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KARTET 2018



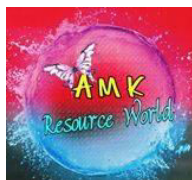
FREE

METHODOLOGY OF TEACHING SCIENCE

E - Book for KARTET

(Covers all Important Concepts as per Syllabus)





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METHODOLOGY OF TEACHING SCIENCE

WHAT IS SCIENCE?

We will not give you any standard definition of science as given by scholars nor the definition given by scientists. Instead we will help you to define science in your own words as you develop an understanding of science.

Human beings are curious by nature. They have a highly developed mind because of which they can observe precisely, correlate observations and predict future happenings on the basis of their observations. This ability has helped human beings to adjust to nature.

They explore, interpret and change the physical world according to their own need and requirement. The process of observing, describing, exploring and using the physical world is nothing but science.

Suppose Aman says "All insects have three pairs of limbs." If this statement is Aman's own observation then we will say that Aman is learning science.

What are the sequences after which Aman has given this statement?

Aman saw an ant moving on a wall and while observing its movement his attention was diverted to its legs. On another occasion he saw an housefly and his attention was drawn on its legs. Aman was amazed to note that it also had the same number of legs as an ant had. In this way Aman's instances of observing insects goes on increasing and he gave the conclusion that 'all insects have 3 pair of limbs.'

The first observation could be chance observation but once he realised the similarities his further observations became more intentional or selected some element of curiosity was involved in Aman's second observation onward. During the intentional observations Aman might have observed other creatures also which he kept in other categories. He could have retained his attention only on insects and that too on the part of body responsible for locomotion. Aman is learning science. Aman has not given the statement on the basis of only one observation Learning of science is a lengthy and continuous process.

SCIENCE AS A PROCESS

Process and processing are the words we often use in our day-to-day conversations. In teaching profession alone the word 'Process' is extensively used such as admission process, teaching process, learning process, process of socialization, examination process, and evaluation process etc.

Process may involve the following activities :

- steps to accomplish a task
- ways of doing work
- planning various stage of an activity, and
- establishing systematic steps for gathering and retaining information.

In science, the way of gathering information, thinking, measuring, solving a problem or in other words the ways of learning science are called the 'processes of science'.

Let us reconsider Aman's observation leading to his statement 'All insects have three pairs of limbs'. First of all, Aman :

- became aware of various insects in and around his house
- saw some ants carrying sugar cubes
- was curious about their activity.

Then, he:

- by chance observes the limbs/legs and count them
- intentionally observes housefly, mosquito and other small insects in and outside home
- observes common characteristics of insects especially limbs
- draws inferences, and
- makes a statement.

Basic Processes or Basic Processing Skills

Aman has employed two basic skills here :

- 1. Observation and**
- 2. Inferences.**

To apply processes, certain skills are required. These skills are called processing skills. These are as follows.

Observation:

You must be clear by now that observation is not just 'seeing' or 'looking at', or 'glancing' or 'viewing'. During the time we are awake, we 'see' or 'look at' various objects and phenomenon around us. The regularity in viewing these phenomena or objects catches our attention becomes observation

- **Observation**
- **Classification**
- **Communication**
- **Measurement**
- **Estimations**
- **Prediction**
- **Generalization.**

INFERENCE

The abilities of Prediction, Explanation and Generalization together form the process of making Inferences.

The quality of knowledge acquired by an individual depends upon the quality of basic skills applied. Sharp observation will lead to sound and accurate knowledge.

As the mind grows with age, the complexities of the processes also increase. Several skills functions together and help the child to interact and adjust in his physical and social environment. Integration or skills help an individual to answer Why, When and How type of questions. Many skills are required to solve a problem and to carry on an experiment. These skills are:

Integrated Skills

Various skills that are required to carry on an experiment successfully or to solve a problem are known as integrated Skills.

When an individual is confronted with a problem, then he looks for the nature of the problem and its relationship with the whole system. Suppose you want to dissolve some solid substance into a given amount of liquid to make a solution, and you wonder as to how much solid could be dissolved in the liquid. Now the process of making the solution depends upon the nature of the solute, nature of the solvent and the temperature. These are the variables of the system. Here system can be designated as the 'solution'.

Skills are:

- **Identifying and Controlling Variables**
- **Defining Operationally**
- **Forming Hypothesis**
- **Experimenting:**
- **Tabulation or Graphing**
- **Interpreting Data**
- **Investigating**

The systematic and organised use of the above mentioned process skills help people understand and adjust to their physical and social environment. It is through these processes that they learn to unfold the mysteries of nature which in turn help them to use nature according to their own needs and requirements. According to **Dr. D.S. Kothari** - "**to learn science is to do science, there is no other way of learning science.**" **Science is a systematic process of learning"**

SCIENCE PROCESS SKILLS

To apply processes, certain skills are required. These skills are called processing skills. These are as follows.

