal utensils for cooking food, because Metals like Iron and Copper are good conductors of heat. Almost all Metals are good conductors of heat and electricity.<br>Teacher – Students Have you observed that electrical wiring in your house? It has copper wires but the switchboard on the wall is made up of wood or plastic. It is because Copper is a good | Teacher explains some other properties of metals.<br><br>Teacher explains the content in detail with examples. |

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| conductor and wood and plastic are bad conductor of electricity. Substance that allows heat and electricity to flow through them are called conductors of heat and conductors of electricity respectively.<br>Teacher- Students can you give some such examples?<br>Student 1:- Handles of pan, tavas, and pressure cooker are made up of plastic or wood. But these things are made up of metals.<br>Student2-:- Handles of pan, iron are made up of plastic.<br>Teacher- Yes student, very good observation.<br>Metals produce a ringing sound. Non –Metals do not produce a ringing sound. You must have observed the bell in schools and temples are made up of metals.<br>Now we will learn the **Chemical properties of Metals and Non-Metals**<br>▪ **Reaction with Oxygen.**<br>When metals react with Oxygen, their oxides are formed.<br>When Magnesium burns in air it combines with Oxygen and forms Magnesium Oxide. When Magnesium burns it produce a bright light.<br>$2\,Mg + O_2 \longrightarrow 2MgO$<br>Magnesium Oxygen Magnesium Oxide<br>Iron, left exposed in moist air, rusts. A reddish substance is formed on its surface. This is the chemical reaction of Iron with the Oxygen in the air.<br>**Try this**.<br>Take an Iron article that has rusted. Scrape off the rust. Add the rust to water in a test tube. Shake the test tube .Test the water in it with red and blue litmus paper. The red litmus paper turns blue. It means that, Oxides of Metals are alkaline in nature.<br>▪ **The action of acids on metals**<br>Take 4 test tubes and label them A,B,C,D. place a Magnesium ribbon in A, a thin sheet of Aluminum in B, Iron filings in C and a Copper wire in D. now using a dropper , add 5 ml of dilute | Teacher explains the content in detail with examples.<br><br>Teacher explains the content with chemical reaction. |

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| hydrochloric acid to each of the test tube. Observe the reactions carefully. If a reaction does not take place, heat the test tube slightly. Now take a burning match stick near the mouth of each of the test –tube. What do you see? You hear a little popping sound as you take the matchstick near each test-tube.<br>Hydrogen gas is released in the reaction of most of the Metals with an acid. As Hydrogen is inflammable, it burns with a pop sound when a burning matchstick is taken near the mouth of the test-tube.<br>**Test –tube A**<br>$Mg + 2HCl \longrightarrow MgCl_2 + H_2$<br>Magnesium Hydrochloric acid Magnesium chloride Hydrogen<br>**Test –tube B**<br>$2Al + 6HCl \longrightarrow 2AlCl_3 + 3H_2$<br>Aluminium Hydrochloric Acid Aluminium chloride Hydrogen<br>**Test –tube C**<br>**$Fe + 2HCl \longrightarrow FeCl_2 + H_2$**<br>Iron Hydrochloric Acid Ferrous chloride Hydrogen<br>**Test –tube D**<br>Copper does not react with hydrochloric acid at normal or high temperature. It dissolves in hot concentrated sulphuric acid and produces a solution of copper sulphate and sulpher dioxide gas.<br>$Cu + 2H_2SO_4 \longrightarrow CuSO_4 + SO_2 + 2H_2O$<br>Copper Sulphuric Acid Copper sulphate Sulpher dioxide water<br>**The action of bases on metals**<br>In a test-tube, take 5-10 ml of Sodium hydroxide solution. Drop a thin piece of Aluminium in it. Take a burning matchstick near the | Teacher explains the content with chemical reaction. |

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| mouth of the test tube. You will hear a popping sound. It tells you that the gas that burns was Hydrogen.<br>When bases react with metals, Hydrogen gas released.<br>Teacher- Students we have learnt about the reactions on Metal and Non-metals. Now we will learn the next point. Can you tell me the uses of metals?<br>Student1:- To make ornaments and coins of Gold, Silver, Tin etc.<br>Student2:- Mercury is used in thermometer.<br>Student3:- Copper wires are mainly used as conducting wires, and in electrical gadgets, radio, refrigerator, etc.<br>Student 4:-Iron and Aluminium sheets are used to make roofs of houses.<br>Student 5:- Many of cooking utensils are made up of metals.<br>Teacher –Yes students. Very good (teacher shows some metal objects.) Apart from this we use compounds of sodium such as common salt (sodium chloride), washing soda (sodium carbonate), baking soda (sodium bicarbonate) for various purposes in everyday life.<br>Teacher -Students now we will learn about the **uses of non-metals**……<br>1. Graphite is used as the core in pencils<br>2. Graphite is used as one of the electrode in an electro-chemical cell.<br>3. Silicon dioxide, the oxide of the metalloid silicon, is used in making glass and cement.<br>4. Silicon is used in the solar cell.<br>5. Red phosphorous is of great use for various purpose such as making safety matches, crackers, germicides, explosive, etc.<br>6. Sulphur is used for producing acid and also in some medicines and in gum-powder.<br>Teacher- students why are Gold, Platinum, Silver costly?<br>Students 1- They are not affected by environment.<br>Teacher- Yes student, metals like Platinum and Gold are found in | Teacher explains the content with appropriate examples.<br><br>Teacher explains the content with suitable examples. |

nature in the form of elements. They are not affected by air, water, acids, heat etc. Hence, they are called the **Noble metals**. They do not ordinarily take part in chemical reaction.

Teacher – Students now can you tell the uses of noble metals?

Student1- Gold is used for plating silver.

Student 2- Platinum is used in some medical instruments.

Student3- Gold and Platinum are mainly used for making ornaments.

Student4- Gold coins were used in olden times.

Teacher- Very good students. Why Gold coins are not used now days?

Teacher- In ancient times there were various currencies of different kings. But in our India we are having one currency, which is uniform all over the country. So we are not using Gold coins in transaction. We use rupees.

Students we are observing that the rates of gold are different. It depends on purity. It is measured in carats. Twenty – four carat gold is considered as 100% pure. The purity of gold determines its price. However, 24 carat pure gold is very soft. Ornaments of pure gold break or bent easily. So Copper or Silver is added to Gold in the necessary proportion. Ordinarily, twenty-two carat gold is used for making ornaments.

**Observe the percentage of gold in gold of different purities.**

| Carat | Percentage of gold |
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| 24 | 100 |
| 22 | 91.8 |
| 18 | 75 |
| 14 | 58.5 |
| 12 | 50 |
| 10 | 42 |

Teacher- Students again I will give you some 'Yes' type examples and some 'No' type examples to clear one more

Teacher explains the content with suitable examples

Teacher explains the content with the help of chart.

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| concept.<br>Yes - Copper gets some green or brown colored patches.<br>Yes- Silver articles turns black.<br>No- Glass vessel breaks down.<br>No- Algae accumulates inside the plastic bottle.<br>Student1- In Yes type example metal surface are getting affected.<br>Yes-Copper vessels remain wet, they develop yellowish green patches.<br>Yes- Iron articles slowly get covered with a reddish substance.<br>No- Wooden furniture becomes porous due to termites.<br>No- Rubber articles break down.<br>Students1- In No type example all are Non- metals.<br>Student 2- In 'Yes' type example there is effect of environment on metal.<br>Student- Yes teacher, we are having Lord Ganesha's statue of Silver, when it was new it was white, and now it turns blackish.<br>Teacher- Yes students. This is called as **<u>Corrosion.</u>**<br>In all the above examples, the gases present in air react with the metals Iron, Copper or Silver due to moisture, to produce compounds of the metals. This action that wears the metal is known as **Corrosion**.<br>Oxygen gas reacts with Iron, carbon dioxide gas, with Copper and hydrogen sulphide gas with silver.<br>To prevent the corrosion of metals, a layer of grease or oil is applied to them or they are coated with another metal that does not rust. Iron is galvanized (given a coat of zinc) to prevent rusting. Ships are coated with enamel paints to prevent the corrosion of metal sheet by the salty sea water. These paints contain metals like Zinc or Magnesium. This prevents contact between the metal surface and the surrounding air. Therefore, chemical reactions cannot take place and corrosion is prevented.<br>Teacher- so students did you understands the concept of corrosion? | Teacher explains the content.<br>Teacher presents labeled examples.<br>Teacher explains the content with the help of chart |

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| Students- Yes teacher<br>Teacher- Students, now we will learn the next topic which is called as Alloy.<br>**Alloy: - A homogenous mixture of two or more metals or of metals and non-metals is called as Alloy.**<br>Alloys contain metals in specific proportion. In the alloy physical properties change but chemical properties remains the same.<br>For example, when Copper and Tin are mixed we get alloy called Bronze, in the alloy, Copper loses its softness and the alloy becomes hard.<br>The alloy sheet is obtained from Iron and Carbon. It is a stronger material. Iron, Carbon and Chromium form the alloy called Stainless steel. It is more durable and clean. It does not rust. | Teacher explains the content with suitable examples |
| Teacher – Students in our day today life where do we use alloys?<br>Student1:- Most of the utensils in kitchen are made up of steel.<br>Student2:- Bronze is used for medals.($3^{rd}$ rank)<br>Teacher –Very good students. So students in this lesson we have studied about the following points.<br>• Concept of metals and Non-metals.<br>• Physical properties of metals and Non-metals.<br>• Difference between metals and Non-metals.<br>• Chemical properties of metals and Non-metals.<br>• Uses of metals and nonmetals. And<br>• Alloy.<br>Now I will ask you some questions, answer it.<br>Qu. 1. What are the characteristics of metals?<br>Student- Metals are ductile, malleable, having luster, Most of the metals are solid, and good conductor of heat and electricity.<br>Qu. 2 what are the characteristics of non-metals?<br>Student- Non Metals do not have luster, .They are brittle and are not malleable. At normal temperature it is in liquid or gaseous state, they are poor conductor of heat and electricity.<br>Qu. 3 what are alloys? Give examples. | Student compares attributes in positive and negative examples.<br><br>Teacher confirms definition according to essential attributes. |

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| A homogenous mixture of two or more metals or of metals and non-metals is called as Alloy. Examples are Bronze, stainless steel,<br>Qu. 4 what are the uses of Metals?<br>Making cooking utensils.<br>Used as Conducting electricity.<br>To make roofs of houses.<br>To make coins and ornaments.<br>Used in Thermometers.<br>Qu5. What are the uses of non -metals?<br>1. Graphite is used as the core in pencils<br>2. Graphite is used as one of the electrode in an electro-chemical cell.<br>3. Silicon dioxide, the oxide of the metalloid silicon, is used in making glass and cement.<br>4. Silicon is used in the solar cell.<br>5. Red phosphorous is of great use for various purposes such as making safety matches, crackers, germicides, explosive, etc.<br>6. Sulphur is used for producing acid and also in some medicines, gun-powder.<br>Teacher – Very good students. You answered very well. So today we have completed the lesson Metals and Non- Metals. In next period we will start a new lesson.<br>Thank you. | |

- **Instructional Effect:**

  **1.** Student understands the concept of Metal, Non-Metal and corrosion.

  **2.** Student differentiates between metals and non – metals.

- **Nurtarant Effect:**

  **1.** Student will find the examples of Metals and Non-Metal in daily life.

  **2.** Student's logical reasoning will increase in communication.

**Lesson plan - Concept Attainment Model**

**Subject science**

**Standard -8th**

**Unit –Air**

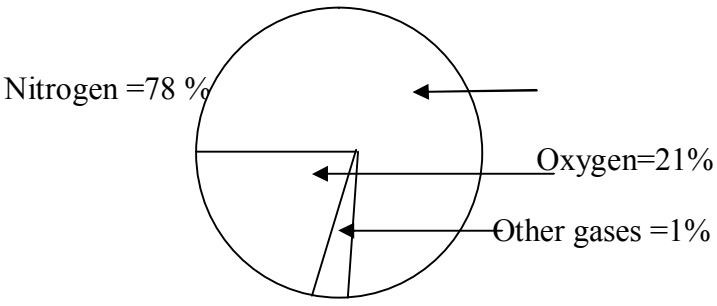
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**Objectives:**

1. To teach students the components of air.
2. To teach students the uses of different gases.
3. To teach students about air pollution, its causes, effects and remedies on it.
4. To teach students about acid rain.

**Concepts: - Air, Air Pollution and Acid Rain.**

| Student- Teacher Interaction | Syntax of the Model |
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| Teacher –Students, we have learnt about the basic needs of human beings. These basic needs are fulfilled by the natural resources.<br>Which are the natural resources?<br>Student1- water<br>Students2-soil.<br>Teacher –Students, which are the basic needs of human beings?<br>Student – food, shelter and clothes.<br>Teacher – Yes students, today we are going to start a new chapter. Which is also an integral part of our life? I will give you some 'Yes' type examples and some 'No' type examples. Yes type examples are having some similar characteristics; you have to find out those similarities, you can add your own examples too.<br>Yes- It is the natural resource. | Teacher present labeled examples.<br>Students compare attributes in |

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| No – Example is Soil.<br>Student- Soil is also natural resource.<br>Yes- It fulfills the basic need of all living organisms.<br>No-Example is water.<br>Student1- Water is an integral part of basic need, but it is not water.<br>Yes- It is present all around us. It is the environment. Some natural disasters also happen in the environment due to change in it.<br>No-Provide minerals and metals.<br>Student1- Can we live without that?<br>Teacher –No students, life on earth is impossible without it.<br>Student2- As it is the environment and integral part of life, then is it air?<br>Teacher- Yes student, your guess is perfect, it is the **AIR**<br>There is a thick envelope of air all around us. We call it as the atmosphere. Air contains Oxygen, Nitrogen, Carbon dioxide, water vapour and some inert gases.<br>  <br><br>About 100 years ago, The proportion of Carbon dioxide in air was about 0.29%, and today it is 0.035% what is the reason?<br>Student1-Because of industrialization.<br>Student2- Excess use of vehicles.<br>Student3 – Increase in dust. | positive and negative examples.<br>Students generate and test hypotheses.<br>Students generate examples.<br>Teacher confirms name and definition of concept according to essential attributes. |

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| Teacher –Yes Student, because of these things air gets polluted and the percentage of Carbon dioxide increased. Nitrogen, oxygen and other gases are the main constituents of air. We will learn one by one.<br><br>Oxygen: - Oxygen is found in air in free state. It is also present in water in the dissolved state. The survival of living things depends on water.<br><br>**Preparation of Oxygen:-**<br><br>To prepare Oxygen, take a mixture of potassium chlorate and manganese dioxide in the proportion5:1, in a test tube. Heat the test tube to 300 $^{0}$ C. You will see gas bubbles rising into the water filled gas jar inverted over the water. Fill 3-4 jars with the gas.<br><br>Oxygen takes the place of water in the gas jar. As Oxygen fills more and more of the space in the gas jar, the level of water in it keeps falling and we can come to know that the gas jar is full. Oxygen is slightly heavier than air. It is collected by the downward displacement of water.<br><br>$2KClO_3 \xrightarrow[(MnO_2)]{\text{Heat } 300^0C} 2KCl + 3O_2$<br><br>Potassium Chlorate — Potassium Chloride — Oxygen<br><br>Manganese dioxide does not actually take part in this reaction. It acts as a catalyst.<br><br>**Physical Properties** :-<br><br>1. Oxygen is a colorless, odorless, tasteless gas.<br>2. It dissolves sparingly in water<br><br>**Chemical Properties :-** | Teacher explains the content with chemical reaction. |

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| 1. Oxygen combines readily with other elements to produce their oxides.<br>2. Oxygen does not itself burn but supports burning.<br>(Teacher explains one activity for the property.) When the wood in the fire is burning low, blow on it with blower the fire glares up and begins to burn vigorously. This happens because oxygen helps burning. This property is used in blacksmith's bellows.<br>Teacher – But students why the candle snuff out when we blow air in the flame by our mouth.<br>Student – We exhale Carbon dioxide, which stops burning.<br>Teacher – Correct student. In fire Extinguisher cylinder Carbon dioxide gas is used.<br>**Uses of Oxygen:-**<br>Teacher – Students what are the uses of oxygen?<br>Student1- For Respiration<br>Student2- For Combustion<br>Teacher – Yes students, all animals need oxygen for Respiration. Do plants also need Oxygen?<br>Student – Yes, at night plants take Oxygen and give out Carbon dioxide.<br>Teacher- Yes, thus all living things need Oxygen for respiration. Oxygen is supplied artificially, if a person cannot breathe.<br>Students have you seen the mountaineers carrying Oxygen? Why do they carry it?<br>Student1 – Because as we go high and high the air becomes thin, it becomes difficult to breathe, so the mountaineers need additional supply of Oxygen so they carry the Oxygen cylinder with them.<br>Student – Oxygen is also used for the patients who are having | Teacher explains the content in detail. |

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| trouble in respiration.(Ventilation)<br><br>Teacher – Very good student. Also the flames of mixture Oxy hydrogen and Oxyacetylene are used for welding. Now we will learn the next constituent of air…<br><br>**Nitrogen :-**<br><br>Nitrogen it is the greatest portion of air. Nitrogen is an important constituent of protein. Hence, it is important for the growth of living things. However Nitrogen cannot be used directly from the air. Nitrogen fixation is necessary before it can be used. The conversion of atmospheric Nitrogen into compounds like Ammonia and Nitrates, which can be used by living things is called Nitrogen Fixation. This is brought about by both biological and atmospheric factors.<br><br>**Biological fixation** – Micro-organisms that bring about Nitrogen fixation are of two kinds. One of these types is found in the nodules on the roots of certain plants (teacher shows such plant roots having nodules and explains.) While the other types are found in the soil. The micro-organisms in the nodules absorb the nitrogen from the air and convert it into Nitrogen compound.<br><br>The micro-organisms in the soil convert atmospheric Nitrogen into ammonia, nitrous acid, and nitric acid and eventually into nitrates. (Teacher shows slide of biological fixations)<br><br>**Atmospheric Fixation**: -When there is lightning in the sky, atmospheric Nitrogen and Oxygen combine to form Nitric Oxide. This Nitric Oxide is oxidized again and Nitrogen dioxide is formed.<br><br>Nitrogen dioxide dissolves in rainwater and finally forms Nitric acid. This nitric acid falls to earth, dissolved in rainwater. There it reacts with salts in the soil to form nitrates .Plants use these nitrates for their own growth.<br><br>Thus Nitrogen in the air becomes available to living things after | Teacher explains the content by giving appropriate examples.<br><br>Teacher explains the content with the help of power point slides. |