Observation:

You must be clear by now that observation is not just 'seeing' or 'looking at', or 'glancing' or 'viewing'. During the time we are awake, we 'see' or 'look at' various objects and phenomenon around us. The regularity in viewing these phenomena or objects catches our attention and becomes observation.

We see birds flying, raining, cloth drying, water boiling or different varieties of plants, flowers, animals etc. The foremost process skill is observation. It is through observation only that we know our environment, physical as well as social. We observe natural phenomena, objects, plants, animals and human beings and learn about their nature and behaviour

What do you do when you first observe a thing? You look for its characteristics and on the basis of these characteristics you classify it into a particular category.

Classification:

During classification, you may group distinct objects in one group on the basis of similarities which the objects share e.g. text books, reference books, novels, story books etc. are grouped together under the category or class of books. Similarly, are the class of Insects, Flowers, Acids, Carnivorous or Intelligent People etc.

Communication:

For representing a class of objects we need some name, label, sign or symbol etc. These labels and signs communicate the information about the class members. Communication is an important skill in transmitting and testing the knowledge. For recording and communicating the information, especially in science we also need the skill of Measurement.

Measurement:

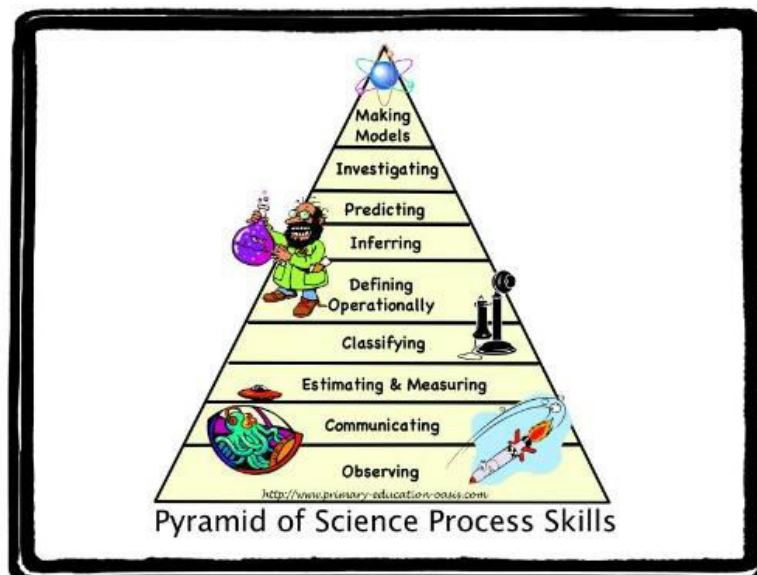
Measurement is used, for recording precise and accurate observations. For example 'rise in temperature, change in dimensions, change in duration etc. For recording such observation various scales and instruments could be used. Selection of the instruments depend upon the degree of precision or exactness required in the measurement.

Estimations:

Sometimes we do not require such accuracy there we can use Estimations e.g. half a class of water or one fourth of a piece of bread, a bunch of flowers etc. On the basis of the acquisition of the aforementioned skills one can peip into the future. While planning activities skill of prediction is required.

Prediction:

When you observe dark clouds in the sky, what do you say about the weather? If you have to go out you may have to take an umbrella. Why? Because you have predicted, the weather. Prediction is the skill which helps us to know the behaviour of any particular object or phenomenon before it



happens. All our planning depends upon prediction. Prediction about eclipses, crops, weather, behaviour of substances of human beings are some instances.

If you are able to predict various phenomena on the basis of your experience and observations, you can also explain it. To explain the phenomenon you should be able to relate various facts properly. This ability of establishing relationship between various phenomena or facts is the ability of **Generalization**.

INTEGRATED SCIENCE PROCESS SKILLS

Integrated Skills: Various skills that are required to carry on an experiment successfully or to solve a problem are known as integrated Skills. **These skills are:**

Identifying and Controlling Variables:

In science we study the effect of one variable over the other. For example if you want to study the effect of 'Praise' on the 'achievement' of your students. The first variable i.e. 'Praise' will be called the Independent Variable and the effect of this variable; on other variable i.e. "Achievement" which is called the Dependent Variable will be seen. There are other factors also which might effect the achievement but you are not studying their effect on the achievement such as age of the students, intelligence, physical comforts, fatigue etc. These variables have to be controlled or kept constant.

Defining Operationally:

Whatever information individuals acquire through experiments, observations or experiences, they use it to describe in meaningful statement is the phenomenon, object or event etc. For example "The solubility of a substance in a given solution increases with the increase in temperature of the solution."