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| biological and atmospheric fixation.<br><br>Through excretion and decay of living things as well as through burning, Nitrogen compounds get decomposed. Thus Nitrogen is released back into atmosphere. That is how the portion of Nitrogen in the atmosphere remains constant. Students do you understand Nitrogen Fixation now?<br><br>Students-Yes teacher.<br><br>Teacher – Students what are uses of Nitrogen?<br><br>Student1- It is useful for plants.<br><br>Student2- It is useful to produce fertilizers.<br><br>Student3- It is used to prepare ammonia and nitric acid.<br><br>Teacher- Yes students. Nitrogen is also used in industry on the large scale for the production of ammonia and nitric acid. It is also used for producing fertilizers. As we just discussed Nitrogen is useful for the growth of living things. Plants use nitrogen to produce Proteinaceous substances. Other living things use plants as food. This helps them to grow, too. Nitrogen is used to make thermometers for measuring very high temperature.<br><br>Teacher-Students now we will learn about another gas i.e.<br><br>**Carbon dioxide: -** Plants use carbon dioxide from the air during the process of Photosynthesis and release oxygen into air. This process takes place in the presence of sunlight.<br><br>Teacher –Students here again I would like to introduce one more concept by giving some 'Yes' type and some 'No' type examples. Find the similarities in 'Yes' type examples and try to get the concept.<br><br>Yes- Increases the extent of carbon di- oxide and carbon monoxide.<br><br>No- Increases the extent of moisture in air.<br><br>Yes- Caused due to smokes of factories, vehicles and burnings. | Student generates examples.<br><br>Teacher explains the content with the help of diagram on ppt.<br><br>Teacher present labeled examples. |

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| No- Caused due to excess use of fertilizer and pesticides.<br><br>Students- Teacher is it related with contamination of air?<br><br>Teacher- Yes students.<br><br>Student1- Teacher in last Diwali my mother suffered due to Asthma because of smoke of fire crackers.<br><br>Student2- Even my grandfather is suffering from respiratory disorder when we shifted in Pune from our village.<br><br>Teacher- Yes students, it causes High blood pressure and cancer also. It is harmful for plants and animals too. This increased proportion of harmful gases in the atmosphere is called as **Air Pollution**.<br><br>Students we have seen that the proportion of carbon dioxide is increasing causing air pollution. We have studied various causes of pollution. The rising proportion of Carbon dioxide increases the threat to Greenhouse Effect. Students this natural recourse is getting polluted now a days. What may be the causes of air pollution?<br><br>Student1- Excess use of vehicles<br><br>Student2– Due to burning of plastics and garbage<br><br>Student3- Due to industrialization<br><br>Teacher – Yes students. When chemical substances collect in any place beyond a certain level, their harmful effects can be seen. This is called **Pollution.** Pollution is being caused by effluents from factories. These include contaminated water, dust, soot, chemicals especially gases released in the atmosphere by burning of Carbon and Sulphur. Lead, Aluminium, Zinc, acid, bases etc. also causes pollution. The number of factories is on the rise. The waste chemicals given out by factories are in gaseous, liquid as well as in the solid state. They are let out into the atmosphere, water and soil. | Students compare attributes in positive and negative examples.<br><br>Students generate and test hypotheses.<br><br>Students generate examples.<br><br>Teacher confirms name and definition of concept according to essential attributes. |

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| Teacher – Students what are the ill effects of air pollution?<br><br>Student 1- Air pollution causes respiratory dieses<br><br>Student2- It leads to high blood pressure.<br><br>Student3- It also causes Psychological disorder.<br><br>Teacher –( Teacher shows slides and explains) Yes students, air pollution also leads to a higher incidence of respiratory disorder, cancer of intestine, disorder of the urinary bladder, high blood pressure, night blindness, etc. It also causes palpitation, breathlessness and psychological disorders, too.<br><br>It is now accepted that pollution affects animals and plants too. The life-span of animals decreases also their capacity for producing milk get decrease.<br><br>Air pollution also damages plants. There is a fall in photosynthesis production by plants also. Other effects, like untimely falling of leaves, absence of fruiting, etc. have also been seen on plants.<br><br>Students we have seen many ill effects of air pollution. Can you suggest some remedies to minimize the pollution?<br><br>Student 1- Avoid deforestation. Plant more and more trees.<br><br>Student2- Industries should be developed away from cities.<br><br>Student3- Motor vehicle should be serviced and maintain properly. Avoid excess use of vehicles, use public transports etc.<br><br>Teacher – Very good Students. Apart from these measures the government also taking a war footing steps to control it.<br><br>1. .A law has been enacted making bit mandatory to treat chemical waste before letting it out of factory.<br>2. Precaution should be taken to prevent the concentration of chemicals in any one place.<br>3. To prevent the harm causes by air pollution, industrial | Teacher explains the content by giving various examples.<br><br>Teacher shows ppt.<br><br>Teacher explains the content with new information. |

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| estates should be established away from cities and the height of their chimneys should also be increased.<br>4. Engines of motor vehicle should be serviced and maintained properly to prevent them from causing pollution.<br>5. Forests should be grown to help to reduce pollution of air<br>Teacher- Students have you heard the term Acid Rain?<br>Students – No teacher.<br>Teacher – Factories in big cities emits Nitrogen dioxide and Sulphur dioxide gases. As rain falls, these gases dissolve in it forming Nitrous oxide and Sulphurous acid. With the rainwater, these acids fall to the ground. This is called Acid rain. This can sometimes cause trees to die and fall. Acid rain also causes yellow patches on marble. (Teacher shows some images of acid rain.)<br>Teacher – Students have you heard the word Greenhouse Effect?<br>Student – No teacher.<br>Teacher- The warming of earth or global warming due to re-emission of sun's energy absorbed by the earth followed by its absorption by $CO_2$ molecule and $H_2O$ vapour present near the earth's surface and then its radiation back to earth is called **Greenhouse Effect**.<br>The phenomenon has been named greenhouse effect because it is similar to a greenhouse for plants in cold countries. A greenhouse is a place where plants are grown on the soil but there are walls and roof made of glass. The sun's energy can enter through the glass but cannot go out of it. The energy thus absorbed by the soil and the structure of green house. The energy thus absorbed is re-emitted back into the green house. The infrared radiation (heat) is re-emitted by earth and absorbed by carbon dioxide and water vapour in lower concentration. The heat | Teacher explains the content with suitable examples.<br>Teacher explains the content with new information. |

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| radiated back to earth by carbon dioxide and water vapours. Now a days the temperature of earth is increasing so more energy is emitted towards earth.<br><br>Students observations of weather are recorded every hour with the help of machines and are carried out in person once every day. An observatory records observations of atmospheric factors such as temperature, pressure, velocity of winds and humanity. It keeps a record of the changes occurring in them and forecasts the weather based on the changes observed.<br><br>Teacher - Students you must have seen the gas that gushes out of the bottle of an aerated drink when you open it. This gas is Carbon Dioxide. Why does it gush out like this?<br><br>Teacher - Carbon dioxide dissolves only sparingly in water. Hence, it has to be dissolved in water under pressure. When the cap of the bottle is pressed open, the pressure is released and the Carbon dioxide gas gushes out.<br><br>Teacher – Students have you heard the word dry ice?<br><br>Student – No teacher.<br><br>Teacher – If carbon dioxide is cooled to $-57^0$C, it freezes. In this form, it is called dry ice. Dry ice is used to bring down the temperature of a substance suddenly. It is also used for preserving foodstuff.<br><br>Teacher –Students have you seen the drops of water on the pot which is just taken out from fridge. You can do an activity at home. Take a clean glass. Dry its outer surface. Place some pieces of ice in the glass. You will soon see little droplets of water collecting on the outer surface of the glass. The water vapour is condenses and collects on the glass in the form of droplets.<br><br>Some deliquescent substance absorbs water vapour from the air. This too, tells of the presence of water vapour in the air. Clouds and fog are formed by the condensation of water vapour. | Teacher explains the content<br><br>Teacher explains the content with activity.<br><br>Teacher explains the content by showing image. |

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| Teacher – Students tell me which gases we have studied?<br>Student1 – Oxygen<br>Student 2- Nitrogen<br>Student 3-Carbon dioxide.<br>Teacher – Yes students, apart from this some inert gases are also present in the air. The inert gases Argon, Helium and Neon, are among the other constituent of air. It has many uses. Argon is used in electric bulbs; Helium is used to obtain very low temperature while Neon is used in the neon lights on hoardings that display advertisement.<br>Scientists of India Meteorological Department at Pune have developed a system which can accurately predict the arrival of the south-west monsoon. Research related to several different subjects such as atmospheric pressure, Antarctica, storms, cyclones, pollution in suburban area etc. is carried on there. (teacher shows the image)<br>So students we have learnt the chapter Air today. Teacher revises the main points of the lesson.<br>Students in this lesson we have learnt the following points.<br>• Oxygen<br>• Nitrogen<br>• Other gases<br>• Air pollution<br>• Acid rain.<br>• Observatory<br>Teacher- Students now I am going to ask you few questions based on this chapter.<br>Q. Name the constituents of air | Teacher revises the main points. |

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| Student- Nitrogen =78 %,Oxygen =21%,Other gases =1%<br><br>Q. What are the ill effects of pollution are seen?<br><br>Student- Air pollution causes respiratory dieses<br><br>- It leads to high blood pressure.<br><br>- It also causes psychological disorder.<br><br>- Air pollution also leads to a higher incidence of respiratory disorder, cancer of intestine, disorder of the urinary bladder, high blood pressure, night blindness, etc. It also causes palpitation, breathlessness and psychological disorders, too.<br><br>It is now accepted that pollution affects animals and plants too. The life-span of animal's decreases and their capacity for producing milk gets decrease.<br><br>Air pollution also harms plants. There is a fall in photosynthesis production by plants also. Other effects, like untimely falling of leaves, absence of fruiting, etc. have also been seen on plants.<br><br>Teacher- So students today we have learnt about air, its constituents ,air pollution, acid rain and also the function of observatory.<br><br>In next period we will start a new lesson. Thank you. | |

**Instructional effect:-**

1. Student understands the concept of air, the uses of all gases
2. Student understands the concept of air pollution, its effect, and acid rain.
3. Student understands the concept and use of observatory.

**Nurtarant effect:-**

1. Student will try to minimize the air pollution and will create awareness about it.
2. Student will collect more information about Greenhouse effect, acid rain etc.

**Lesson plan - Concept Attainment Model**

**Subject – Science**

**Standard – 8th**

**Unit – Soil**

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**Objectives:-**

1. To teach the different types of soil to the students.
2. To teach the uses of soil to the students.
3. To teach the constituents of soil to the students.
4. To teach the concept of soil Erosion and soil Pollution to the students.
5. To teach the concept of soil Erosion and soil Pollution to the students

**Concepts**- Soil, soil Erosion and Soil Pollution.

| Student –Teacher Interaction | Syntax of Model |
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| Teacher- Students, today we are going to learn a new chapter. I will give you some clues which are relevant to the concept. I will give you some 'Yes' type examples and some 'No' type examples. Some characters are similar in 'Yes' type examples. You have to find out the similarities, you can also generate your own examples.<br>Yes- It is natural resource.<br>Yes- It is essential for plants.<br>No- Examples are sunlight and air.<br>Student – Teacher, in Yes examples you say that it is natural resource and in No examples air and sunlight are included, but these both are natural resources. Sunlight and air are also essential for plants for the process of photosynthesis.<br>Teacher- Yes students, I will give you some more examples which will clear your doubts. | Teacher presents labeled examples.<br>Students compare |

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| Yes- Provides all the basic necessities.<br>No- Man made things.<br>Student- Do we all depend on it?<br>Teacher- Yes students, observe the next examples.<br>Yes- Provide minerals and metals.<br>Yes- Important factor of agriculture.<br>Student- Teacher, is it an integral part of food chain?<br>Teacher – Yes student.<br>Student1- Is it essential for growth of plant?<br>Teacher- Yes student.<br>Student- Is it available everywhere?<br>Teacher- Yes.<br>Student- If it is available all over, important for growth of plants, natural resource, then is it Soil?<br>Teacher –Yes student, your guess is correct. It is **Soil.** So today we are going to learn in detail about '**Soil**'.<br>Soil is made up of stones and pebbles, sand, fine soil particles as well as organic substances. The effect of various elements of nature is the cause of the wearing of rocks and formation of soil. This process of transformation of rocks into soil is called weathering. Rocks and boulders also break as a result of effect of rivers, rainwater, wind and continuous change in weather. Rocky surface develops cracks. Extreme heat and cold also causes cracks in rocks water that collect in these cracks freezes in the cold. Freezing water increases in volume and results in the breaking of rocks. (Teacher shows the slides of weathering and explains.)<br>Insects and microorganisms live, grow and die in the soil. | attributes in positive and negative examples.<br>Students generate and test hypotheses.<br>Students generate examples.<br>Teacher confirms name and definition of concept according to essential attributes. |

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| Plants also take roots, grow and die in this same soil.<br><br>Rodents like rats make burrow in the soil to live in them. This results in the conversion of rough earth into soil due to crumbling. Such biological process goes on in the ground continuously and adds to the effect of weathering.<br><br>Roots of plants growing into cracks in rocks also help the process of weathering. The soil that is formed by weathering mainly caused by roots of plants is clay.<br><br>**Constituents of Soil:-**<br><br>Soil has constituents of plants and animals. They are called organic constituents. The constituents of plant origin include bacteria, fungi, algae, blue –green algae, decomposed leaves, etc. The constituents of animal origin are protozoa, worms, insects, shells and the decomposed remains of dead animal.<br><br>(Teacher shows the relevant slides and explains in detail)<br><br>Teacher –Students have you seen earthworms?<br><br>Student –Yes teacher.<br><br>Teacher –Where can we find earthworms?<br><br>Student- In the farms.<br><br>Teacher –Do you know that earthworms are called as farmer's friend? Can you give the reason?<br><br>Student – It converts the bio waste into organic fertilizers. It ploughs the soil.<br><br>Student 2- It makes the soil soft, Which help the plant to grow faster.<br><br>Teacher –Students what will happen if there is no soil?<br><br>Student 1-Plants could not grow.<br><br>Student 2 –Animal life could not exist. | Teacher explains the content with the help of slides.<br><br>Teacher explains the content in detail and shows the slides. |

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| Student 3 –We cannot get any minerals, metals etc.<br>Student 4- Water could not be stored and collected in dams.<br>Student 5- Without soil life on earth will not be possible.<br>Teacher – Yes. Very good children. Soil becomes an integral factor in the life of human being. Plant grows on soil and soil provides food for animals and human beings. Plants provides us all the basic necessities i.e. Food, shelter and clothing. Various minerals and metals are also obtained from soil. Rainwater is also available because of soil. Thus without soil life on earth is not possible. Soil is a natural resource.<br>Now students tell me what are the uses of soil?<br>Student 1- For construction of walls of houses.<br>Student 2- For making bricks.<br>Student 3- For making articles like clay toys, lamps etc.<br>Student 4- For making some vessels of everyday use.<br>Teacher- Very good Students. Soil has the property of elasticity that can give desired shape so we can make various articles and vessels (teacher shows some slides of various uses of soil and explains). Soil is an integral part of agriculture. Soil also holds water, the rain water gets collected in deep places such as ponds and wells and this water becomes available to us all the year.<br>Teacher - Students have you seen various colors of soil?<br>Student –Yes teacher.<br>Teacher -Which different colored soil have you seen?<br>Student 1- Brown and Black colored.<br>Student 2-Red soil.<br>Student 3-Yellow or Copper colored soil.<br>Teacher – Yes students. There are different colors of soil. | Teacher explains the content in detail by giving more information. |

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| (teacher shows some slides of different colored soil.) Color is an important property of soil. We get an idea of fertility, drainage and other such properties of soil from its color. The color of soil depends upon its texture, organic content and chemical substances like iron, quicklime that it may contain.<br><br>Fine particles of quarts, feldspar, and mica, carbonates of metals oxides and sulphites of iron are present in soil along with organic matter.<br><br>China clay and loamy soil are the three types of soil used to make earthen pots and other articles. (teacher shows the images of different types of soil and explain its uses. ) The soil found near the Kaolin mountain is called Kaolin or china clay. It is white in color and used to make crockery, tiles for bathrooms, tanks, laboratory, apparatus etc.<br><br>Various kinds of oxides are used to decorate earth wares or porcelain article. Iron oxide is used to obtain red ochre and copper oxide to obtain the green color.<br><br>Clay and loamy soil are different types of Kaolin. As loamy soil is white in color it is used to make statues, idols, etc.<br><br>Soil particles are of different sizes. The proportion of the particle of the different sizes determines the texture of soil. The different types of soil, based on texture are<br><br>1. Sandy soil<br>2. Clayey soil and<br>3. Silt.<br><br>If the soil has greater portion of large particles or of sand, the soil is called as sandy sail. Clayey soil has the greatest portion of fine particles of soil while silt soil consists of fine to medium sized soil particles. Silt soil has medium capacity for holding water. While clayey soil has the greatest capacity for | Teacher explains the contain and shows the slides of soil colors. |

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| holding water. However soil which holds a lot of water is not well aerated. This arrests the growth of roots in the soil.<br><br>Teacher – Students now I am going to introduce one more concept related to soil by giving some Yes type and some No type examples. You have to guess the concept.<br><br>Yes- It means the change in surface by mechanical action.<br><br>No- Sedimentation of rocks.<br><br>Student1- In Sedimentation of rocks there is change in rock surface due to heat, cold ice and there is weathering of rocks. There is also change in surface by mechanical action. Then why it is in No type examples?<br><br>Teacher- You are right student, I will give you some other examples so that the concept will be clear to you.<br><br>Yes - Soil on ground is washed away due to rain water falling on it, by fast current of water flowing on it or by gusts of wind.<br><br>No- Examples are high tide and low tide.<br><br>Student1- Teacher, in high tide and in low tide the sand is washed out towards the sea. Then what is the difference between Yes and No type example.<br><br>Teacher- Students, in Yes type examples the fertile land is washed away and in high tide and low tide there the sand gets washed away.<br><br>Yes- The soil cover is reduced and the soil loses its fertility.<br><br>No- Example is volcanic eruption.<br><br>Student1- Due to volcanic eruption the fertility of the land increases but in Yes type example the soil loses the fertility.<br><br>Teacher- Yes student, you have linked it properly.<br><br>Students all these characteristics are found in the process called as <u>Erosion of Soil.</u> | Teacher explains the content in detail.<br><br>Teacher explains the content with discussion. |

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| **Erosion of Soil**: - Erosion means the change in surface by mechanical action. Soil on ground is eroted by rain water falling on it, by fast current of water flowing on it or by gusts of wind .This causes the thin layer of fertile soil on the surface to be carried away. The soil cover is reduced and the soil loses its fertility.<br><br>Teacher – What may be the causes of soil erosion?<br><br>Student 1- Flood<br><br>Student 2- Slope of soil<br><br>Student 3-Deforestration<br><br>Teacher –Yes students these are the main causes of soil erosion.<br><br>So to prevent soil erosion which activities Should we implement?<br><br>Student 1 –Should build the bunds.<br><br>Student 2- Avoid deforestation. Plant more trees, it will provide cover to the soil.<br><br>Student 3 –Arrange the soil horizontally. Minimize the slope.<br><br>Teacher – Very true students. To prevent erosion, soil must be kept covered, allow grass to grow. Crops grown on land and trees planted on it provide this cover.<br><br>Erosion also depends upon the slope and the type of soil. Soil can be reduced by arranging soil horizontally across the line of slope. The bunds also help to stop the soil erosion.<br><br>If soil erosion is arrested, soil is conserved, this is called soil conservation. The government department for soil conservation is located at district place.<br><br>**Social Forestry**:- Government schemes were started to plant trees in all possible places such as on the borders of fields, railway tracks, on the banks of streams and rivers etc. This is | Teacher explains the content with discussion.<br><br>Teacher explains the content in detail. |