Forming Hypothesis:

We have already discussed the meaning and importance of prediction. Statements of predictions are also called the Hypotheses. It denotes the conditions in which future happenings are expected. As these statements mention the conditions for prediction, they are said to be more formal and controlled scientifically. Hypothesis makes a guess about the expected outcome of an experiment.

Experimenting:

Experiments are conducted to test hypothesis. Designing and conducting an experiment requires the use of many skills. During the testing of a hypothesis we study the effect of independent variable on the dependent variable keeping other variables under control.

Tabulation or Graphing:

During the experiment the investigator collects information in an organised way. The information can be represented clearly in the form of tables or graphs.

Interpreting Data:

The information received or the knowledge gained through the study of data help the investigator to test the hypothesis or form conclusions. You can study the table and conclude that amount of solute dissolved in one litre of solution increases with rise in temperature or the volume of a gas decreases with rise in pressure.

Investigating:

In order to solve a problem pupils are required to observe, collect and analyse the data in order to form meaningful conclusions. All the above mentioned processes help the learner to discover meaningful information and form/take decisions.

The systematic and organised use of the above mentioned process skills help people understand and adjust to their physical and social environment. It is through these processes that they learn to unfold the mysteries of nature which in turn help them to use nature according to their own needs and requirements.

According to Dr. D.S. Kothari - "to learn science is to do science, there is no other way of learning science.' Science is a systematic process of learning".

OBJECTIVES AND AIMS OF TEACHING SCIENCE

Education is a process of bringing about changes in an individual in a desired direction. It is a process of helping a child to develop his potentialities to the maximum and to bring out the best from within the child. To bring about these changes we teach them various subjects at different levels of school.

Science as a subject is included in the school curriculum from the very beginning. Before taking any decision about teaching science we should pose certain questions to ourselves, such as, why do we teach them science? What are the goals and objectives of teaching science? What changes does science teaching bring about in the behaviour of the students?

A **goal** is the ultimate target in life which an individual tries to achieve. Goals are basically long term objectives which require a long period of time to be achieved. For example, development of scientific attitude, to become a responsible citizen etc.

Objectives are short term targets which are specific and could be achieved in a single day or single hour. For example, acquiring knowledge about

:some specific things within a prespecified time limit, would come under the purview of objectives.

Students are potential human resources required to be developed into educated, sound, skilled and efficient citizens who will fulfill the aims of social, economical, political and technological development of the society.

The aim of education is to provide opportunities for personal all-round development of individuals, to equip them with upto date and sound knowledge of science and technology and make them capable of using science and technology for the betterment of human society.

Goals/Aims for Science Teaching

Considering the individual teacher and his/her own reason for teaching science it would become impossible for any educational system to provide facilities for each teacher to achieve his/her goals. Therefore, goals are decided at the national level.

Various commissions and committees on education set up by Government of India after Independence emphasized the teaching of science from the primary level. All of them emphasized the teaching of science for:

- the development of process skills like observation, classification, measurement, communication etc.
- acquisition and understanding of knowledge, development of problem solving skill, skill of investigation, ability to think logically and to draw conclusions on the basis of experiments.
- development of ability to reach generalizations and to apply them for solving every day problems.
- development of understanding of inter-relationships of science and society.
- to foster creativity in people, enabling them to carry out innovations in science.

GOALS FOR SCIENCE INSTRUCTION UNDER 'PROJECT-2061' (NSF, WASHINGTON)

Goal-I: Science must enhance each learner's Personal Development

This could be achieved when children will :

- understand and use new ideas and scientific information to improve their lives.
- develop skills to support scientific inquiry.
- develop problem solving skills needed to respond to a changing society and environment.
- develop a positive attitude towards science that will encourage continued interest and learning.
- develop the attitude and skills they need to become responsible consumers.

This goal focuses on ways to enhance students' personality, their curiosity, honesty, self confidence, ability to make decisions, examine values, reason logically and practice the ethics of science

Goal-II: Learner must understand the inter-relationship of Science, Technology and Society

Under this goal the learners will be able to :

- understand the interaction of science, technology and society.
- recognize that solution to one problem can create new problems and that decision must consider the possible consequences for other community members.
- recognize that data may be interpreted differently by different people depending on their values and experiences.
- recognize how the advancement of science and technology has changed the lives of people in local, national and global communities.
- possess a sense of custodianship (collective responsibility for the environment over a period of time) as the need for conservation increases.

GOAL-III: Science must develop each learner's Academic and Process Skill

Science instruction should help the learners to:

- develop a knowledge and understanding of scientific principles and concepts.
- develop attitude, values, ethics of science to use as a basis for science related decisions.
- learn to think critically, creatively and rationally so that they can solve problems and promote lifelong learning.
- develop process skills so that they can think scientifically.
- develop psychomotor skills so that they can properly manipulate/handle equipment and instruments.