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| called social forestry. This project was started in1976 for the first time.( teacher shows some slides of social forestry and explain.)<br><br>This project is meant to encourage small farmers and adivasies to plant trees. They are also given financial aid for this purpose. As a result fallow and barren land has been reclaimed for agriculture. The number of has risen and wood has become available in plenty.<br><br>The social forestry project of Maharashtra Government is carried out in most schools by teams called the 'Harit Sena' or the 'Green Brigade'<br><br>Teacher - Students have you heard about pollution?<br><br>Students – Yes teacher.<br><br>Teacher –What is meant by pollution?<br><br>Student 1- A disturbance in the natural balance of the various factors present is called as pollution.<br><br>Teacher –Which types of pollutions do you know?<br><br>Student 1- Water pollution.<br><br>Student 2-Sound pollution<br><br>Student 3-Air pollution<br><br>Teacher – Students now we will learn one such similar concept through Yes and No example.<br><br>Yes- Causes due to factory outlets.<br><br>No- Causes due to hard water.<br><br>Students- Teacher some time the soil loses its fertility due to water quality.<br><br>Teacher- Yes student.<br><br>Yes- It is also caused due to excess use of fertilizers and | Teacher explains the content by giving information.<br><br>Teacher explains the content by giving examples.<br><br>Teacher explains the content.<br><br>Teacher explains the content by discussion. |

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| pesticides.<br><br>Yes- It is caused due to acid rain.<br><br>No- It is caused due to deforestation.<br><br>No- It causes the Green House effect.<br><br>Stident1- It must be related to soil as fertilizers and pesticides are used there.<br><br>Student2- Even due to acid rain the soil gets saline.<br><br>Student3- Is it harmful for all mankind?<br><br>Teacher- Yes students.<br><br>Student – Teacher is it like air pollution, water pollution?<br><br>Teacher- Very good student, the concept is called as <u>Soil Pollution.</u><br><br>When chemical fertilizers are used in greater quantities than necessary, when chemicals are sprayed as pesticides the proportion of chemicals in the soil increases. Soil is also polluted by the water let out from factories and by other causes such as acid rain. Using too much water and chemicals makes the soil saline. This is called as soil pollution. Crops cannot grow in such soil. (teacher shows the slides of soil pollution and explain)<br><br>Students what can be done to prevent soil pollution?<br><br>Student 1 – To minimize the use of chemical fertilizer and pesticides. Instead of that should use organic fertilizers.<br><br>Student2- Water outlets from factory should be treated properly<br><br>Teacher – Yes. If we follow these steps, soil pollution can be minimized.<br><br>**Soil testing: -**Soil testing can tell us about the good quantities and shortcomings of the soil. A farmer grows a variety crops. Often, he does not get a good harvest. Farmers also face some problems. At such time he has to take into consideration factors | Teacher explains the content by revising it. |

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| such as color, texture, and content of organic matter in the soil. Soil testing helps to find out these things.<br>Teacher –So students today we have learnt about soil.<br>• Uses of soil<br>• Color of soil<br>• Texture of soil<br>• Constituents of soil<br>• Erosion of soil<br>• Soil pollution.<br>• Soil testing.<br>Teacher - Students I am showing some sample of soil. Identify the color of soil<br>Student1-Black soil<br>Student 2-Red copper color.<br>Teacher – Identify the type of soil.<br>Student1 –Sandy soil<br>Student2-Silt soil<br>Student3- Clayey soil.<br>Teacher- Very good students. Tomorrow we will learn the next chapter. Thank you. | |

- **Instructional effect**

1. Student understands the nature and concept of soil, soil erosion and soil pollution.
2. Student's inductive thinking ability gets increased.

- **Nurturant Effect:-**

1. Student will observe different types of soil in surroundings.

2. Student will understand the uses and importance of soil.
3. Student will try to minimize the soil pollution and will make people aware about it.

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**Evaluation sheet for lesson plan of Concept Attainment Model**

**Evaluation scheme**

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**Rating scale** – 1: Unsatisfactory, 2: Average, 3:- Satisfactory, 4: Good, 5: Excellent.

Name of the lesson:-

| No. | Criteria | 1 | 2 | 3 | 4 | 5 |
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| 1 | Selection of content for Concept Attainment Model | | | | | |
| 2 | All positive examples were having all the characters of the concept | | | | | |
| 3 | Quantity ( number) of examples were included | | | | | |
| 4 | Sequence of presentation of examples. | | | | | |
| 5 | Steps ( syntax) of the model | | | | | |
| 6 | Explanation of Essential attributes | | | | | |
| 7 | Scope for students to add their examples. | | | | | |
| 8 | Scope for students to generate and test the hypothesis. And describe their thinking strategies. | | | | | |
| 9 | Helpful in achieving instructional and Nurturant effects | | | | | |
| 10 | Overall effect | | | | | |
| | Total marks=50 | | | | | |

Qualitative Feedback

Suggestions for Improvement

Name and Signature of the Expert

**Lesson plan - Inductive Thinking Model**

**Subject: - Science**

**Standard: - 8th**

**Unit: - Disease**

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**Objectives: - Students will learn**

1. The types of various diseases.
2. The symptoms of various diseases.
3. The preventive measures of various diseases.

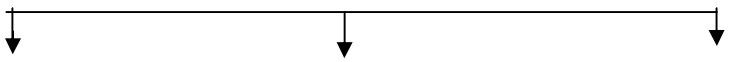
**Concepts-** Disease, Types of disease (Epidemic, Communicable and contagious) and Vaccination.

| Teacher-student Interaction. | Syntax of the Model |
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| Teacher- Good morning, students. Students today we are going to learn a new lesson named as Diseases. When a person gets a disease, his or her normal physical and mental condition and overall health are all disturbed.<br><br>There are micro-organisms around us. Some of them are useful but some of them can cause diseases. They can do us harm. They enter our body through food, water or air. If our resistance to disease is weak, we develop the symptoms of disease in other word we fall ill. The diseases are classified by considering different attributes.<br><br>I will give you some examples of diseases, you have to classify it and make some groups based on some similar characteristics. Teacher writes the name of diseases on black board. | Strategy one<br><br>Concept formation |

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| AIDS | Rabies | Cholera | Polio |
| Cancer, | brain tumor | Typhoid | Tuberculosis |
| Diabetes | Enteritis | Diarrhea | Chicken |

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| pox<br>( Students also add some examples of diseases, Teacher write the list on black board )<br>Teacher- Students can you classify these disease? You can do this activity in pairs. You can add one disease in more than one group. List the criteria on what basis you have classified it.<br>(Student groups the diseases by discussing with each other.)<br>Teacher- students can you tell me the groups and try to give the name to each group.<br>Student1- I have classified the diseases as curable and incurable, like AIDS, Polio, Cancers are incurable and Diarrhea is curable etc.<br>Student 2 – I have grouped as long time and short time diseases. As Typhoid and Chicken pox are short time and Diabetes, brain tumors Cancers are long time diseases.<br>Student3- Some diseases are caused due to virus, some are caused due to bacteria. Like Chicken pox is caused due to virus. Flue. Tuberculosis, Typhoid are the diseases caused due to bacteria.<br>Students 4- Even some are caused due to contaminated water or air also. e.g. Diarrhea, Malaria, Cholera, Dysentery, Diarrhea, Malaria, Polio, Typhoid etc.<br>Teacher –Good students, students can you group it in a different way?<br>Student 1 – Can we classify it on the basis of mode of spreading?<br>Student 2-Some diseases are spread due to change in weather or contamination of water.<br>Student 3- Many people get the same disease at a time.<br>Student 4- Yes, now a days many people are suffering from cough, Flue, Swine flu also. | Phase one<br>Enumeration and listing<br>Phase-2<br>Grouping<br>Phase -3<br>Labeling, Categorizing.<br>Strategy Two<br>Interpretation of Data |

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| Teacher—Yes student, there is a specific name to such type of diseases, all such type of diseases are called as **Epidemic disease**. These diseases are caused due to change in weather or water. The diseases like Cholera, Typhoid, Influenza (flu), Diarrhea and Conjunctivitis are some examples of Epidemic diseases.<br><br>(Teacher shows slides and explains.)<br><br>Student1- Teacher, when we come in contact with other diseased person we also get that disease.<br><br>Student 2- Yes teacher, when I was suffering from cough my mother told me to use handkerchief while coughing.<br><br>Teacher- Why did your mother tell to use handkerchief?<br><br>Student 2- So that the germs should not get mix with air and spread the disease.<br><br>Student3- Teacher, can diseases also get communicated?<br><br>Teacher- Yes students, constant sharing of space with a diseased person can result in the disease producing germs to enter in healthy person's body through the air. Such diseases are called as **Communicable Diseases**. Examples are Tuberculosis, Influenza etc. (Teacher shows slides and explains.)<br><br>Student1- Teacher, sometimes germs from the diseased person's body enter a healthy person's body through direct or close contact.<br><br>Teacher- Correct student, such diseases are called as **Contagious diseases.** Scabies, Eczema are some Contagious diseases.<br><br>Teacher- Students, now we have classified the different diseases into three types. We can represent it as… | Phase -4<br>Identifying Critical Relationship.<br><br>Phase-5<br>Exploring Relationships<br><br>Phase-6<br>Making Inferences. |

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| Diseases<br>  <br>Epidemic Disease Communicable Disease Contagious Disease<br>Diseases like those described above are caused by the micro-organisms, bacteria and viruses.<br>Teacher – The symptoms of diseases are not seen as soon as the germs enter a person's body. They appear after a certain period. The period between the entry of virus or bacteria and the appearance of symptoms are definite. It is called the **incubation period**. Each disease has a specific incubation period.<br>In this lesson we shall study the symptoms of various diseases and the measure of their prevention.<br>**1. Chickenpox –**<br>(Teacher shows some slides and explains)<br>**Mode of infection:** - A person gets Chickenpox when the disease producing virus enters the body with the air, that is breath in, or by contact with an infected person's clothes, utensils etc.<br>Main symptoms - 1. High fever<br>2. Headache<br>3. Small boils on the skin<br>4. They look like blisters scabs formed on them in a few days.<br>Teacher -Students we have learnt about the mode of infection; so now tell me which preventive measures we have to adapt?<br>Student1 – We should not use the clothes and utensils of infected persons.<br>Student 2- Should take proper medical treatment. | Strategy Three<br>Application of Principles<br>Phase -7<br>Predicting Consequences,<br>Phase -8 |

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| Teacher – Yes students. There is a vaccine available for chickenpox. A person does not generally get chickenpox a second time. The resistance acquired the first time is lifelong.<br><br>**2. Polio**:- (Teacher shows some slides and explains)<br><br>**Mode of Infection:** - The disease spreads through contaminated water, food or minute particles in the air.<br><br>Teacher – Students have you seen any person suffering from Polio?<br><br>Student1 – Yes teacher, they cannot walk properly.<br><br>Student2- They need some support to walk. Their legs seem to be very thin.<br><br>Teacher – Yes Students. Apart from this we will see the remaining symptoms in detail.<br><br>**Symptoms** :- 1.Fever<br><br>2. Throat becomes red.<br><br>3. Strain is felt in the muscles of the back and leg.<br><br>4. Weakness in the muscle of the arms or legs.<br><br>5. Growth of muscle is arrested.<br><br>6. Muscles become flaccid and cause disability.<br><br>Teacher – Students, What should be the preventive measure?<br><br>Student1 – To give polio drop, the advertisement is shown on TV.<br><br>Student 2- Should take proper treatment.<br><br>Teacher – Yes Students.<br><br>(Teacher shows some slides of polio vaccination and explains)<br><br>The National Department of Health is at present running a campaign to administer the polio vaccine to the maximum possible number of children less than five years of age on the | Explaining the predictions.<br><br>**Strategy Two**<br><br>**Interpretation of Data**<br><br>Phase -4<br>Identifying Critical Relationship.<br><br>Phase-5<br>Exploring Relationships |

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| same day, all over the country, every year.<br><br>This helps to strengthen the resistance of children of this age group to this disease. During this campaign every child in India under the age group of five is given two doses of this vaccine on two fixed days with an interval of 6 weeks between them. These two doses are booster doses and have to be taken in addition to the regular one.<br><br>This campaign is expected to eradicate Polio from our country. **Salk and Sabin** were the scientists who succeeded in producing the Polio vaccines using the Polio virus.<br><br>Teacher – Students, do you scare of dog, monkey or rabbit?<br><br>Student – Yes teacher, they bite.<br><br>Teacher – Yes students, you are right. Students now we will learn about **Rabies;** which is caused due to bite of such animals.<br><br>**3. Rabies –** The disease is caused by the bite of an affected dog, monkey, cat or rabbit.<br><br>(Teacher shows some slides and explains)<br><br>**Symptoms: -** 1. Severe headache.<br>2. Fever.<br>3. Throat muscles become rigid and contracted.<br>4. Patient cannot swallow liquids or even water.<br>5. Fear of water (hydrophobia).<br>6. Patient is delirious.<br>7. Patient's limbs become flaccid and go into a spasm.<br><br>**Preventive measures**: -<br><br>4. Clean the wound caused by bite by flushing with soap and plenty of water. | Phase-6<br>Making Inferences.<br><br>Strategy One<br>Concept Formation.<br><br>Strategy Two<br>Interpretation of Data<br><br>Phase -4<br>Identifying |

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| 5. Go to doctor at once and take the required doses of injections of the anti-rabies vaccine.<br>6. Give all pet animals in your house the anti-rabies vaccine.<br>**Remember**:-People start treatment for this disease when they have been bitten by a dog, cat, monkey etc. Sometimes, they do not take the prescribed number of injections due of fear or due to other reasons. Such incomplete inoculation may not prevent the disease.<br>Students have you seen some person suffering from cough for a long time. Even they cannot breathe properly. It means they might have the diseases called T.B. Let's learn about it in detail.<br>7. **Tuberculosis: - Robert Koch** was the scientist who discovered the bacteria which causes this disease.<br>**Mode of infection: -** The germs enter the air through the spittle of the patient. The disease spreads through the air.<br>**Symptoms: -** 1. Cough.<br>2. Low grade fever.<br>3. Blood in spittle.<br>4. Loss of weight.<br>5. Pain in the chest.<br>6. Difficulty in breathing.<br>Teacher- students as we have seen that Tuberculosis is caused by virus, It is also communicable disease. So can you tell me some preventive measures?<br>Student 1 - Taking proper medical treatment.<br>Student 2- keeping safe distance from infected person.<br>Student 3- Use handkerchief while sneezing and coughing.<br>Teacher- | Critical relationship<br>Phase-5<br>Exploring Relationship.<br>Strategy One<br>Concept Formation |

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| **Preventive measures**: -<br>1.Taking the B.C.G. vaccination.<br>2. Isolating the patient<br>At present Tuberculosis is considered to be a most easily communicable disease. In India, one T.B. patient dies every two minutes. The WHO (World Health Organization) runs a Tuberculosis eradicate campaign. DOT (Direct Observation and Treatment) centers have been set up for this purpose. Excellent medicines from the World Health Organization are available free of charge.<br>Student- Yes teacher, I have seen this advertisement on television.<br>Teacher- Students now we will learn about the next disease called Typhoid.<br>**5. Typhoid:-** (Teacher shows some slide and explains)<br>**Mode of infection**: -Through contaminated food, water and also through houseflies.<br>Teacher- Students can you identify the type of this disease?<br>Student1- It is Epidemic Disease as it is caused due to food, water etc.<br>Teacher- Yes students.<br>**Symptoms: -** 1. Fever that lasts for a definite period.<br>2. Rose colored rash on the chest.<br>3. Diarrhea.<br>4. Headache.<br>Teacher – Students I have told you about the mode of infection. Now tell me What should be preventive measures?<br>Student 1- Food should be kept covered at home. | Phase-4<br>Identifying Critical relationship.<br>Phase-6<br>Exploring relationship.<br>Phase-6<br>Exploring relationship. |

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| Student 2- Drink boiled water.<br><br>Student3- Avoid eating uncovered food specially when outside.<br><br>Teacher –Yes Students. Also taking typhoid vaccine, eating only clean, fresh food and maintaining public hygiene are some precautions to avoid typhoid.<br><br>**6. Cholera** (Teacher shows some slide and explains)<br><br>**Mode of infection: -**This disease spreads through water or food contaminated due to houseflies.<br><br>Student- Teacher is it also an Epidemic disease?<br><br>Teacher- Yes students.<br><br>**Symptoms: -** 1 Severe diarrhea and vomiting.<br><br>2. Dehydration.<br><br>3. Dry skin, Sunken eyes.<br><br>4. Stomachache.<br><br>5. Cramps in the legs.<br><br>Teacher – Students which precautions we should take to avoid Cholera?<br><br>Student 1- Controlling houseflies.<br><br>Student 2- Not eating food left uncovered.<br><br>Student 3-Drinking boiled water.<br><br>Teacher- Very good Students. Also we should maintain hygiene at public places and should take the cholera vaccine.<br><br>The Health Department has made it obligatory to take the cholera vaccine before going to places of pilgrimage or traveling abroad. Human beings themselves are carriers of the '**vibrio cholerae'** bacteria which causes this disease.<br><br>Now we will learn about the disease Enteritis<br><br>**7.Enteritis:- (**Teacher shows some slides and explain**)** | Strategy –Three<br><br>Application of Principle.<br><br>Phase-7<br><br>Explaining and verifying the Prediction. |

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| The inflammation of the inner lining of the intestine due to infection by bacteria, virus and worms or by chemical or other harmful substances is called Enteritis. 'Enter on' means 'intestines' and 'it is' –means 'inflammation'.<br>Teacher –Students, which would be the modes of infection?<br>Student1- Through contaminated water.<br>Student2- Through contaminated food.<br>Student3- Due to fast food.<br>Teacher- Exactly students!<br>**Symptoms: -** 1.Stomachache<br>2. Fever<br>3.Vomiting<br>4.Loss of appetite<br>5. Diarrhea or constipation.<br>6 .Loss of weight<br>Teacher – Students, tell me the preventive measures.<br>Student 1-Keep food clean.<br>Student 2-Maintain personal cleanliness.<br>Student 3 – Consume only safe food and water.<br>Teacher – Yes students, these all are the preventive measures to avoid Enteritis.<br>Now we will learn more about Diarrhea.<br>**8 Diarrhea:-**<br>Mode of infections: - Spreads through food via houseflies and also through contaminated water and milk.<br>Teacher- This is also Epidemic disease.<br>**Symptoms:-** 1**.** Dehydration due to loose motion. | Phase-5<br>Exploring relationship.<br>Phase-6<br>Making Inference.<br>Strategy –Three<br>Application of Principle. |