This goal concentrates on what children need to become scientifically literate. The curriculum must include the knowledge, concepts, principles, and ideas of science, as well as the attitudes, values and ethics of science, and critical thinking and problem solving skills.

GOAL-IV: Science must help to expand each learner's career awareness

This goal focuses on learner 's ability to :

- realize that science and technology are relevant to all fields of employment.
- develop an awareness of occupational and professional opportunities in science for women, minorities and handicapped.
- develop an awareness of science requirements for occupations and professions.
- recognize that scientists and technicians possess a full range of personal characteristics and should not be stereotyped.

- develop effective and positive work habits related to science.
- become informed about the contribution scientists make to society.

These goals of education are intended to be achieved by the time pupils leave the school and enter the society as responsible and efficient citizens. During the school years they are in the process of developing the personal, social and intellectual aspects of the personality. However, it is necessary to see that the development is taking place in the right direction. In order to monitor the process of development, short term objectives of teaching have been framed by educationists in all societies keeping in view the requirements and nature of individuals as well as that of the discipline, towards progressive development.

PROBLEM IN SCIENCE TEACHING

While all curriculum areas share some of the same issues and concerns, individual curriculum areas seem to also have concerns specific to them and their courses. This list looks at the top ten concerns for science teachers. Hopefully, providing a list such as this can help open up discussions with fellow teachers who can then work towards effective solutions to these issues.

1. Safety

Many science labs, especially in chemistry courses, require students to work with potentially dangerous chemicals. While science labs are equipped with safety features like ventilation hoods and showers, there is still a concern that students will not follow directions and harm themselves or others. Therefore, science teachers must always be aware of everything that is happening in their rooms during labs. This can be difficult, especially when students have questions requiring the teacher's attention.

2. Dealing with Controversial Topics

Many topics covered in science courses can be considered controversial. Therefore, it is important that the teacher has a plan and knows what the school district policy is concerning the way they teach topics such as evolution, cloning, reproduction, and more.

3. Knowledge vs. Understanding

Since science courses cover a large number of topics, there is always friction between how deep and how wide a teacher should go in their curriculum. Due to time constraints, most teachers will teach a breadth of knowledge without having the time to go in depth on individual topics.

4. Time Consuming Planning Requirements

Labs and experiments often require science teachers to spend a lot of time in preparation and set up. Therefore, science teachers have less time to grade during the normal school hours and often find themselves working late or coming in early to keep up.

5. In Class Time Constraints

Many labs cannot be completed in less than 50 minutes. Therefore, science teachers are often faced with the challenge of dividing labs up over the course of a couple of days. This can be difficult when dealing with chemical reactions, so a lot of planning and forethought needs to go into these lessons.

6. Cost Limitations

Some science lab equipment costs a lot of money. Obviously, even in years without budget constraints, this precludes teachers from doing certain labs. This can be especially difficult for newer teachers to deal with as they come across great labs that they just can't afford to create.

7. Facilities Limitations

School labs across the country are aging and many do not have new and updated equipment called for during certain labs and experiments. Further, some rooms are set up in such a way that it is actually difficult for all students to effectively participate in labs.

8. Prerequisite Information

Certain science courses require students to have prerequisite math schools. For example, chemistry and physics both require strong math and particularly algebra skills. When students are placed in their class without these prerequisites, science teachers find themselves teaching not only their topic but also the prerequisite math required for it.

9. Collaboration vs. Individual Grades

Many laboratory assignments require students to collaborate. Therefore, science teachers are faced with the issue of how to assign individual grades for these assignments. This can sometimes be very difficult. It is important for the teacher to be as fair as possible so implementing a form of individual and group evaluations is an important tool in giving out fair grades to students.

10. Missed Lab Work

Students will be absent. It is often very difficult for science teachers to provide students with alternative assignments for lab days. Many labs cannot be repeated after school and students are instead given readings and questions or research for assignments. However, this is another layer of lesson planning that can not only be time consuming for the teacher but provide the student with much less of a learning experience

INNOVATIONS IN SCIENCE TEACHING PRACTICE

Thanks to internal and external motivation, man has always been on the way to exploring knowledge and enhancing required skills. His insatiable thirst for knowledge has been instrumental in constructing new knowledge and building new skills. This process still continues and the product of it is innovation. In fact, innovations happen in all areas of life.

Innovation in Teaching –Learning of Science

With changing curriculum there is need to bring change in teaching-learning process. The teacher should keep in mind the prior experiences/exposure of child while planning curricular inputs. Teacher should involve learner in teaching –learning process in order to develop interest of students in learning science. The NCF 2005 also emphasizes the constructivist approach of pedagogical practices. There can be various innovative practices adopted by teacher like use of kits/software, IT -based modules, hands-on learning, exploratory modules etc. which are elaborated below so that the teachers develop papers for the NTSC based on his/her efforts in above mentioned areas.