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| 2. Sunken eyes.<br>3. Dry mouth and lips.<br>4. Reduced urine formation.<br>5. Cold hands and feet.<br>6. Slow pulse rate.<br>Teacher- Students, what should be the preventive measures?<br>Student1- Maintain cleanliness in cooking area.( kitchen)<br>Student2- Maintain personal cleanliness.<br>Student3- Prevent dust, flies from settling on food.<br>Teacher – Yes students. Also we should drink boiled and cooled water. Wash fruits and vegetables before use.<br>Teacher – Students, we have learnt about many diseases, and in that we have seen that personal cleanliness can avoid many diseases. So tell me what must be done to maintain personal cleanliness?<br>Student 1- We should brush our teeth twice a day regularly.<br>Student 2- We should clean our hands, legs with soap after we come from outside, before having food and after toilet.<br>Student 3- We should take bath regularly with soap.<br>Student 4- We should cut our nails and hair on time.<br>Student 5-Avoid unhealthy, uncovered, stale and street food ,<br>Student6- Should eat fresh food. Have balanced diet and sufficient sound sleep.<br>Teacher- Yes students. You all gave correct answer. Also we should drink filtered and boiled water. Learning healthy habits, maintain personal hygiene as well as keeping our surrounding clean. Taking proper medical treatment immediately if symptoms of disease are seen. | Phase-7<br>Explaining and verifying the Prediction.<br>Phase-5<br>Exploring relationship.<br>Phase-6<br>Making Inference.<br>Phase-7<br>Predicting Consequences. |

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| Students always remember that diseases are caused by micro-organisms and not by the anger of God or envy of others. They are cured with proper medical treatment, not with black magic or witchcraft.<br>Students now we will learn about<br>**Dehydration:-**<br>The body becomes dry because of loss of water due to diarrhea. This is called dehydration. To make up for the loss of water due to loose motion or diarrhea, give the patient Oral Rehydration Solution (ORS) and start medical treatment at once.<br>In case of diarrhea, the absorptive function of the intestine is disturbed. However the sugar in the ORS can be absorbed in the body. Along with sugar salt and water are also absorbed. This gives temporary relief. If medical treatment is given immediately, the possible serious outcomes can be avoided.<br>**Preventive measures:** -It is better to prevent diseases than to treat and cure diseases by medical treatment after they occur. Diseases can be prevented by vaccination.<br>Vaccinations are available for the prevention of several diseases. Vaccinating a person strengthens his or her resistance to disease. Thus vaccination is a preventive measure. Vaccinating people to prevent the danger in future or to prevent an epidemic is the responsibility of the Health Department. Nevertheless, each one of us must also co-operate with the Health by talking care of ourselves.<br>The government implements special programs for the vaccination of children. Various types of vaccines such as the BCG, the triple vaccine (diphtheria, whooping cough, tetanus) Polio, Measles, double vaccine (diphtheria, tetanus) hepatitis-B are given to every child from time to time.<br>Students now we will learn about the disease AIDS. | Strategy-Three<br>Application of Principles.<br>Phase-8<br>Supporting Prediction.<br>Strategy-one<br>Concept Formation.<br>Concept Formation<br>Phase-9<br>Verifying the Prediction. |

**9.AIDS:-** AIDS is the acronym for **Acquired Immuno Deficiency Syndrome**

(Teacher shows some slides and explains.)

In 1986, it became clear that the virus of this disease discovered by **Dr. Monteniere** in Franc and **Dr. Gallo** in America were same kind. It was named as the Human Immuno – deficiency Virus or HIV. Infection by the HIV virus causes AIDS. When someone gets AIDS he/she loses his/her ability to fight disease. So, they attract diseases frequently. However, treatment can extend an AIDS affected person's life considerably.

We must not shun people With AIDS. In fact, we should extend a helping hand to them.

- In 1986 the World Health Organization (WHO) started the worldwide AIDS control program.
- In 1987, the National AIDS Control Program was started in India.

Through WHO, excellent medicines are available in government hospitals free of cost.

So students in this lesson we have learnt about the modes of infection, symptoms of diseases and preventive measures of the diseases. We should have some healthy habits. Take proper care and treatment, have scientific attitude. Vaccination helps in preventing diseases. Be aware of these diseases. Now I will ask you some questions. Answer these questions.

Qu.1 Why should a person suffering from tuberculosis avoid going to public places?

Student- Tuberculosis spreads through the air. The germs enter the air through the spittle of the patient. So a person suffering from tuberculosis should avoid going to public places.

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| Qu.2 Why the wound caused by a dog bite should be flushed clean with soap and water.<br><br>Student- For dog bite we should clean the wound by running water and be sure to clean and disinfect the wound thoroughly , because all animal bites can transmit bacteria<br><br>Good students, In next class we will start a new lesson. Thank you. | |

**Instructional effects:-**

1. Student understands the concept of Diseases and types of diseases.
2. Student understands about various diseases.
3. Student implements the knowledge about diseases.
4. Student uses the preventive measures for diseases.

**Nurturant effects: -**

1. Student will take care of his/her health.
2. Student will follow the preventive measures and vaccination.
3. Students will educate family members about disease.
4. Student will practice the healthy habits.
5. Student will follow the personal and public hygiene.

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**Lesson plan - Inductive Thinking Model**

**Subject- Science**

**Std-8th**

**Unit –Metals and Non-metals**

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**Objectives:- Students will learn….**

1. The concept of metals and non-metals
2. Physical and chemical properties of metals and non-metals and
3. The concept of alloy.

| **Teacher- Student Interaction.** | **Syntax of Model** |
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| Teacher - Good morning students. Students today we are going to learn a new chapter. I have brought some objects with me; I will show it to you and also will write its name on black board. You have to classify these objects based on some similar characteristics. You can include one object in more than one group also, but you have to give the reasons for the classification.<br>(Teacher shows the objects and also writes their names on black board.)<br>Duster, Chalk, Golden earrings<br>Books, Metal scale, wooden table<br>Copper wire, Diamond ring, plastic cup<br>Iron nail, Wooden scale, pan (Tava)<br>eraser, coins<br>Rubber tyres, Copper vessel, Aluminium can<br>Pencil, plastic plates<br>Spatula(Wooden and Steal) | Strategy-One<br>Concept Formation.<br>Phase-1<br>Enumeration and listing. |

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| Teacher- Students, now you can group these objects.<br><br>Student 1-Teacher, I have classified the things which are used in kitchen like- Spatula, pan(tava) ,copper Vessel, Aluminium can, Plastic plates , plastic cup etc.<br><br>Student 2- I have grouped the objects which are used in offices like Books, Wooden table, Pencils, Erasers.<br><br>Student 3- I have classified the objects which are used in classrooms like Duster, Chalk, Books, Metal Scale, Wooden Table, Iron nails(to attach maps), wooden Scale ,Eraser, pencils etc.<br><br>Teacher- Students, each object should get classified.<br><br>Student 4- I have grouped the ornaments like Golden rings, coin and diamond rings etc.<br><br>Teacher- Students, you all have classified the objects according to their uses; can you consider the material of these objects?<br><br>Student 1-Then duster, Wooden scale, Wooden cable, pencil will be in one group.<br><br>Student 2- Can I put copper vessel, Aluminium can, coins iron nails, golden ring in one group as they all are hard and shiny.<br><br>Teacher- Yes students, these all are hard; shiny also they show the property of ductility and malleability.<br><br>Malleability is the ability of a solid to be formed into a thin sheet on beating.<br><br>Take an iron nail. Beat it with hammer and flatten it. If you continue to hammer it, it becomes a thin flat sheet.<br><br>Ductility is the property of a material. It is its ability of being drawn into a wire. Platinum, Gold is well known as highly ductile metals.2.5 Km of platinum wire is known to have been drawn from 1.27g of platinum. .<br><br>Student 2- can I add Diamond ring to the above group as diamond is also hard, shiny and used in making jewelry? | Phase-2<br>Grouping.<br><br>Phase-3<br>Labeling and Categorizing<br>.<br><br>Strategy – Two<br>Interpretation of data |

Student 3- Can I add my steal tiffin box in the above group?

Teacher- Yes student, You can add steal box but you cannot add Diamond in the above group because steal, iron copper, gold platinum these all elements show one unique character i.e. They all are good conductor of heat and electricity. It means they transmit electricity and heat. So all those elements which are in solid state at normal room temperature (except mercury) , hard, shiny , malleable, ductile and good conductor of heat and electricity are called as **METAL**s and those elements which do not shows these properties are called as **NON-METALs.**

Phase -4

Identifying Critical Relationship

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Look at the table below .what do you notice?

| Substance/object | Luster | hardness | Elements |
|---|---|---|---|
| 1. Copper vessel | √ | √ | Copper |
| 2.Sulpher powder | × | × | Sulphur |
| 3.An aluminium can | √ | √ | Aluminiu |
| 4.Coal powder | × | × | Carbon |
| 5. A silver box. | √ | √ | Silver |

Phase-5

Exploring Relationship

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Teacher- Students, let's see some physical properties of Metals and Non- metals.

- **Malleability**

Malleability is the ability of a solid to be formed into a thin sheet on beating.

Take an iron nail. Beat it with hammer and flatten it. If you continue to hammer it, it becomes a thin flat sheet. Malleability is a property of metals.

Try hammering a piece of coal. It does not flatten into a sheet.

Teacher- Students can you give more examples of Malleability of

Phase-six

Making Inference.

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| metals?<br>Student1:- Silver or Gold plates.<br>Student2:- Iron pan used in kitchen.<br>Teacher – Yes students.<br>Now let's see the next property called Ductility<br>▪ **Ductility**<br>Ductility is the property of a material. It is its ability of being drawn into a wire. Metals can be drawn into wires. Platinum, Gold is well known as highly ductile metals.2.5 Km of Platinum wire is known to have been drawn from 1.27g of platinum. Can we draw coal into a wire? Can we beat it into a sheet? Coal is nothing but a carbon. Carbon is a non –metal. Non-metal are neither malleable nor ductile.<br>Teacher – Students can you add some examples of ductile elements?<br>Student 1:- Copper wires used in electric wires.<br>Student2:- Golden jewelry, silver jewelry<br>Teacher- Yes students. In electricity copper wires are used. Why not Iron, Gold or Silver.<br>Students think but are unable to answer.<br>Teacher- Students, copper is the best conductor of electricity having least resistance, it is available easily and quite reasonable in cost.<br>▪ **Conduction of heat and electricity.**<br>Teacher- We use metal utensils for cooking food, because metals like iron and copper are good conductors of heat. Almost all metals are good conductors of heat and electricity.<br>Have you observed the electrical wiring in your house? It has copper wires but the switchboard on the wall is made up of wood or plastic. It is because Copper is a good conductor and wood and plastic are bad conductor of electricity. Substance that allows heat and electricity to flow through them are called conductors of heat and | Strategy – Three<br>Phase -7<br>Predicting Consequences.<br>Phase-8 verifying the prediction |

conductors of electricity respectively.

Teacher- Students can you give some such examples?

Student 1:- Handles of tavas, and pressure cooker are made up of plastic or wood. But these things are made up of metals.

Student2-:- Handles of pan, iron are made up of plastic.

Teacher- Yes students, very good observation.

Metals produce a ringing sound. Non –metals do not produce a ringing sound. You must have observed the bell in schools and temples are made up of metals.

Application of Principle.

Teacher:- students now can you differentiate between Metals and Non Metals

| | Metals | Non -metals |
|---|---|---|
| Student1 | Metals have a luster. | Nonmetals do not have luster. |
| Student2 | Metals are malleable. They can be beaten into thin sheets. | Non –metals are brittle, they are not malleable. |
| Student3 | Metals are ductile; they can be drawn into wires. | Non metals are not ductile. They cannot be drawn into thin wires. |
| Student4 | Metals are good conductors of heat and electricity. | Non-Metals are poor conductors of heat and electricity. |
| Student5 | At normal temperature metals are in the solid state. | At normal temperature Non- metals are in the solid (e.g. coal) or in gaseous state.(Oxygen) |

Phase- 8

Explaining Hypothesis.

Teacher: - Very good students. You have considered almost all

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| characteristics. Mercury is also a metal though it is in liquid state, it shows the unique feature of metal i.e. conduction of heat. Because of this feature it is used in thermometer.<br><br>Now we will learn the **Chemical properties of Metals and Non-metals**<br><br>▪ **Reaction with Oxygen.**<br><br>When metals react with Oxygen, their oxides are formed.<br><br>When Magnesium burns in air it combines with Oxygen and forms Magnesium oxide. When magnesium burns it produces a bright light.<br><br>$2\,Mg + O_2 \longrightarrow 2MgO$<br><br>Magnesium Oxygen Magnesium oxide<br><br>Iron, left exposed in moist air, it gets rust. A reddish substance is formed on its surface. This is the chemical reaction of iron with the oxygen in the air.<br><br>**Try this**.<br><br>Take an iron article that has rusted. Scrape off the rust. Add the rust to water in a test tube. Shake the test tube .Test the water in it with red and blue litmus paper. The red litmus paper turns blue. It means that, oxides of metals are alkaline in nature.<br><br>▪ **The action of acids on Metals**<br><br>Take 4 test tubes and label them A,B,C,D. place a Magnesium ribbon in A ,a thin sheet of Aluminum in B, Iron filings in C and a Copper wire in D. now using a dropper , add 5 ml of dilute hydrochloric acid to each of the test tube. Observe the reactions carefully. If a reaction does not take place, heat the test tube slightly. Now take a burning match stick near the mouth of each of the test-tube. What do you see? You hear a little popping sound as you take the matchstick near each test-tube.<br><br>Hydrogen gas is released in the reaction of most of the metals with an acid. As hydrogen is inflammable, it burns with a pop when a | Strategy-3<br><br>Application of Principle<br><br>Phase- Eight<br><br>Explaining Hypothesis. |

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| burning matchstick is taken near the mouth of the test-tube.<br>**Test –tube A**<br>$Mg + 2HCl \longrightarrow MgCl_2 + H_2$<br>Magnesium Hydrochloric acid Magnesium chloride Hydrogen<br>**Test –tube B**<br>$2Al + 6HCl \longrightarrow 2AlCl_3 + 3H_2$<br>Aluminium Hydrochloric Acid Aluminium chloride Hydrogen<br>**Test –tube C**<br>**$Fe + 2HCl \longrightarrow FeCl_2 + H_2$**<br>Iron Hydrochloric Acid Ferrous chloride Hydrogen<br>**Test –tube D :**<br>Copper does not react with hydrochloric acid at normal or high temperature. It dissolves in hot concentrated sulphuric acid and produces a solution of copper sulphate and sulpher dioxide gas.<br>$Cu + 2H_2SO_4 \longrightarrow CuSO_4 + SO_2 + 2H_2O$<br>Copper sulphuric acid copper sulphate sulpher dioxide water<br>**The action of bases on metals**<br>In a test-tube, take 5-10 ml of sodium hydroxide solution. Drop a thin piece of Aluminium in it. Take a burning matchstick near the mouth of the test tube. You will hear a popping sound. It tells you that the gas that burns was Hydrogen.<br>When bases react with metals, hydrogen gas is released.<br>Teacher- Students, we have learnt about the reactions on metal and | Phase- 5<br>Exploring Relationships<br><br>Phase -4<br>Identifying Critical Relationship. |

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| non-metals. Now we will learn the next point. Can you tell me the uses of metals?<br>Student 1:- To make ornaments and coins of Gold, silver, tin etc.<br>Student 2:- Mercury is used in thermometer.<br>Student 3:- Copper wires are mainly used as conducting wires, and in electrical gadgets, radio, refrigerator, etc.<br>Student 4:-Iron and Aluminium sheets are used to make roofs of houses.<br>Student 5:- Many of cooking utensils are made up of metals.<br>Teacher –Yes students. Very good (teacher shows some metal objects.) Apart from this we use compounds of sodium such as common salt (sodium chloride), washing soda (sodium carbonate), baking soda (sodium bicarbonate) for various purposes in everyday life.<br>Teacher –Students, now we will learn about the **uses of non-metals**……<br>1. Graphite is used as the core in pencils<br>2. Graphite is used as one of the electrode in an electro-chemical cell.<br>3. Silicon dioxide, the oxide of the metalloid silicon, is used in making glass and cement.<br>4. Silicon is used in the solar cell.<br>5. Red phosphorous is of great use for various purpose such as making safety matches, crackers, germicides, explosive, etc.<br>6. Sulphur is used for producing acid and also in some medicines, gum-powder.<br>Teacher- Students why do Gold, Platinum and Silver are costly?<br>Students 1- They are not affected by environment<br>Teacher- Yes students, metals like Platinum and Gold are found in | Application of Principles.<br>Application of Principles.<br>Phase -8<br>Supporting the predictions. |

nature in the form of elements. They are not affected by air, water, acids, heat etc. Hence, they are called the **noble metals**. They do not ordinarily take part in chemical reaction.

Teacher – Students, now can you tell me the uses of noble metals?

Student1- Gold is used for plating silver.

Student 2- Platinum is used in some medical instruments.

Student3- Gold and Platinum are mainly used for making ornaments.

Student4- Gold coins were used in olden times.

Teacher- Very good students. Why Gold coins are not used now days?

Teacher- In ancient times there were various currencies of different kings. But in our India we are having one currency, which is uniform all over the country. So we are not using Gold coins in transaction; we use rupees.

Students we are observing that the rates of gold are different. It depends on purity. It is measured in carats. Twenty –four carat gold is considered as 100% pure. The purity of gold determines its price. However, 24 carat pure gold is very soft. Ornaments of pure gold break or bent easily. So copper or silver is added to gold in the necessary proportion. Ordinarily, twenty-two carat gold is used for making ornaments.

**Observe the percentage of gold in gold of different purities.**

| Carat | Percentage of gold |
|---|---|
| 24 | 100 |
| 22 | 91.8 |
| 18 | 75 |
| 14 | 58.5 |
| 12 | 50 |
| 10 | 42 |

Application of Principles.

Phase-6

Making Inference

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| Teacher- Students you must have seen that your mother uses lemon or Pitambari to clean the copper utensils. Why do she is apply these things?<br><br>Student1- Because copper gets some green or brown colored patches.<br><br>Teacher – Yes students. Also have you observed that silver article turns black?<br><br>Student- Yes teacher, we are having Lord Ganesha's statue of silver, when it was new it was white, and now it has turned blackish.<br><br>Teacher- Yes students, even Iron articles slowly get covered with a reddish substance, if Copper vessels remain wet, they develop yellowish green patches. Silver articles also turn black. This is called as corrosion.<br><br>In the above example, the gases present in air react with the like Iron, Copper or Silver due to moisture, to produce compounds of the metals. This action that wears the metal is known as **Corrosion**.<br><br>Oxygen gas reacts with Iron, carbon dioxide gas- with Copper and hydrogen sulphide gas with silver.<br><br>To prevent the corrosion of metals, a layer of grease or oil is applied to them or they are coated with another metal that does not rust. Iron is galvanized (given a coat of zinc) to prevent rusting. Ships are coated with enamel paints to prevent the corrosion of metal sheet by the salty sea water. These paints contain metals like zinc or magnesium. This prevents contact between the metal surface and the surrounding air. Therefore, chemical reactions cannot take place and corrosion is prevented.<br><br>**Alloy: - A homogenous mixture of two or more metals or of metals and non-metals is called as Alloy.**<br><br>Alloys contain metals in specific proportion. In the alloy physical properties change but chemical properties remain the same.<br><br>For example, when Copper and Tin are mixed we get alloy called | Strategy – One<br><br>Concept Formation.<br><br>Phase -two- Grouping and Labeling. |

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| Bronze, in the alloy, Copper loses its softness and the alloy becomes hard.<br><br>The alloy sheet is obtained from Iron and Carbon. It is a stronger material. Iron, Carbon and Chromium form the alloy called stainless steel. It is more durable and clean. It does not rust.<br><br>Teacher – Students in our day- to -day life where do we use alloys?<br><br>Student 1:- Most of the utensils in kitchen are made up of steel.<br><br>Student 2:- Bronze is used for medals.($3^{rd}$ rank)<br><br>Teacher –Very good students. Students in this lesson we have studied about the following points.<br>• Concept of metals and Non-metals.<br>• Physical properties of metals and Non-metals.<br>• Difference between metals and Non-metals.<br>• Chemical properties of metals and Non-metals.<br>• Uses of metals and nonmetals.<br>• Alloy.<br><br>Now I am asking you some questions, answer them.<br><br>Qu. 1. What are the characteristics of metals?<br><br>Student- Metals are ductile, malleable, having luster, Most of the metals are solid and good conductor of heat and electricity.<br><br>Qu. 2 What are the characteristics of Non-metals?<br><br>Student- Non Metals do not have luster .They are brittle and are not malleable. At normal temperature they are in liquid or gaseous state, they are poor conductor of heat and electricity.<br><br>Qu. 3 What are alloys? Give examples.<br><br>Student- A homogenous mixture of two or more metals or of metals and non-metals is called as Alloy. Examples are Bronze, Stainless steel. | Application of Principles. |

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| Qu. 4 What are the uses of Metals?<br>Student- For making cooking utensils.<br>Used as Conducting electricity.<br>To make roofs of houses.<br>To make coins and ornaments.<br>Used in Thermometers.(mercury) etc.<br>Qu.5. What are the uses of non -metals?<br>1. Graphite is used as the core in pencils.<br>2. Graphite is used as one electrode in an electro-chemical cell.<br>3. Silicon dioxide, the oxide of the metalloid silicon, is used in making glass and cement.<br>4. Silicon is used in the solar cell.<br>5. Red phosphorous is of great use for various purpose such as making safety matches, crackers, germicides, explosive, etc.<br>6. Sulphur is used for producing acid and also in some medicines, gum-powder.<br>Teacher – Very good students. You answered very well. So today we have learnt the lesson Metals and Non- metals. In next period we will start a new lesson.<br>Thank you. | |

- **Instructional Effect:**

  **1.** Student form the concepts according to characteristics.

  **2.** Student differentiates between Metals and Non- metals.

  **3.** Student understands the uses of Metals and Non-metals

  **4.** Student forms the concept of Alloy.

- **Nurturant Effect:**

  **1.** Logical thinking of students will increase.

  **2.** Student will apply knowledge in real life.

  **3.** Student will be sensitive to language.

  **4.** Increase in higher order thinking like Grouping, Categorizing, Analysis and Synthesis etc.

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**Lesson plan - Inductive Thinking Model**

**Subject - Science**

**Standard -8th**

**Unit –Air**

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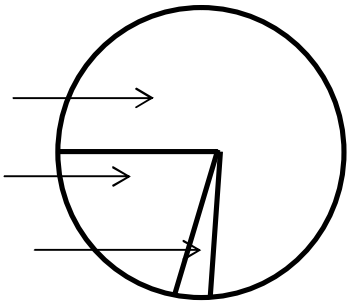
**Objectives:**

1. To teach students the components of air.
2. To teach students the uses of different gases.
3. To teach students about air pollution its causes, effects and remedies on it.
4. To teach students about acid rain.

**Concepts: - Air and air pollution.**

| Student- Teacher interaction | Syntax of the model |
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| Teacher –Students we have learnt about the basic needs of human beings. These basic needs are fulfilled by the natural resources.<br>Which are the natural resources?<br>Student 1- water<br>Student 2-Soil.<br>Student 3- Sunlight.<br>Teacher -Students which are the basic needs of human beings?<br>Student – Food, shelter and clothes.<br>Teacher – Yes students, apart from these breathing is the process which starts with our birth and ends with our death, so breathing is the fundamental process of all living things. Today we are going to start a new chapter. I will give you some examples you have to observe those examples, categorize it on the basis of similarities. | Strategy-One<br>Concept Formation. |

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| It is the natural resource.<br>It fulfills the basic need of all living organisms.<br>It is present all around us. It is the environment. Some natural disasters also happen in the environment due to change in it.<br>Life on earth is impossible without it.<br>It is the mixture of gases.<br>It is an essential part of photosynthesis.<br>It is a part of water cycle.<br>It is an integral part of agriculture.<br>Life on other planet is impossible because of absence of this. | Phase-One<br>Enumeration and listing. |
| Student1- I have grouped the following examples together-It is the natural resource, it is a part of water cycle, it is an integral part of agriculture, life on other planet is impossible because of absence of this. It fulfills the basic need of all living organisms. It is an essential part of photosynthesis etc. We can find all these characteristics in the natural resource called water. | Phase-2<br>Grouping |
| Student2- I have grouped the examples.-It is the natural resource; It is present all around us. It is the environment. Life on earth is impossible without it. It is an essential part of photosynthesis. It is a part of water cycle. It is an integral part of agriculture.<br>Life on other planet is impossible because of absence of this. I have grouped all these characteristics and given the name as Soil. Soil shows all these characteristics. | Phase-3<br>Labeling and Categorizing. |
| Student 3- It is the natural resource .It fulfills the basic need of all living organisms. It is present all around us. It is the environment. Some natural disasters also happen in the environment due to change in it. Life on earth is impossible without it. It is the mixture of gases. It is an essential part of photosynthesis. Life on other planet is impossible because of absence of this. I have grouped all these characteristics in one group. Can I give the name gases to it? | |

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| Teacher – Student you have grouped it properly it is a mixture of gases. It is called as **AIR.** Air is present all around us. It is the mixture of many gases. It is essential for all living things for breathing. All animals inhale Oxygen and exhale Carbon-dioxide. Plants inhale carbon dioxide and exhale Oxygen, at night Plants inhale Oxygen and exhale Carbon dioxide. There is a thick envelope of air all around us. We call it as the atmosphere. Air contains Oxygen, Nitrogen, Carbon dioxide, water vapour and some inert gases.<br><br>Nitrogen =78 %<br>Oxygen =21%<br>Other gases =1%<br>  <br><br>About 100 years ago, The proportion of carbon dioxide in air was about 0.29%, and today it is 0.035% what is the reason?<br><br>Student 1-Because of industrialization.<br><br>Student 2- Excess use of vehicles.<br><br>Student 3 – Increase in dust.<br><br>Teacher –Yes Students, because of these things air gets polluted and the percentage of carbon dioxide increased. Nitrogen, Oxygen and other gases are the main constituents of air. We will learn one by one in detail.<br><br>**Oxygen:** - Oxygen is found in air in free state. It is also present in water in the dissolved state. The survival of living things depends on water. Now we will see how Oxygen is prepared in laboratory.<br><br>**Preparation of Oxygen:-**<br><br>To prepare Oxygen, take a mixture of Potassium chlorate and Manganese dioxide in the proportion 5:1, in a test tube. Heat the test tube to $300^0$ C. You will see gas bubbles rising into the water | Strategy-Two<br><br>Phase-4<br><br>Identifying Critical relationship.<br><br>Phase-5<br><br>Exploring Relationship.<br><br>Phase-6<br><br>Making Inferences.<br><br>Phase-4<br><br>Identifying Critical relationship. |

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| filled gas jar inverted over the water. Fill 3-4 jars with the gas.<br><br>Oxygen takes the place of water in the gas jar. As oxygen fills more and more of the space in the gas jar, the level of water in it keeps falling and we can come to know that the gas jar is full. Oxygen is slightly heavier than air. It is collected by the downward displacement of water.<br><br>Heat $300^0C$<br>$2KClO_3 \longrightarrow 2KCl + 3O_2$<br>$(MnO_2)$<br>Potassium Chlorate → Potassium Chlorate + Oxygen<br><br>Manganese dioxide does not actually take part in this reaction. It acts as a catalyst.<br><br>Now we will learn the properties of Oxygen.<br><br>**Physical Properties** :-<br><br>1.Oxygen is a colorless, odorless, tasteless gas.<br><br>2.It dissolves sparingly in water.<br><br>**Chemical properties :-**<br><br>1. Oxygen combines readily with other elements to produce their oxides.<br><br>2 Oxygen does not itself burn but supports burning.<br><br>(Teacher explains one activity for the property.) When the wood in the fire is burning low, blow on it with blower the fire glares up and begins to burn vigorously. This happens because oxygen helps burning. This property is used in blacksmith's bellows.<br><br>Teacher – But students why the candle snuff out when we blow air in the flame by our mouth.<br><br>Student – We exhale Carbon dioxide, which stops burning. | Phase-4<br>Identifying Critical relationship.<br><br>Phase-5<br>Exploring Relationship. |

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| Teacher – Correct student. In fire Extinguisher cylinder Carbon dioxide gas is used. Students now we will learn its uses.<br>**Uses of Oxygen: -**<br>Teacher – Students what are the uses of Oxygen?<br>Student1- For respiration<br>Student2- For combustion<br>Teacher – Yes students, all animals need Oxygen for respiration. Do plants also need oxygen?<br>Student – Yes, at night plants take Oxygen and gives out Carbon dioxide.<br>Teacher- Yes, thus all living things need Oxygen for respiration. Oxygen is supplied artificially, if a person cannot breathe properly.<br>Students have you seen the mountaineers carrying oxygen cylinder? Why do they carry it?<br>Student 1 – Because as we go high and high the air becomes thin, it becomes difficult to breathe, so the mountaineers get additional supply of oxygen through gas cylinder.<br>Student 2 – Oxygen is used for the patients who are having trouble in respiration.(Ventilation)<br>Teacher – Very good student. Also the flames of mixture Oxy hydrogen and Oxyacetylene are used for welding. Now let's learn about the next gas.<br>**Nitrogen :-**<br>Teacher – The next constituent of air is Nitrogen. It is the greatest portion of air. Nitrogen is an important constituent of protein. Hence, it is important for the growth of living things. However Nitrogen cannot be used directly from the air. Nitrogen fixation is necessary before it can be used. The conversion of atmospheric nitrogen into compounds like Ammonia and Nitrates which can be used by living things is called Nitrogen Fixation. This is brought | Strategy-Three<br>Application of Principles.<br>Phase- Seven<br>Predicting Consequences<br>Phase-8<br>Supporting Prediction. |

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| about by both biological and atmospheric factors.<br><br>**Biological fixation** – Micro-organisms that bring about Nitrogen fixation are of two kinds. One of these types is found in the nodules on the roots of certain plants (teacher shows such plant roots having nodules and explains.) While the other types are found in the soil. The micro-organisms in the nodules absorb the nitrogen from the air and convert it into nitrogen compound.<br><br>The micro-organisms in the soil convert atmospheric Nitrogen into Ammonia, Nitrous acid, and Nitric acid and eventually into nitrates. (Teacher shows slide of biological fixations)<br><br>**Atmospheric fixation**: - When there is lightning in the sky, atmospheric Nitrogen and Oxygen combine to form nitric oxide. This nitric oxide is oxidized again and nitrogen dioxide is formed.<br><br>Nitrogen dioxide dissolves in rainwater and finally forms nitric acid. This nitric acid falls to earth, dissolved in rainwater. There it reacts with salts in the soil to form nitrates .Plants use these nitrates for their own growth.<br><br>Thus Nitrogen in the air becomes available to living things after biological and atmospheric fixation.<br><br>Through excretion and decay of living things as well as through burning, nitrogen compounds get decomposed. Thus Nitrogen is released back into atmosphere. That is how the portion of nitrogen in the atmosphere remains constant.<br><br>Teacher – Students, now can you tell me what arethe uses of Nitrogen?<br><br>Student 1- It is useful for plants.<br><br>Student 2- It is useful to produce fertilizers.<br><br>Student 3- It is used to prepare ammonia and nitric acid.<br><br>Teacher- Yes students. Nitrogen is used in industry for the large scale production of ammonia and nitric acid. It is also used for | Phase- Nine<br><br>Verifying the prediction. |

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| producing fertilizers. As we just discussed Nitrogen is useful for the growth of living things. Plants use Nitrogen to produce Proteinaceous substances. Other living things use plants as food. This helps them to grow, too. Nitrogen is used to make thermometers for measuring very high temperature.<br><br>Teacher-Students now we will learn about another gas i.e. Carbon dioxide**.**<br><br>**Carbon dioxide**: -Plants use Carbon dioxide from the air during photosynthesis and release Oxygen into air. This process takes place in the presence of sunlight.<br><br>Teacher –Students here again I would like to introduce one more concept by giving examples. Find the similarities in those examples and group the examples.<br><br>Contamination of water<br><br>Increases the extent of Carbon di- oxide and Carbon monoxide.<br><br>Increases the extent of moisture in air.<br><br>Causes soil pollution<br><br>Causes irritability due to loud music or sound.<br><br>Causes due to smokes of factories, vehicles and burnings.<br><br>Fertility of soil decreases.<br><br>Spreads diseases due to contaminated water.<br><br>Causes due to excess use of fertilizer and pesticides.<br><br>Hearing capacity of a person decreases.<br><br>Student1- Teacher I have grouped the examples which are relevant with soil as-<br><br>Causes soil pollution, Fertility of soil decreases, Causes due to excess use of fertilizer and pesticides. In all these examples the quality of soil is decreasing due to some man made activities.<br><br>Teacher – Yes student, good classification. | Phase- Eight<br>Predicting Consequences<br><br>Phase-9<br>Verifying Predictions.<br><br>Strategy-One<br>Concept Formation. |

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| Student 2- Teacher, I have grouped the examples related to water. As Contamination of water, Spreads diseases due to contaminated water. It causes due to excess use of fertilizer and pesticides. These entire things spoil the water. Even fertilizer also gets mixed with water and cause water pollution.<br><br>Student 3- I have classify the examples based on loud sound like Hearing capacity of a person decreases, causes irritability due to loud music or sound.<br><br>Student 4- I also grouped the example related to air as- Causes due to smokes of factories, vehicles and burnings. Increases the extent of carbon di- oxide and carbon monoxide. Increases the extent of moisture in air. These all examples are related with air.<br><br>Student5- Teacher, some diseases also spreads due to air.<br><br>Teacher- Yes students, the proportion of gases in air is changing because of that some diseases are spread.<br><br>Students- Teacher is it related with contamination of air?<br><br>Teacher- Yes students.<br><br>Student 1- Teacher in last Diwali my mother suffered due to Asthma because of smoke of fire crackers.<br><br>Student 2- Even my grandfather is suffering from respiratory disorder when we shifted in Pune from our village.<br><br>Teacher- Yes students, it causes High blood pressure and cancer also. It is harmful for plants and animals too. This increased proportion of harmful gases in the atmosphere is called as **Air Pollution**.<br><br>Students we have seen that the proportion of carbon dioxide is increasing and which causing air pollution. We have studied various causes of pollution. The rising proportion of Carbon dioxide increases the threat to Greenhouse effect.<br><br>Students this natural recourse is getting polluted now a days. What | Phase-1<br>Enumeration and listing.<br><br>Phase-2<br>Grouping<br><br>Phase-3<br>Labeling and Categorizing. |

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| may be the causes of air pollution?<br>Student 1- Excess use of vehicles<br>Student 2– Due to burning of plastics and garbage.<br>Student 3- Due to industrialization.<br>Teacher – Yes students. When chemical substances collect in any place beyond a certain level, their harmful effects can be seen. This is called pollution. Pollution is being caused by effluents from factories. These include contaminated water, dust, soot, chemicals especially gases released in the atmosphere by burning of Carbon and Sulphur. Lead, Aluminium, Zinc, acid, bases etc. also causes pollution. The number of factories is on the rise. The waste chemicals given out by factories are in gaseous, liquid as well as in the solid state. They are let out into the atmosphere, water and soil.<br>Teacher – Students what are the ill effects of air pollution?<br>Student 1- Air pollution causes respiratory dieses.<br>Student 2- It leads to high blood pressure.<br>Student 3- It also causes psychological disorder.<br>Teacher –( Teacher shows slides and explains) Yes students, air pollution also leads to a higher incidence of respiratory disorder, cancer of intestine, disorder of the urinary bladder, high blood pressure, night blindness, etc. It also causes palpitation, breathlessness and psychological disorders, too.<br>It is now accepted that pollution affects animals and plants too. The life-span of animals decreases also their capacity for producing milk get decrease.<br>Air pollution also affects plants. There is a fall in photosynthesis production by plants also. Other effects- like untimely falling of leaves, absence of fruiting, etc. have also been seen on plants.<br>Students we have seen many ill effects of air pollution. Can you | Phase-7<br>Predicting<br>Consequences<br>.<br>Phase-8<br>Supporting<br>Predictions. |

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| suggest some remedies to minimize the cause of pollution ?<br>Student 1- Avoid deforestation. Plant more and more trees.<br>Student 2- Industries should be developed away from cities.<br>Student 3- Motor vehicle should be serviced and maintain properly. Avoid excess use of vehicles, use public transports etc.<br>Teacher – Very good Students. Apart from these measures the government also taking a war footing steps to control it.<br>1) A law has been enacted making bit mandatory to treat chemical waste before letting it out of factory.<br>2) Precaution should be taken to prevent the concentration of chemicals in any one place.<br>3) To prevent the harm causes by air pollution, industrial estates should be established away from cities and the height of their chimneys should also be increased.<br>4) Engines of motor vehicle should be serviced and maintained properly to prevent them from causing pollution.<br>5) Forests should be grown to help to reduce pollution of air.<br>Teacher- Students, I am assigning you one activity- collect the news from newspaper related different types of pollution and make a collage of it and write an essay on it.<br>Teacher- Students have you heard the term acid rain?<br>Students – No teacher.<br>Teacher – Factories in big cities emits Nitrogen dioxide and sulphur dioxide gases. As rain falls, these gases dissolve in it forming Nitrous oxide and sulphurous acid. With the rainwater, these acids fall to the ground. This is called acid rain. This can sometimes cause trees to die and fall. Acid rain also causes yellow patches on marble. Tajmahal is made up of white marble, but due to increased air pollution it is becoming brownish- yellow now. Tajmahal is changing color due to deposition of dust and | Application of Principles.<br>Explaining predictions.<br>Application of Principles. |