Hands-on Activities based on scientific principles:

Teacher can develop such activities for teaching-learning of science involving students in performing different activities in the classroom or outside the classroom. For example; the teacher can develop such activities for various topics such as; solubility of substances in water, scattering of light, studying the stages and conditions of germination of seeds by using materials from the surroundings.

Exploratory Modules/studies:

Modules are the written material / documents developed by the teachers or experts on various topics. Teacher may use this type of material for his/her teaching. The modules are like self-learning material written in simple to complex or known to unknown forms. For example; for studying topic like food chains, types of plants and the seasons in which they grow and flourish, exploring different types of agricultural practices adopted by farmers etc.

Experimental Study:

teachers should try to design some experimental study on some scientific concepts, processes or phenomena related to science curriculum. These experiments may include topics like, study of the phenomena of transpiration in plants, study of natural indicators, water holding capacity of the soil etc.

Use of Resource Material:

Such materials are developed or procured from the surroundings/ available source by the teachers for his/her teaching and to develop students' interest in science. For example; teacher may develop series of small experiments to be performed by the students, teacher can even see the effectiveness of the resource material developed for physically challenged and other categories of special children etc.

Multimedia Packages / Software Packages/ IT based Modules:

As a teacher one can develop or procure such packages for using them in teaching-learning process. For example; teaching abstract concepts like structure of atom, blood circulatory system in human being etc.

Improvised Apparatus/Kits:

Teacher may try to develop and use the low-cost improvised apparatus or kits for teaching science. They may also carry out comparative study of the effectiveness of different kits/ apparatus, if available for the same topic/concept.

Evaluation/Assessment:

Teachers may carry out studies on the effectiveness of different assessment techniques and tools. Based on observation, reporting, some of the process skills may also be assessed. Studies may also be conducted on teachers' perception about the Continuous and Comprehensive Evaluation system.

Action Research by Teachers:

Teachers can take up action research for solving the problems faced by them in their classrooms. For example; students with learning difficulties may be helped by using carefully prepared remedial material.

Curriculum Reform:

Teachers' perception about the existing curriculum can be taken-up and also their suggestion for further modification of the same.

Note for the Teachers:

Teacher should try to develop their papers for the NTSC by following the steps given below;

- Sensing and defining the problem
- Survey of related literature
- Development of Tools/ Experimental design
- Collection of data
- Classification and analysis of the data
- Interpretation of data and drawing inferences

BLOOM'S TAXONOMY OF INSTRUCTIONAL OBJECTIVES

In 1956, Benjamin Bloom with collaborators Max Englehart, Edward Furst, Walter Hill, and David Krathwohl published a framework for categorizing educational goals: *Taxonomy of Educational Objectives*. Familiarly known as Bloom's Taxonomy, this framework has been applied by generations of K-12 teachers and college instructors in their teaching.

The framework elaborated by Bloom and his collaborators consisted of six major categories: Knowledge, Comprehension, Application, Analysis, Synthesis, and Evaluation. The categories after Knowledge were presented as "skills and abilities," with the understanding that knowledge was the necessary precondition for putting these skills and abilities into practice.

Bloom's taxonomy is a classification of learning objectives within education. It is named for Benjamin Bloom, who chaired the committee of educators that devised the taxonomy, and who also edited the first volume

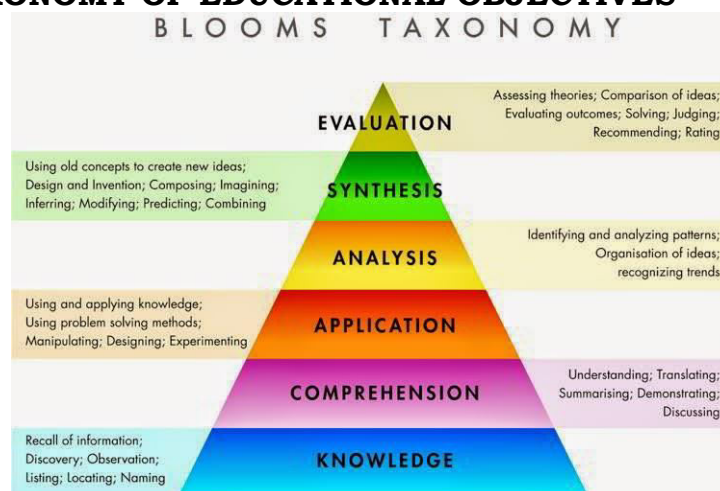
of the standard text, *Taxonomy of Educational Objectives: The Classification of Educational Goals*.