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| Carbon containing particles emitted in burning fossil fuels, biomass and garbage.(Teacher shows some images of acid rain.)<br><br>Teacher – Students have you heard the word Greenhouse effect?<br><br>Student – No teacher.<br><br>Teacher- The warming of earth or global warming due to re-emission of sun's energy absorbed by the earth followed by its absorption by $CO_2$ molecule and $H_2O$ vapour present near the earth's surface and then its radiation back to earth is called **Greenhouse effect**.<br><br>The phenomenon has been named Greenhouse effect because it is similar to a greenhouse for plants in cold countries. A Greenhouse is a place where plants are grown on the soil but there are walls and roof made of glass. The sun's energy can enter through the glass but cannot go out of it. The energy thus absorbed by the soil and the structure of green house. The energy thus absorbed is re-emitted back into the green house. The infrared radiation (heat) is re-emitted by earth and absorbed by carbon dioxide and water vapour in lower concentration. The heat radiated back to earth by carbon dioxide and water vapour. Now a days the temperature of earth is increasing, so more energy is reflected towards earth.<br><br>Students observations of weather are recorded every hour with the help of machines and are carried out in person once every day. An observatory records observations of atmospheric factors such as temperature, pressure, velocity of winds and humanity. It keeps a record of the changes occurring in them and forecasts the weather based on the changes observed.<br><br>Teacher - Students you must have seen the gas that gushes out of the bottle of an aerated drink when you open it. This gas is carbon dioxide. Why does it gush out like this?<br><br>Teacher - Carbon dioxide dissolves only sparingly in water. Hence, | Supporting hypothesis. |

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| it has to be dissolve in water under pressure. When the cap of the bottle is pressed open, the pressure is released and the carbon dioxide gas gushes out.<br><br>Teacher – Students have you heard the word dry ice?<br><br>Student – No teacher.<br><br>Teacher – If Carbon dioxide is cooled to -57$^0$C, it freezes. In this form, it is called dry ice. Dry ice is used to bring down the temperature of a substance suddenly. It is also used for preserving foodstuff.<br><br>Teacher –Students have you seen the drops of water on the pot which is just taken out from fridge. You can do an activity at home. Take a clean glass. Dry its outer surface. Place some pieces of ice in the glass. You will soon see little droplets of water collecting on the outer surface of the glass. The water vapour in the condenses and collects on the glass in the form of droplets.<br><br>Some deliquescent substance absorbs water vapour from the air. This too, tells the presence of water vapour in the air. Clouds and fog are formed by the condensation of water vapour.<br><br>Teacher – Students tell me about which gases have we studied?<br><br>Student1 – Oxygen<br><br>Student 2- Nitrogen<br><br>Student 3-Carbon dioxide.<br><br>Teacher – Yes students, apart from this, some inert gases are also present in the air. The inert gases Argon, Helium and Neon, which are among the other constituent of air. It has many uses. Out of this Argon is used in electric bulbs; Helium is used to obtain very low temperature while Neon is used in the neon lights on hoardings that display advertisement.<br><br>Scientists of India Meteorological Department at Pune have developed a system which can accurately predict the arrival of the | Supporting Predictions.<br><br>Application of Principles. |

south-west monsoon. Research related to several different subjects such as atmospheric pressure, Antarctica, storms, cyclones, pollution in suburban area etc. is carried on there. ( teacher shows the image)

Teacher revises the main points of the lesson.

Students in this lesson we have learnt the following points.

- Oxygen
- Nitrogen
- Other gases
- Air pollution
- Acid rain.
- Observatory

Teacher- Students now I am going to ask you few questions based on this chapter.

Q. Name the constituents of air and their proportions.

Student- Nitrogen =78 %

Oxygen =21%

Other gases =1%

Q. What are the ill effects of air pollution are seen?

Student- Air pollution causes respiratory dieses

- It leads to high blood pressure.

- It also causes psychological disorder.

- Air pollution also leads to a higher incidence of respiratory disorder, cancer of intestine, disorder of the urinary bladder, high blood pressure, night blindness, etc. It also causes palpitation, breathlessness and psychological disorders, too.

Pollution affects animals and plants too. The life-span of animals decreases, also their capacity for producing milk gets

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| decrease.<br><br>Air pollution also effects on plants. There is a fall in photosynthesis production by plants also. Other effects, like untimely falling of leaves, absence of fruiting, etc. have also been seen on plants.<br><br>Teacher- Very good students, you answered very well. So students today we have learnt about air, its constituents, air pollution, acid rain and also the function of observatory.<br><br>In next period we will start a new lesson. Thank you. | |

- **Instructional effect:-**

  1. Student understands the concept of air and air pollution.
  2. Student understands the physical and chemical properties of gases.
  3. Student understands the causes, effect and remedies of air pollution.

- **Nurturant effect:-**

  1. Student will understand the formation of concept.
  2. Student will understand the similarities and differences of concept.
  3. Student will understand the process of classification and categorization.
  4. Student will try to minimize the air pollution and also make people aware about it.
  5. Student will use the natural resources wisely.

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**Lesson plan - Inductive Thinking Model**

**Subject –Science**

**Std-8th**

**Unit –Soil**

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**Objectives:-**

1. To teach the different types of soil.
2. To teach the uses of soil.
3. To teach the constituents of soil.
4. To teach the concept of soil Erosion and soil Pollution.

| Student –Teacher interaction | **Syntax of Model** |
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| Teacher- Students, today we are going to learn a new chapter. I will give you some examples you have to classify it on the basis of similarities and differences.<br><br>Natural Resource<br>Air — Provide minerals and metals<br>Important factor of agriculture — water<br>Electricity — Red soil<br>Clayey soil — Cotton<br>Provides all the basic necessities — Natural things<br>Silt — Roads<br>Soil — Man made things.<br>Roads<br><br>Student1- I have grouped all man made things together like roads, Electricity, cotton etc. | Strategy-One<br>Concept formation.<br><br>Phase-1<br>Enumeration and Listing. |

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| Student2- I have classified all the characteristics of natural things like provide minerals and metals, It provides all the basic necessities, important factor of agriculture, natural Resource etc.<br><br>Students3- I have grouped all natural things together like air, water, soil.<br><br>Student4- Teacher what is silt?<br><br>Teacher – Silt is a type of soil.<br><br>Student5- Okay, then can I group the types of soil mentioned above - like Soil, Clayey soil, Red soil, Silt.<br><br>Teacher- Very good student, some types of soil are mentioned above. Students can you short list the characteristics of soil from the above given list?<br><br>Student6- Characteristics of soil may be – natural resource, provides all the basic necessities, provide minerals and metals, important factor of agriculture.<br><br>Teacher- Yes Students, very good, you have observed the given examples very well and sorted characteristics and types of soil properly. So today we will learn a chapter named as 'Soil' in detail.<br><br>Soil is made up of stones and pebbles, sand, fine soil particles as well as organic substances. The effect of various elements of nature is the cause of the wearing of rocks and formation of soil. This process of transformation of rocks into soil is called weathering. Rocks and boulders also break as a result of effect of rivers, rainwater, wind and continuous change in weather. Rocky surface develops cracks. Extreme heat and cold also causes cracks in rocks water that collect in these cracks freezes in the cold. Freezing water increases in volume and results in the breaking of rocks. (Teacher shows the slides of weathering and explains.)<br><br>Insects and microorganisms live grow and die in the soil. Plants also take roots, grow and die in this same soil. | Phase-2<br><br>Grouping.<br><br>Phase-3<br><br>Labeling, Categorizing.<br><br>Strategy- Two<br><br>Interpretation of data. |

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| Rodents like rats make burrow in the soil to live in them. This results in the conversion of rough earth into soil due to crumbling. Such biological process goes on in the ground continuously and adds to the effect of weathering.<br><br>Roots of plants growing into cracks in rocks also help the process of weathering. The soil that is formed by weathering mainly caused by roots of plants is clay.<br><br>**Constituents of soil:**-Soil has constituents of plants and animals. They are called organic constituents. The constituents of plant origin include bacteria, fungi, algae, blue –green algae, decomposed leaves, etc. The constituents of animal origin are protozoa, worms, insects, shells and the decomposed remains of dead animal.<br><br>(Teacher shows the relevant slides and explains in detail)<br><br>Teacher –Student have you seen earthworms?<br><br>Student –Yes teacher.<br><br>Teacher –Where can we find earthworms?<br><br>Student- In the farms.<br><br>Teacher –Do you know that earthworms are called as farmer's friend? Can you give the reason?<br><br>Student – It converts the bio waste into organic fertilizers. It ploughs the soil.<br><br>Student 2- It makes the soil soft, which helps the plant to grow faster.<br><br>Teacher –Students what will happen if there will be no soil?<br><br>Student 1-Plants could not grow.<br><br>Student 2 –Animal life could not exist.<br><br>Student3 –We cannot get any minerals, metals etc.<br><br>Student4- Water could not be stored and collected in dams. | Phase-4<br><br>Identifying Critical Relationships.<br><br>Phase-5<br><br>Exploring Relationship.<br><br>Strategy- Three<br><br>Application Of Principles. |

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| Student 5- Without soil life on earth will not be possible.<br><br>Teacher – Yes. Very good children. Soil becomes an integral factor in the life of human being. Plant grows on soil and soil provides food for animals and human beings. Plants provides us all the basic necessities i.e. Food, shelter and clothing. Various minerals and metals are also obtained from soil. Rainwater is also available because of soil. Thus without soil life on earth is not possible. Soil is a natural resource.<br><br>Now students tell me what are the uses of soil?<br><br>Student 1- For construction of walls of houses.<br><br>Student 2- For making bricks.<br><br>Student 3- For making articles like clay toys, lamps etc.<br><br>Student 4- For making some vessels of everyday use.<br><br>Teacher- Very good Students. Soil has the property of elasticity that can give desired shape so we can make various articles and vessels (teacher shows some slides of various uses of soil and explains). Soil is an integral part of agriculture. Soil also holds water, the rain water gets collected in deep places such as ponds and wells, and this water becomes available to us all the year.<br><br>Teacher - Students have you seen various colors of soil<br><br>Student –Yes teacher.<br><br>Teacher which different colored soil you have seen?<br><br>Student 1- Brown, black colored.<br><br>Student 2-Red soil<br><br>Student 3-Yellow or copper colored soil.<br><br>Teacher – Yes students .There are different colors of soil. (teacher shows some slides of different colored soil.) Color is an important property of soil. We get an idea of fertility, drainage and other such properties of soil from its color. The color of soil depends upon its | Phase-7<br><br>Predicting Consequences.<br><br>Phase-8<br><br>Supporting Predictions. |

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| texture, organic content and chemical substances like iron, quicklime that it may contain.<br><br>Fine particles of quarts, feldspar, and mica, carbonates of metals oxides and sulphites of iron are present in soil along with organic matter.<br><br>China clay, clay and loamy soil are the three types of soil used to make earthen pots and other articles. (teacher shows the images of different types of soil and explain its uses. ) The soil found near the Kaolin mountain is called Kaolin or china clay. It is white in color and used to make crockery, tiles for bathrooms, tanks, laboratory, apparatus etc.<br><br>Various kinds of oxides are used to decorate earth wares or porcelain article. Iron oxide is used to obtain red ochre and copper oxide to obtain the green color.<br><br>Clay and loamy soil are different types of Kaolin. As loamy soil is white in color it is used to make statues, idols, etc.<br><br>Soil particles are of different sizes. The proportion of the particle of the different sizes determines the texture of soil. The different types of soil, based on texture are<br><br>**1.** Sandy soil<br>**2.** Clayey soil<br>**3.** Silt<br><br>If the soil has greater portion of large particles or of sand, the soil is called as sandy sail. Clayey soil has the greatest portion of fine particles of soil while silt soil consists of fine to medium sized soil particles. Silt soil has medium capacity for holding water. While clayey soil has the greatest capacity for holding water. However soil which holds a lot of water is not well aerated. This arrests the growth of roots in the soil.<br><br>Teacher – Students now I am going to introduce one more concept | Phase-9<br>Verifying the prediction.<br><br>Application of Principles.<br><br>Phase-8<br>Supporting consequences. |

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| related to soil by giving some examples. You have to guess the concept.<br>Change in surface of soil by mechanical action.<br>Sedimentation of rocks.<br>Weathering of rocks.<br>Change in surface by mechanical action like earthquake.<br>Soil on ground is washed away due to rain water falling on it,<br>High tide and low tide.<br>Soil on ground is washed away due to fast current of water flowing on it.<br>Change in rock surface due to heat, cold and ice.<br>Soil on ground is washed away due to gusts of wind.<br>Student1- All these are natural phenomenon.<br>Teacher- Yes students.<br>Student2- Some examples are directly related with soil.<br>Student3- I have grouped the example according to formation of soil. Sedimentation of rocks, weathering of rocks, change in surface by mechanical action like earthquake. In all these process there is formation of soil.<br>Student4- I have grouped the examples according to washing of soil as Soil on ground is washed away due to rain water falling on it, soil on ground is washed away due to fast current of water flowing on it and soil on ground is washed away due to gusts of wind.<br>Student5- What is the meaning of washing of soil?<br>Teacher- Erosion means the change in surface by mechanical action. Soil on ground is eroted by rain water falling on it, by fast current of water flowing on it or by gusts of wind .This causes the thin layer of fertile soil on the surface to be carried away. The soil cover is reduced and the soil loses its fertility. | Strategy one<br>Concept Formation.<br>Phase-2<br>Grouping.<br>Phase-3<br>Labeling and categorizing<br>Phase-5<br>Exploring Relationship. |

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| Teacher- Student, in high tide and in low tide the sand gets wash out towards the sea but in erosion the soil is washed. Also in volcanic eruption there is change in soil surface here the fertility of the land increase, but in erosion the soil loses the fertility.<br>Teacher – What may be the causes of soil erosion?<br>Student 1- Flood<br>Student 2- Slope of soil<br>Student 3- Deforestation<br>Teacher –Yes students, these are the main causes of soil erosion.<br>So to prevent soil erosion which activities should we implement?<br>Student 1 –Should build the bunds.<br>Student 2- Avoid deforestation. Plant more trees, it will provide cover to the soil.<br>Student 3 –Arrange the soil horizontally. Minimize the slope.<br>Teacher – Very true students. To prevent erosion, soil must be kept covered, allow grass to grow. Crops grown on land and trees planted on it provide this cover.<br>Erosion also depends upon the slope and the type of soil. Soil can be reduced by arranging soil horizontally across the line of slope. The bunds also help to stop the soil erosion.<br>If soil erosion is arrested, soil is conserved, this is called soil conservation. The government department for soil conservation is located at district place.<br>Social forestry :- Government schemes were started to plant trees in all possible places such as on the borders of fields, railway tracks, on the banks of streams and rivers etc. This is called social forestry. This project was started in1976 for the first time.( teacher shows some slides of social forestry and explain.)<br>This project is meant to encourage small farmers and adivasies to | Phase-6<br>Making Inferences.<br>Application of Principles. |

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| plant trees. They are also given financial aid for this purpose. As a result fallow and barren land has been reclaimed for agriculture. The number of trees has risen and wood has become available in plenty.<br>The social forestry project of Maharashtra Government is carried out in most of the schools by teams called the 'Harit Sena' or the 'Green Brigade'<br>Teacher - Students have you heard about pollution?<br>Students – Yes teacher.<br>Teacher –What is meant by pollution?<br>Student 1- A disturbance in the natural balance of the various factors present is called as pollution.<br>Teacher –Which types of pollution do you know?<br>Student 1- Water pollution.<br>Student 2- Sound pollution<br>Student 3- Air pollution<br>Teacher – Students now we will learn one such similar concept through some examples you have to classify the examples according to similarities and differences.(teacher gives examples)<br>Causes due to factory outlets.<br>Causes due to hard water.<br>Causes due to excess use of fertilizers and pesticides.<br>It is caused due to acid rain.<br>It is caused due to deforestation.<br>It causes the Green House effect.<br>It causes respiratory disorder and diseases like asthma.<br>It reduces the hearing capacity due to high voice.<br>Causes flood or sometimes drought. | Strategy –One<br>Concept Formation.<br>Phase-1<br>Enumeration and Listing.<br>Phase-2<br>Grouping |

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| Student1- These all are the ill effect of pollutions.<br><br>Student2- Causes due to factory outlets. It is the effect of air pollution.<br><br>Student3- Even Asthma is also caused due to air pollution.<br><br>Student4- Hearing capacity gets reduced due to noise pollution.<br><br>Student5- Flood or droughts are caused due to imbalance in nature.<br><br>Student6- Teacher can we include the remaining examples in one group? Like causes due to hard water, causes due to excess use of fertilizers and pesticides, caused due to acid rain, causes the Green House effect, etc. Are all these related with soil?<br><br>Teacher- Yes students, these all are the causes of **<u>Soil pollution</u>**.<br><br>When chemical fertilizers are used in greater quantities than necessary, when chemicals are sprayed as pesticides the proportion of chemicals in the soil increases. Soil is also polluted by the water let out from factories and by other causes such as acid rain. Using too much water and chemicals makes the soil saline. This is called as soil pollution. Crops cannot grow in such soil. (teacher shows the slides of soil pollution and explain)<br><br>Students what can be done to prevent soil pollution?<br><br>Student 1 – To minimize the use of chemical fertilizer and pesticides. Instead of that should use organic fertilizers.<br><br>Student2- Water outlets from factory should be treated properly<br><br>Teacher – Yes. If we follow these steps, soil pollution can be minimized.<br><br>**Soil testing: -**Soil testing can tell us about the good quantities and shortcomings of the soil. A farmer grows a variety crops. Often, he does not get a good harvest. Farmers also face some problems. At such time he has to take into consideration factors such as color, texture and content of organic matter in the soil. Soil testing helps to find out these things. | Phase-5<br><br>Exploring Relations.<br><br>Application of Principles.<br><br>Phase-9<br><br>Verifying the prediction.<br><br>Application of Principles |

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| Teacher –So students today we have learnt about soil.<br>• Uses of soil, color of soil<br>• Texture of soil, constituents of soil<br>• Erosion of soil<br>• Soil pollution. And Soil testing.<br>Teacher - Students I am showing some sample of soil. Identify the color of soil<br>Student1-Black soil<br>Student 2-Red copper color.<br>Teacher – Identify the type of soil.<br>Student1 –Sandy soil<br>Student2-Silt soil<br>Student3- Clayey soil.<br>Teacher- Very good students. Tomorrow we will learn the next chapter. Thank you. | |

- **Instructional effect**
  1. Student understands the nature and concept of soil, soil erosion and soil pollution.
  2. Student understands the uses and importance of soil.
- **Nurturant Effect:-**
  1. Student will observe different types of soil in surroundings. Student's inductive thinking ability gets increased.
  2. Student will try to minimize the soil pollution and will make people aware about it.

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**Evaluation sheet for lesson plan of Inductive Thinking Model**

**Evaluation scheme**

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**Rating scale** – 1: Unsatisfactory, 2: Average, 3:- Satisfactory, 4: Good, 5: Excellent.