Bloom's taxonomy refers to a classification of the different objectives that educators set for students (learning objectives). It divides educational objectives into three "domains": cognitive, affective, and psychomotor (sometimes loosely described as "knowing/head", "feeling/heart" and "doing/hands" respectively). Within the domains, learning at the higher levels is dependent on having attained prerequisite knowledge and skills at lower levels. A goal of Bloom's taxonomy is to motivate educators to focus on all three domains.

There are three taxonomies. Which of the three to use for a given measurable student outcome depends upon the original goal to which the measurable student outcome is connected. There are knowledge-based goals, skills-based goals, and affective goals (affective: values, attitudes, and interests); accordingly, there is a taxonomy for each. Within each taxonomy, levels of expertise are listed in order of increasing complexity. Measurable student outcomes that require the higher levels of expertise will require more sophisticated classroom assessment techniques.

When developing instructional objectives, providing instruction, and evaluating student performance, it is important to keep in mind that there are different levels or outcomes of learning. Distinguishing among different levels and outcomes of learning is important. If teachers are unaware of different levels of learning, they are likely to focus on one level to the detriment of others. For example, a teacher may teach a vast amount of factual information but never get around to teaching students to apply and synthesize this information. Or a teacher may teach higher level thinking skills without realizing that these skills require the prior learning of basic skills that must be integrated into these higher order skills.

BLOOM'S TAXONOMY OF EDUCATIONAL OBJECTIVES



Cognitive Domain

1. **Knowledge** (Remembering previously learned material)
2. **Comprehension** (Grasping the meaning of material)
3. **Application** (Using information in concrete situations)
4. **Analysis** (Breaking down material into parts)
5. **Synthesis** (Putting parts together into a whole)
6. **Evaluation** (Judging the value of a product for a given purpose, using definite criteria)

Knowledge (recalling information) represents the lowest level in Bloom's taxonomy. It is "low" only in the sense that it comes first - it provides the basis for all "higher" cognitive activity. Only after a learner is able to recall information is it possible to move on to **comprehension** (giving meaning to information). The third level is **application**, which refers to using knowledge or principles in new or real-life situations. The learner at this level solves practical problems by applying information comprehended at the previous level. The fourth level is **analysis** - breaking down complex information into simpler parts.

The simpler parts, of course, were learned at earlier levels of the taxonomy. The fifth level, **synthesis**, consists of creating something that did not exist before by integrating information that had been learned at lower levels of the hierarchy. **Evaluation** is the highest level of Bloom's hierarchy. It consists of making judgments based on previous levels of learning to compare a product of some kind against a designated standard.

Bloom's Taxonomy of Educational Objectives for Knowledge-Based Goals

| | | |
|-------------------------|--|---|
| 1. Knowledge | Recall, or recognition of terms, ideas, procedure, theories, etc. | When is the first day of Spring? |
| 2. Comprehension | Translate, interpret, extrapolate, but not see full implications or transfer to other situations, closer to literal translation. | What does the summer solstice represent? |
| 3. Application | Apply abstractions, general principles, or methods to specific concrete situations. | What would Earth's seasons be like if its orbit was perfectly circular? |
| 4. Analysis | Separation of a complex idea into its constituent parts and an understanding of organization and relationship between the parts. | Why are seasons reversed in the southern hemisphere? |

| | | |
|----------------------|--|--|
| | Includes realizing the distinction between hypothesis and fact as well as between relevant and extraneous variables. | |
| 5. Synthesis | Creative, mental construction of ideas and concepts from multiple sources to form complex ideas into a new, integrated, and meaningful pattern subject to given constraints. | If the longest day of the year is in June, why is the northern hemisphere hottest in August? |
| 6. Evaluation | To make a judgment of ideas or methods using external evidence or self-selected criteria substantiated by observations or informed rationalizations. | What would be the important variables for predicting seasons on a newly discovered planet? |

Bloom's Taxonomy of Educational Objectives for Skills-Based Goals

| Level of Expertise | Description of Level | Example of Measurable Student Outcome |
|-------------------------------|---|---|
| Perception | Uses sensory cues to guide actions | Some of the colored samples you see will need dilution before you take their spectra. Using only observation, how will you decide which solutions might need to be diluted? |
| Set | Demonstrates a readiness to take action to perform the task or objective | Describe how you would go about taking the absorbance spectra of a sample of pigments? |
| Guided Response | Knows steps required to complete the task or objective | Determine the density of a group of sample metals with regular and irregular shapes. |
| Mechanism | Performs task or objective in a somewhat confident, proficient, and habitual manner | Using the procedure described below, determine the quantity of copper in your unknown ore. Report its mean value and standard deviation. |
| Complex Overt Response | Performs task or objective in a confident, proficient, and habitual manner | Use titration to determine the K_a for an unknown weak acid. |
| Adaptation | Performs task or objective as above, but can also modify actions to account for | You are performing titrations on a series of unknown acids and find a variety of problems with the resulting curves, e.g., only 3.0 ml |

| | | |
|---------------------|--|--|
| | new or problematic situations | of base is required for one acid while 75.0 ml is required in another. What can you do to get valid data for all the unknown acids? |
| Organization | Creates new tasks or objectives incorporating learned ones | Recall your plating and etching experiences with an aluminum substrate. Choose a different metal substrate and design a process to plate, mask, and etch so that a pattern of 4 different metals is created. |