Name of the lesson:-

| No. | Criteria | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| 1 | Given relevant examples. | | | | | |
| 2 | Quantity of relevant examples. | | | | | |
| 3 | Inclusion of examples to support the concept | | | | | |
| 4 | Selection of examples for similarities and differences. | | | | | |
| 5 | Thought provoking and logical questions. | | | | | |
| 6 | Opportunity for students to express their opinion. | | | | | |
| 7 | Inclusion of application based questions. | | | | | |
| 8 | . Given clues for proper classification. | | | | | |
| 9 | Appropriateness in language used. | | | | | |
| 10 | Overall impression | | | | | |
| | Total marks=50 | | | | | |

| Qualitative Feedback | Suggestions for Improvement. |
|---|---|
| | Name and Signature of the Expert |

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## 7. TEST SCORE OF PRE-TEST AND POST-TEST

### 8 A – Division

| Sr. No. | Name of the Student | Marks of Pre-Test | Marks of Post-test |
|---|---|---|---|
| 1 | Arvikar Mrudula Mahendra | 03 | 37 |
| 2 | Bairagi Siddhi Digamber | 02 | 38 |
| 3 | Desai Sharvari Makarand | 01 | 20 |
| 4 | Gaikwad Prikanka Pravin | 06 | 24 |
| 5 | Jamdade Sae Jitendra | 06 | 38 |
| 6 | Kadam Siddhi Anil | 05 | 30 |
| 7 | Kindre Vrushali Prakash | 04 | 25 |
| 8 | Lohar Shravani Rajendra | 01 | 33 |
| 9 | Malviya Tanvi Kapoorchand | 09 | 39 |
| 10 | More Devyani Sanjay | 04 | 35 |
| 11 | More Purva Vikas | 04 | 30 |
| 12 | More Shivani Manoj | 00 | 33 |
| 13 | Palaskar Sonali Laxman | 05 | 34 |
| 14 | Pisal Neha Shankar rao | 07 | 37 |
| 15 | Shinde Sayali Shrikant | 06 | 34 |
| 16 | Suryavanshi Parthivi Santosh | 09 | 29 |
| 17 | Thakar Alankasha Raju | 00 | 36 |
| 18 | Totagre Vijaylaxmi Arunkumar | 01 | 19 |
| 19 | Varma Manisha Amarnath | 02 | 32 |

| | | | |
|---|---|---|---|
| 20 | Admane Gaurav Gautam | 06 | 35 |
| 21 | Bhosale Vedant Sunil | 02 | 38 |
| 22 | Bhusnar Arun Amar | 02 | 36 |
| 23 | Bidve Sahil Sameer | 02 | 09 |
| 24 | Biradar Anish Dilip | 00 | 19 |
| 25 | Chaskar Vinit Dattatray | 03 | 19 |
| 26 | Chavan Akshay Ramu | 12 | 29 |
| 27 | Darekar Abhishek Santosh | 02 | 32 |
| 28 | Dhankude Sairaj Santosh | 02 | 14 |
| 29 | Ghule Sahil Ruoesh | 01 | 19 |
| 30 | Jadhav Prithaviraj Dhiraj | 06 | 39 |
| 31 | Kamatkar Aditya Uday | 06 | 35 |
| 32 | Kamble Avadhoot Vijaykumar | 01 | 31 |
| 33 | Kashid Shirish Bajirao | 00 | 28 |
| 34 | Kandagale Jay Balasaheb | 06 | 37 |
| 35 | Kurkute Arya Mahesh | 05 | 26 |
| 36 | Lagad Arya Narsing | 09 | 30 |
| 37 | Mangasuli Pravin Mallesh | 02 | 38 |
| 38 | Mate Harsh Ravindra | 02 | 29 |
| 39 | Mozar Aniruddha Rajesh | 00 | 32 |
| 40 | Pasalkar Sahil Bipin | 01 | 30 |
| 41 | Pokale Prathamesh Dattatray | 05 | 26 |
| 42 | Polekar Soham Vijay | 05 | 31 |
| 43 | Rasal Satyam Dattatray | 03 | 34 |

| | | | |
|---|---|---|---|
| 44 | Sarwade Praneet Tama radhwaj | 05 | 18 |
| 45 | Shindkar Suraj Chandrakant | 02 | 31 |
| 46 | Sonawane Aditya Krishnath | 01 | 33 |
| 47 | Takawale Pratik Shailendra | 06 | 37 |
| 48 | Tamboli Fardeen Tajuddin | 06 | 18 |
| 49 | Walke Shragwin | 01 | 28 |

**8 B - Division**

| Sr. No. | Name of the student | Marks of Pre-test | Marks of Post-test |
|---|---|---|---|
| 1 | Agare Sanika | 06 | 38 |
| 2 | Bopte Shruti | 05 | 39 |
| 3 | Bhadgaonkar Gauri | 05 | 38 |
| 4 | Bodhe Sakshi Ganesh | 06 | 38 |
| 5 | Borate Manasi | 06 | 39 |
| 6 | Borude Shruti | 08 | 39 |
| 7 | Chindhe Sakshi G | 07 | 38 |
| 8 | Desai Rohini Sanjay | 02 | 31 |
| 9 | Deshpande Sakshi | 07 | 38 |
| 10 | Dumpeti Vanshikha Narendrakumar | 05 | 24 |
| 11 | Durgade Eshwari Sandip | 07 | 36 |
| 12 | Mahajan Tanaya | 04 | 28 |
| 13 | Mhetre Aishwarya | 01 | 39 |

| | | | |
|---|---|---|---|
| 14 | Nanaware Samruddhi | 03 | 36 |
| 15 | Patil Pranali Sahebrao | 01 | 38 |
| 16 | Phadatare Shubhashri | 04 | 34 |
| 17 | Pitroda Khushi R | 00 | 36 |
| 18 | Shelar Bhoomika | 00 | 23 |
| 19 | Vetal Shravani Sunil | 05 | 35 |
| 20 | Zade Namrata | 02 | 38 |
| 21 | Acharya Rohit S | 01 | 33 |
| 22 | Baji Vedant | 04 | 34 |
| 23 | Barve Tejas Prasad | 04 | 26 |
| 24 | Beldare Prashant | 01 | 35 |
| 25 | Bhapkar Shlok | 05 | 37 |
| 26 | Bhosale Prathamesh | 04 | 33 |
| 27 | Chavan Shreetaj K | 00 | 38 |
| 28 | Chaudhari Raju Vanaram | 06 | 39 |
| 29 | Chaudhary Surjeet Rooparam | 03 | 38 |
| 30 | Deokar Abhishek P | 06 | 30 |
| 31 | Deshmane Deep Sachin | 05 | 34 |
| 32 | Dhamale Tejas Sanjay | 06 | 37 |
| 33 | Gaud Om N | 04 | 30 |
| 34 | Gharbudave Vijay M | 02 | 38 |
| 35 | Jadhav Omkar H | 04 | 25 |
| 36 | Kadam Soham Anil | O5 | 33 |
| 37 | Kashid Atharva Suresh | 04 | 37 |

| | | | |
|---|---|---|---|
| 38 | Kendale Siddharth S | 01 | 38 |
| 39 | Kondhare Shreyash N | 00 | 35 |
| 40 | Kulkarni Ishan | 06 | 26 |
| 41 | Mahadik MihirKrushna | 03 | 35 |
| 42 | Mahamuni Atharva Sanjay | 03 | 39 |
| 43 | Rasal Aditya Santosh | 06 | 37 |
| 44 | Sharma Pankaj | 03 | 38 |
| 45 | Ubhe Ujjwala | 01 | 22 |
| 46 | Wagh Vedant Sunil | 01 | 36 |

**8 C – Division**

| Sr. No. | Name of the Student | Marks of Pre-test | Marks of Post-test |
|---|---|---|---|
| 1 | Beldare Disha Minanath | 04 | 23 |
| 2 | Bhovande Shreya Sanjay | 08 | 38 |
| 3 | Deshmukh Manasi Tanaji | 07 | 32 |
| 4 | Dhamale Rajnandani Santosh | 02 | 35 |
| 5 | Hagawane Neha Sunil | 02 | 32 |
| 6 | Hinge Rutuja Bapusaheb | 07 | 38 |
| 7 | Jagtap Komal Vijay | 04 | 24 |
| 8 | Jagtap Sourabhi Hemant | 05 | 33 |
| 9 | Kambale Priyanka Dattatray | 05 | 35 |
| 10 | Lashkare Mrunmayee Sachin | 02 | 34 |
| 11 | Londhe Gauri Rahul | 04 | 30 |

| | | | |
|---|---|---|---|
| 12 | Mangale Shrutika Saudagar | 04 | 36 |
| 13 | More Sanika Sanjay | 05 | 36 |
| 14 | More Shivani Vasant | 05 | 38 |
| 15 | Nangare Dnyati Dnyashwar | 07 | 34 |
| 16 | Poonam Shreya Shivaji | 02 | 39 |
| 17 | Pujari Disha Krishna | 04 | 38 |
| 18 | Puliraj Sarika Narsingh | 04 | 20 |
| 19 | Sawant Mrunal Bhagwat | 06 | 36 |
| 20 | Adgale Om Santosh | 01 | 35 |
| 21 | Bachhe Aditya Manohar | 07 | 37 |
| 22 | Benkar Prathamesh Sanjay | 04 | 29 |
| 23 | Bhalerao Kunal Ganesh | 08 | 26 |
| 24 | Deware Aditya Suryakant | 05 | 35 |
| 25 | Dhuriya Deepak Badrinath | 10 | 37 |
| 26 | Gade Prasad Sanjay | 05 | 19 |
| 27 | Goriwale Deepa Sandeep | 01 | 36 |
| 28 | Gowda Akshay Shanthe | 07 | 28 |
| 29 | Hemgude Lokesh kailas | 04 | 25 |
| 30 | Jadhav Durvesh Ravindra | 03 | 30 |
| 31 | Jambhale Prem Prakash | 03 | 25 |
| 32 | Jibvani Bhautik jagdish | 06 | 25 |
| 33 | Kadam Mahesh Sanjay | 09 | 38 |
| 34 | Kadam Sahil Rajesh | 02 | 39 |
| 35 | Kendurkar Tejas Hemant | 05 | 33 |

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|---|---|---|---|
| 36 | Kinage Gaurishankar Gajanan | 04 | 35 |
| 37 | Kokate Atish Suresh | 04 | 36 |
| 38 | Landage Onkar Rajan | 07 | 25 |
| 39 | Mohite Satyajeet | 04 | 28 |
| 40 | Naiknaware Vishal Bhal | 06 | 27 |
| 41 | Nawadkar Prathamesh Santosh | 08 | 33 |
| 42 | Nerkar Sarvesh Sudhir | 06 | 39 |
| 43 | Nikshe Rohit Raju | 02 | 24 |
| 44 | Patil Tanmay Tukaram | 06 | 28 |
| 45 | Raykar Shreyash Rajendra | 03 | 29 |
| 46 | Saini Vikram Choturam cv | 04 | 28 |
| 47 | Thakur Ayush Pradip | 04 | 33 |
| 48 | Yadav Yash Santosh | 04 | 26 |

**8 D – Division**

| Sr. No. | Name of the Student | Marks of Pre-test | Marks of Post-test |
|---|---|---|---|
| 1 | Aenile Komal Bapu | 04 | 35 |
| 2 | Bathe Samruddhi Sanjay | 06 | 17 |
| 3 | Buchade khushi Vilas | 09 | 15 |
| 4 | Chaudhari Pravina Narayan | 06 | 18 |
| 5 | Chavan Shreya Nandkumar | 09 | 17 |
| 6 | Dahale Mrudula Sushil | 00 | 21 |
| 7 | Dhokale Alanksha Sanjay | 07 | 14 |

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|---|---|---|---|
| 8 | Ghanekar Sakshi Chandrakant | 07 | 19 |
| 9 | Hyam Chitrali Mahesh | 07 | 33 |
| 10 | Kakade Sakshi Rajendra | 05 | 28 |
| 11 | Kashi Shreya Ishwar | 01 | 23 |
| 12 | Kunjir Gayatri Mahadev | 04 | 34 |
| 13 | Malusare Shravani Kishor | 05 | 27 |
| 14 | Nair Vydehi Krishna | 06 | 10 |
| 15 | Pangrikar Shruti Shripad | 06 | 17 |
| 16 | Paygude Arya Rupesh | 09 | 11 |
| 17 | Shelar Pratiksha Sunil | 05 | 15 |
| 18 | Shinde Ishita Jitendra | 10 | 33 |
| 19 | Sakshi Shivprasad | 06 | 23 |
| 20 | Apshetty Prathamesh Vaijinath | 04 | 23 |
| 21 | Bedekar Tanmay Yashawant | 03 | 21 |
| 22 | Badhe Akash Rajesh | 07 | 23 |
| 23 | Bhagwat Prajwal Anil | 06 | 31 |
| 24 | Bhondave Dhananjay Sunil | 10 | 27 |
| 25 | Deoraikar Aanushka Nilesh | 06 | 25 |
| 26 | Ghadshi Suyog Santosh | 05 | 10 |
| 27 | Gujar Shripad Umesh | 07 | 23 |
| 28 | Gund Sai Ramesh | 06 | 28 |
| 29 | Jore Ritesh Babasaheb | 07 | 29 |
| 30 | Kadam Deepa Suresh | 02 | 17 |
| 31 | Kank Ayush Vikas | 07 | 20 |

| | | | |
|---|---|---|---|
| 32 | Kulkarni Pratham Rajesh | 07 | 15 |
| 33 | Loyare Om Ajay | 05 | 20 |
| 34 | Mali Sushil Vilas | 06 | 28 |
| 35 | Mangade Sanket Anil | 06 | 24 |
| 36 | Mane Shivtej Raosaheb | 00 | 09 |
| 37 | More Gaurav L. | 07 | 19 |
| 38 | Nighot Sankalp Rajesh | 06 | 21 |
| 39 | Pahale Manmeetsingh | 05 | 21 |
| 40 | Patil Prathamesh Vidyadhar | 01 | 19 |
| 41 | Pawar Vedant Bapu | 09 | 23 |
| 42 | Paigudde Yuvraj Ashok | 09 | 22 |
| 43 | Rajput Ganesh Kisansingh | 09 | 30 |
| 44 | Rawal Divyansh Manoj | 05 | 20 |
| 45 | Suryavanshi Pratik harichandra | 06 | 21 |
| 46 | Tonge Rohit Hanumant | 04 | 22 |
| 47 | Vidhate Aryan Santosh. | 05 | 24 |

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## 8. LIST OF ABBREVIATIONS

- MOT = Models of Teaching.
- AOM = Advance Organizer Model.
- CAM = Concept Attainment Model.
- ITM = Inductive Thinking Model.
- CFM = Concept Formation Model.
- STD = Standard.
- SSC Board = Secondary School Certificate.
- TM = Teaching Method.
- TT = Traditional Teaching.
- SES = Socio-Economic Status.

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## 9. SUBJECT BASED PHOTOS USED WHILE CONDUCTING THE PROGRAM

### CHICKENPOX





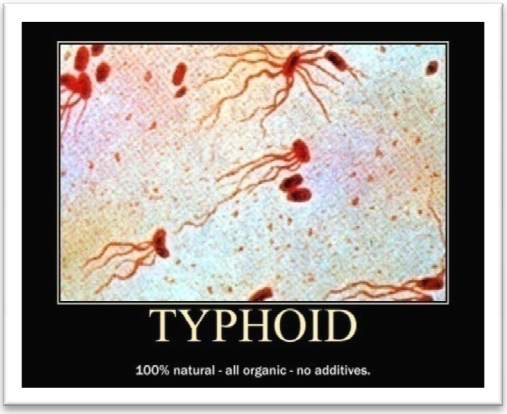

### POLIO

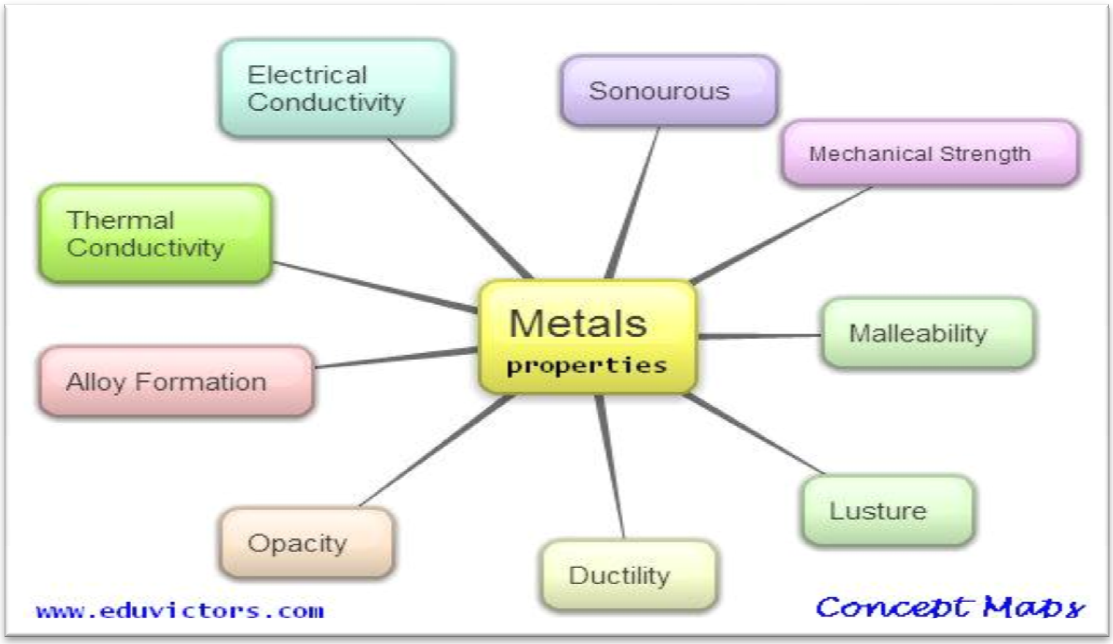


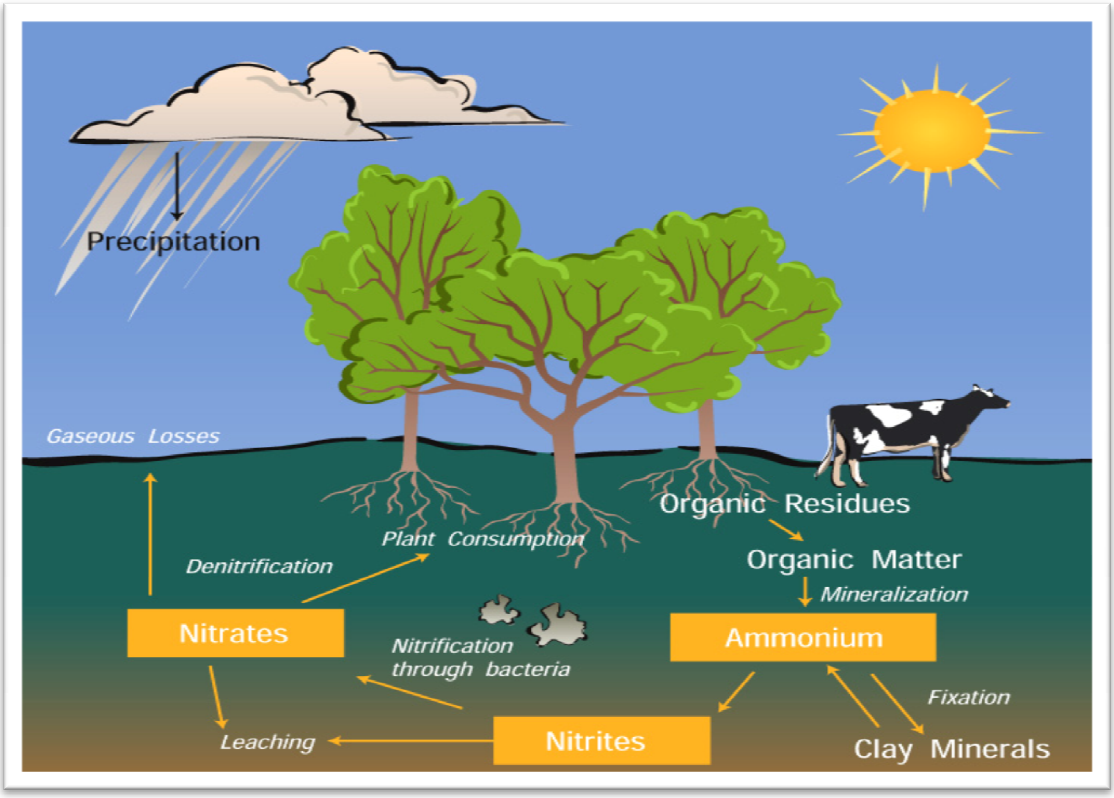

### REBIES




### TYPHOID




Electrical Conductivity
Sonourous
Mechanical Strength
Thermal Conductivity
Metals properties
Malleability
Alloy Formation
Lusture
Opacity
Ductility
www.eduvictors.com
Concept Maps