Bloom's Taxonomy of Educational Objectives for Affective Goals

| Level of Expertise | Description of Level | Example of Measurable Student Outcome |
|---|---|---|
| Receiving | Demonstrates a willingness to participate in the activity | When I'm in class I am attentive to the instructor, take notes, etc. I do not read the newspaper instead. |
| Responding | Shows interest in the objects, phenomena, or activity by seeking it out or pursuing it for pleasure | I complete my homework and participate in class discussions. |
| Valuing | Internalizes an appreciation for (values) the objectives, phenomena, or activity | I seek out information in popular media related to my class. |
| Organization | Begins to compare different values, and resolves conflicts between them to form an internally consistent system of values | Some of the ideas I've learned in my class differ from my previous beliefs. How do I resolve this? |
| Characterization by a Value or Value Complex | Adopts a long-term value system that is "pervasive, consistent, and predictable" | I've decided to take my family on a vacation to visit some of the places I learned about in my class. |

To determine the level of expertise required for each measurable student outcome, first decide which of these three broad categories (knowledge-based, skills-based, and affective) the corresponding course goal belongs to. Then, using the appropriate Bloom's Taxonomy, look over the descriptions of the various levels of expertise. Determine which description most closely matches that measurable student outcome.

Evaluation:

Evaluation, particularly educational evaluation, is a series of activities that are designed to measure the effectiveness of the teaching-learning system as a whole. We are already familiar with the fact that the teaching-learning process involves interaction of three major elements i.e., Objectives, learning experiences and learner appraisal. Evaluation takes care of all the interactive aspects of three major elements i.e., the whole teaching-learning system.

“Evaluation is the collection, analysis and interpretation of information about any aspect of a programme of education, as part of a recognized process of judging its effectiveness, its efficiency and any other outcomes it may have.”

The above Definition offers the following

Evaluation is not just another word for assessment. The quality of our learner’s learning may well be one of the outcomes we need to evaluate. But many other factors may be equally worth looking at.

Assessment:

By assessment, we mean the processes and instruments that are designed to measure the learner’s achievement, when learner are engaged in an instructional programme of one sort or another. It is concerned with ascertaining the extent to which the objectives of the programme have been met. The term assessment/is often used interchangeably with the terms evaluation and measurement. However, assessment has a narrower meaning than evaluation but a broader meaning than measurement. In its derivation, the word assess means “to sit beside” or “to assist the judge”. It, therefore, seems appropriate in evaluation studies to limit the term assessment to the process of gathering the data and fashioning them into an interpretable form; judgement can then be made on the basis of this assessment.

Assessment as we define it, precedes the final decision-making stage in evaluation e.g., the decision to continue, modify, or terminate an educational programme.

Measurement:

It is mainly concerned with collection or gathering of data e.g., students scores in an examination. It is an act or process of measuring physical properties of objects such as length and mass. Similarly, in behavioural sciences, it is concerned with measurement of psychological characteristics such as neuroticism, and attitudes towards various phenomena.

Evaluation involves assessment and measurement it is a and more inclusive term than assessment and measurement.

Hence evaluation process is quite comprehensive and it is very much desired for effective teaching and learning.

Types of Evaluation

Formative Evaluation

The goal of formative Evaluation is to monitor student learning to provide ongoing feedback that can be used by instructors to improve their teaching and by students to improve their learning. More specifically, formative Evaluations:

- help students identify their strengths and weaknesses and target areas that need work
- help faculty recognize where students are struggling and address problems immediately

Formative Evaluations are generally low stakes, which means that they have low or no point value. Examples of formative Evaluations include asking students to:

- draw a concept map in class to represent their understanding of a topic
- submit one or two sentences identifying the main point of a lecture
- turn in a research proposal for early feedback

Summative Evaluation

The goal of summative Evaluation is to evaluate student learning at the end of an instructional unit by comparing it against some standard or benchmark.