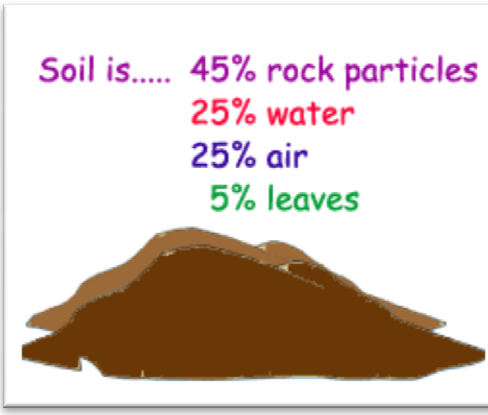

Precipitation
Gaseous Losses
Organic Residues
Plant Consumption
Denitrification
Organic Matter
Mineralization
Nitrates
Nitrification through bacteria
Ammonium
Fixation
Leaching
Nitrites
Clay Minerals

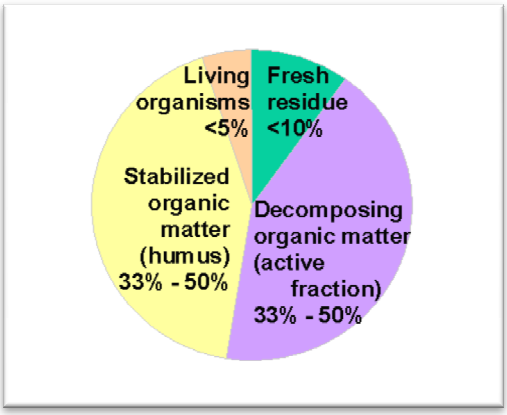




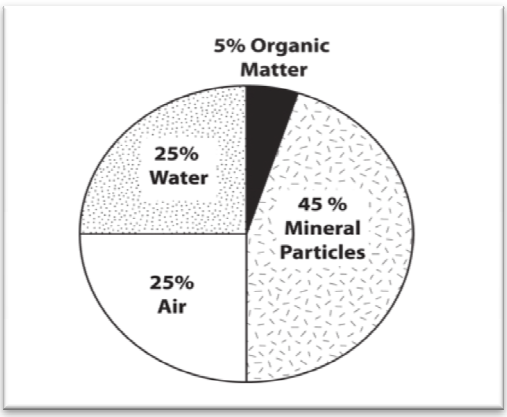





Soil is..... 45% rock particles
25% water
25% air
5% leaves


Living organisms <5%
Fresh residue <10%
Stabilized organic matter (humus) 33% - 50%
Decomposing organic matter (active fraction) 33% - 50%


Soil Components


5% Organic Matter
25% Water
45 % Mineral Particles
25% Air





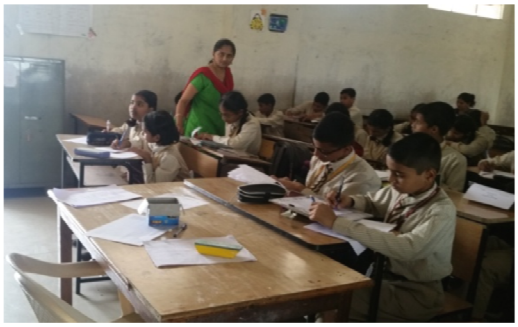


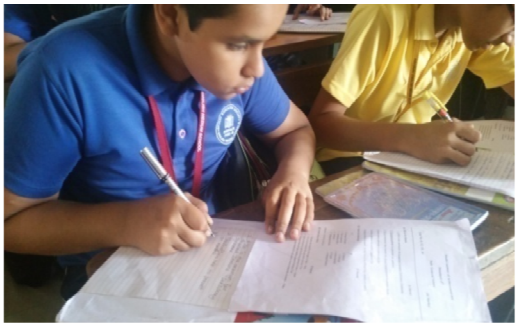




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## 10. PHOTOGRAPHS WHILE CONDUCTING THE PROGRAM



















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ABHINAV EDUCATION SOCIETY'S

ENGLISH MEDIUM SCHOOL & JR. COLLEGE

(PRE-PRIMARY, PRIMARY SECONDARY & JR. COLLEGE)

(Reconnised by Govt. of Maharashtra)

S.S.C. Index No. 11.05.075. H.S.C. Index No. J 11-05-022

Sr. No. 13, Ambegaon Bk., Katraj - Dehu Bypass, Pune - 411046

Tel : (020) 20241144 / (020) 24317897, Email : aesemsjc@yahoo.com

Mr. Rajeev Jagtap — Founder President

Mrs. Sunita R. Jagtap — Founder Secretary

Mrs. Varsha Sharma — Principal

Ref. : AES/EMSJ/17-18/471

Date : Date: -16.11.2016

To,

The Head-Ph.D. Section

Tilak Maharashtra Vidyapeeth, Pune.

Subject: - Conducted the Program based on Models of Teaching in our school.

Respected Sir/ Madam,

This is with respect to the research work carried out by Mrs.AartiPrashantGangurde on title **"Comparative Study of Models of Teaching on Achievement of 8th Standard Students."** under the guidance of Dr. DattatreyaTapkeer.

We herewith certify that she has conducted the lessons on 8A,8B and 8C classes in our school for Science subject for 4 chapters. Already the students of all the divisions of 8th standard were distributed equally on their last year's performance by the school.

We wish her all the best in her on-going research work.

Warm Regards.

Signature

Mrs.Varsha Sharma,

Principal, Abhinav English Meduim School.

Ambegaon (Bk), Pune- 46.

Mrs. Varsha Sharma
Principal
Abhinav Education Society's
English Medium School &
Junior College, Ambegaon (BK)
Pune - 46.

Date : 3.7.2015

To,
The Principal,
Abhinav English Medium School,
Ambegaon Bk., Pune-411046

Respected Madam,

I undersigned Mrs. Aarti P. Gangurde working as an Asst. Professor in our Abhinav College of Education . I am pursuing my Ph.D. from Tilak Maharashtra University, Pune for that I have to conduct a programme on 8th Standard students . I will teach 4 chapters from science subject to 3 divisions of 8th standard by using model of teaching. I request you to please give me permission to conduct the programme. I will be highly obliged waiting for your co-operation.

Thank you.

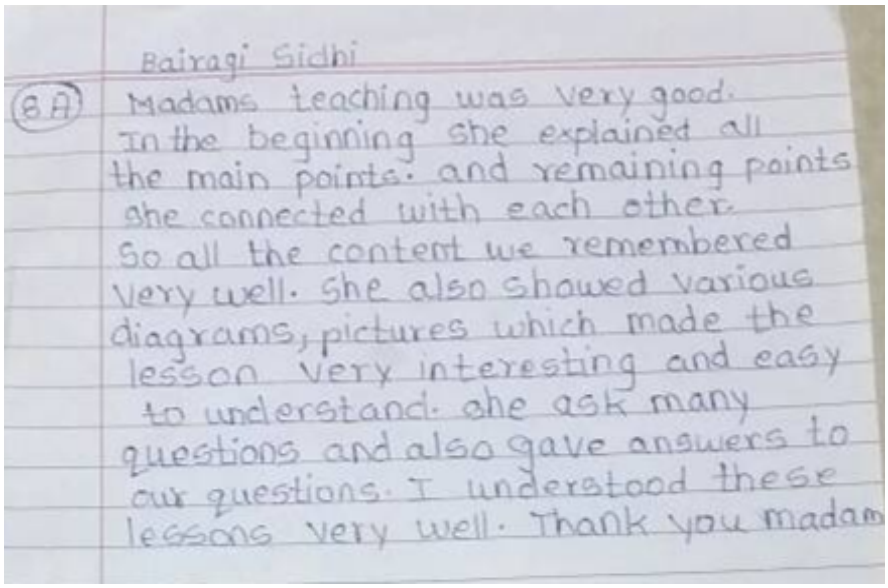
Yours Faithfully,

Gangurde
(Asst.Prof.Aarti Gangurde)

3/7/15
Mrs. Varsha Sharma
Principal
Abhinav Education Society's
English Medium School &
Junior College, Ambegaon (BK)
Pune - 46.

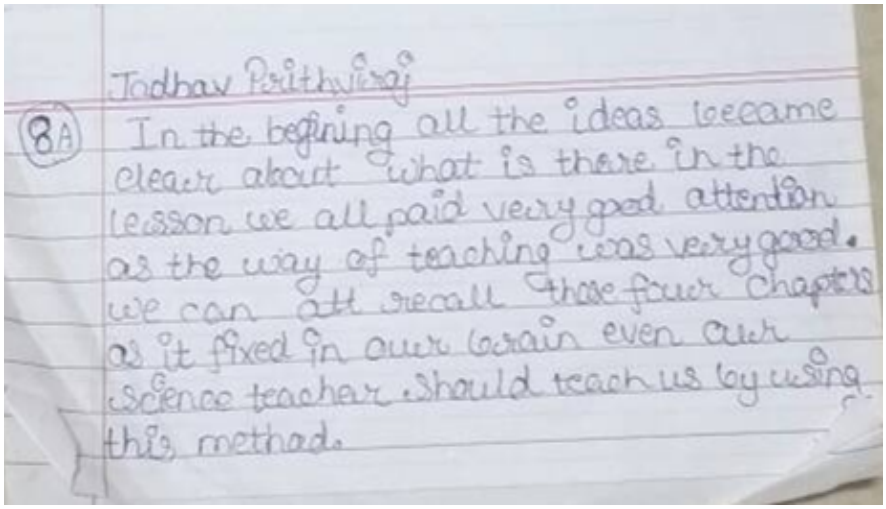
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## 12. FEEDBAK FROM STUDENTS



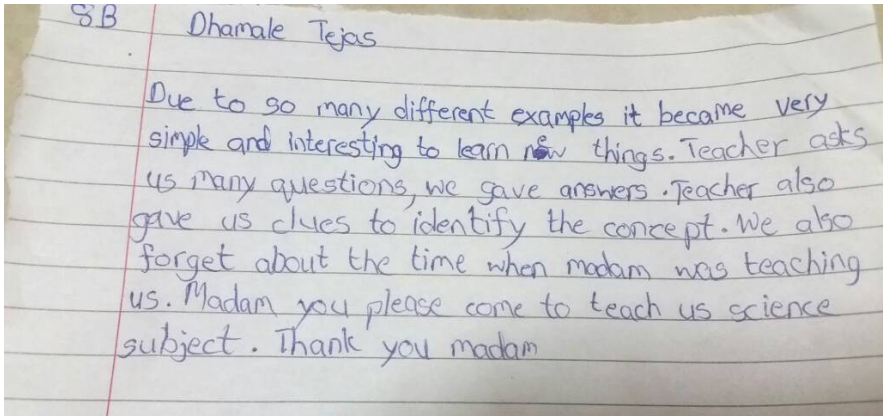
Bairagi Sidhi

8A Madams teaching was very good. In the beginning she explained all the main points. and remaining points she connected with each other. So all the content we remembered very well. She also showed various diagrams, pictures which made the lesson very interesting and easy to understand. she ask many questions and also gave answers to our questions. I understood these lessons very well. Thank you madam



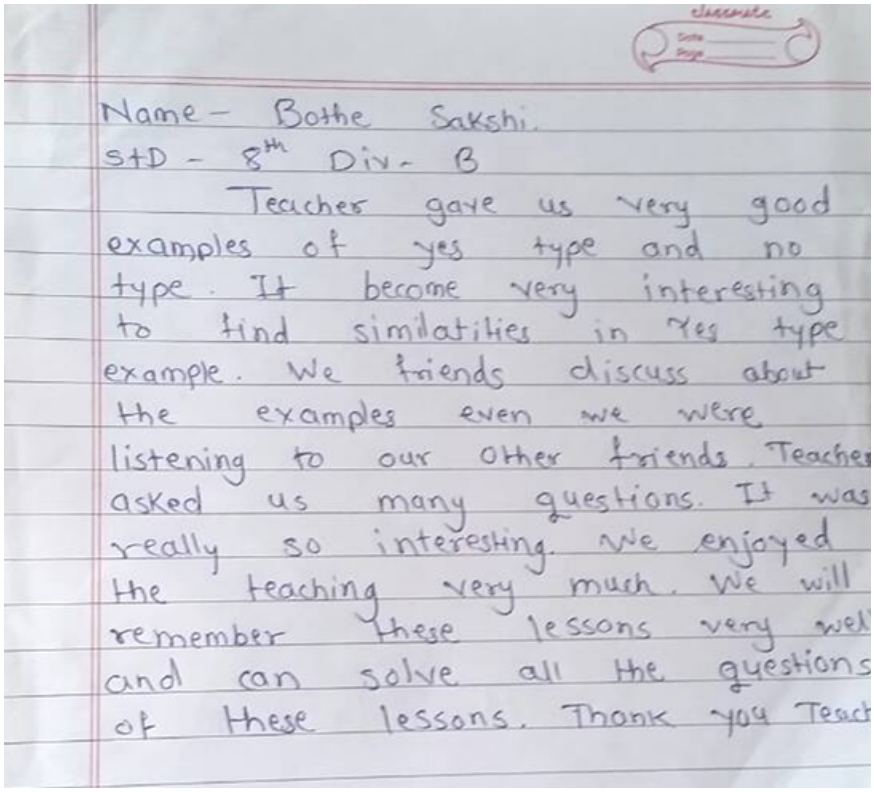
Jadhav Prithviraj

8A In the begining all the ideas became clear about what is there in the lesson we all paid very good attention as the way of teaching was very good. we can all recall these four chapters as it fixed in our brain even our science teacher should teach us by using this method.



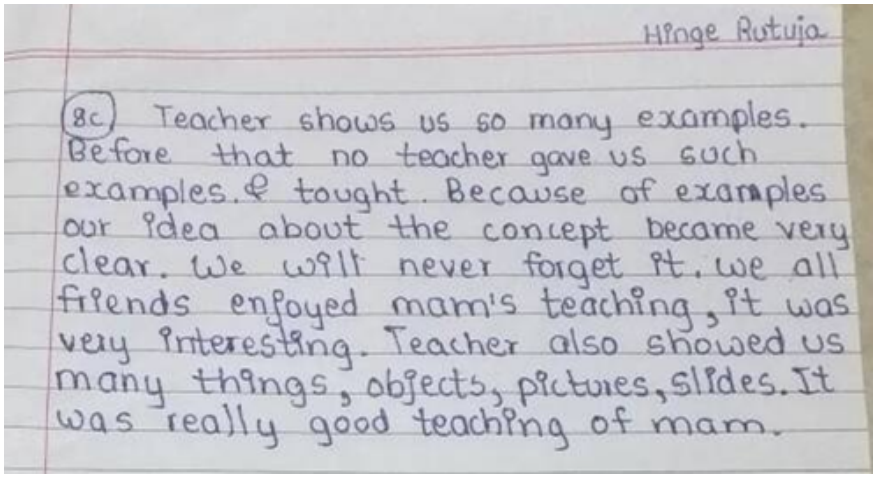
8B Dhamale Tejas

Due to so many different examples it became very simple and interesting to learn new things. Teacher asks us many questions, we gave answers. Teacher also gave us clues to identify the concept. We also forget about the time when madam was teaching us. Madam you please come to teach us science subject. Thank you madam



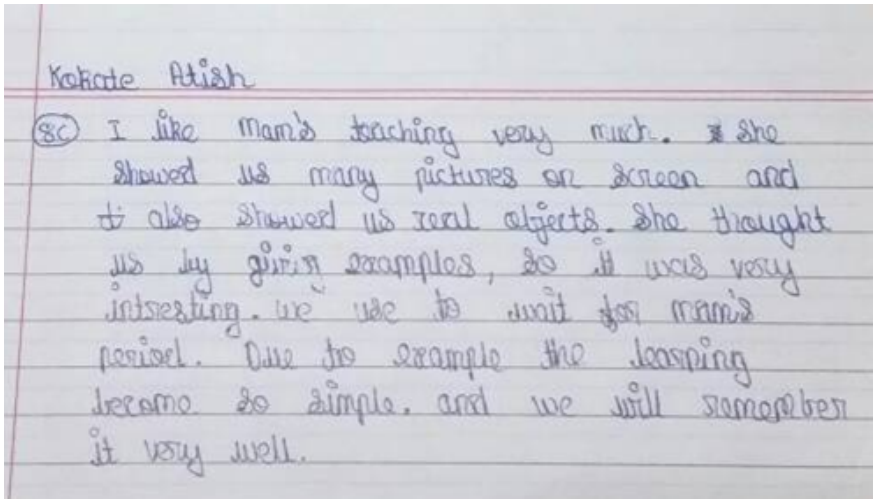
Name - Bothe Sakshi.
STD - 8th Div - B

Teacher gave us very good examples of yes type and no type. It become very interesting to find similatities in Yes type example. We friends discuss about the examples even we were listening to our other friends. Teacher asked us many questions. It was really so interesting. We enjoyed the teaching very much. We will remember these lessons very well and can solve all the questions of these lessons. Thank you Teach



Hinge Rutuja

(8c) Teacher shows us so many examples. Before that no teacher gave us such examples. & tought. Because of examples our idea about the concept became very clear. We will never forget it. we all friends enfoyed mam's teaching, it was very interesting. Teacher also showed us many things, objects, pictures, slides. It was really good teaching of mam.



Kokate Atish

(8c) I like mam's teaching very much. She showed us many pictures on screen and it also showed us real objects. She thought us by giving examples, so it was very interesting. we use to wait for mam's period. Due to example the learning become so simple. and we will remember it very well.

❑❑❑