Summative Evaluations are often high stakes, which means that they have a high point value. Examples of summative Evaluations include:

- a midterm exam
- a final project
- a paper
- a senior recita

Continuous and Comprehensive Evaluation

Continuous and comprehensive evaluation is an education system newly introduced by Central Board of Secondary Education in India, for students of sixth to tenth grades. The main aim of CCE is to evaluate every aspect of the child during their presence at the school. This is believed to help reduce the pressure on the child during/before examinations as the student will have to sit for multiple tests throughout the year, of which no test or the syllabus covered will be repeated at the end of the year, whatsoever. The CCE method is claimed to bring enormous changes from the traditional chalk and talk method of teaching, provided it is implemented accurately.

BASIC FEATURES OR CHARACTERISTICS OF A GOOD EVALUATION PROCESS

● **Validity:** A valid evaluation is one which actually tests what is sets out to test i.e., one which actually measures that behaviour described by the objective(s), under scrutiny. Obviously, no one would deliberately. Construct an evaluation item to test irrelevant material but very often non-valid test

items are in fact used e.g., questions that are intended to test recall of factual material but which actually test the candidate's powers of reasoning, or questions which assume a level of pre-knowledge that the candidates do not necessarily possess.

● **Reliability:** The reliability is a measure of the consistency with which the question, test or examination produces the same result under different but comparable conditions. A reliable evaluation item gives reproducible scores with similar populations of students. It is therefore, independent of the characteristics of individual evaluations. In order to maintain reliability, one evaluative question should test only one thing at a time and give the candidates no other option. The evaluation should also adequately reflect the objectives of the teaching unit.

● **Practicability:** Evaluation procedure should be realistic, practical and efficient in terms of their cost, time taken and ease of application. It may be an ideal procedure of evaluation but may not be put into practice,

● **Fairness:** Evaluation must be fair to all students. This can be possible by accurately reflecting a range of expected behaviours as desired by the course objectives. To keep fairness in evaluation, it is also desired that students should know exactly how they are to be evaluated. This means that students should be provided information about evaluation such as nature of the materials on which they are to be examined (i.e., Context and Objectives), the form and structure of the examination, length of the examination and the value (in terms of marks) of each component of the course.

● **Usefulness:** Evaluation should also be useful for students. Feedback from evaluation must be made available to the students and weakness. By knowing their strength and weakness, students can think of further improvement. Evaluation should suggest all the needful requirements for their improvement.

● **Interpretation of Results:** Another factor which must be considered in the choice of a test is the ease of interpretation of test results. A test score is not meaningful unless the teacher or counselor is able to decide what significance or importance should be attached to it and to make some judgment concerning its relationship to other kind of information about the student. Nearly all test publishers produce manuals designed to aid the teacher in interpreting test results.

But these manuals vary greatly on quality and in the thoroughness with which they do this important job. From the point of view of the teacher, principal, or counselor, the quality of the test manual should be just as important a factor in the choice of a test as the quality of the test itself

CONTINUOUS AND COMPREHENSIVE EVALUATION (CCE)

This content refers to a system of school – based evaluation of student that covers all aspect of students development. As the nomenclature also suggests, this new pattern in evaluation is not one, two, three times a year

but continuous one. It is a developmental process of assessment which emphasizes on two fold objectives and these objectives are continuity in evaluation and assessment of abroad based learning and behavioural outcomes on the other.

It is a total teaching-learning process and spread over the entire span of academic session. It means regularity of assessment, frequency of unit testing, diagnosis of learning gaps, use of corrective measures, refreshing and feed back to evidence to teacher and students for their self evaluation.

Second term comprehensive that the scheme attempt to cover both the scholastic and the co-scholastic aspects of students growth and development, CCE therefore a paradigm shift in evaluation, shifting the focus from testing to holistic learning. It aims to create good citizens possessing sound health, appropriate skills and desirable qualities besides academic excellence

Aims of CCE

- To help develop cognitive, psychomotor and affective skills
- To lay emphasis on thought process and de-emphasize memorization.
- To make evaluation an integral part of teacher learning process.
- To use evaluation for improvement of students achievement and teaching-learning strategies on the basis of regular diagnosis followed by remedial instruction.
- To use evaluation as a quality control device to maintain desired standard of performance.
- To determine social utility, desirability or effectiveness of a programme and take appropriate decisions about the learning, the process of learning and learning environment.
- To make the process of teaching and learning a learner-centred activity.

IMPORTANT FUNCTIONS OF CONTINUOUS AND COMPREHENSIVE EVALUATION

- Continuous evaluation helps in regular assessment to the extent and degree of students progress (ability and achievement with reference to specific scholastic and non-scholastic areas).
- Continuous evaluation serves to diagnose weakness and permit the teacher to ascertain an individual pupil's strengths and weakness and his needs. It provides immediate feedback to the teacher, who can then decide whether a particular unit or concept needs re-teaching into the whole class or whether a few individuals are in need of remedial instruction.
- It helps the teacher to organize effective teaching strategies,
- Mainly times, because of some personal reasons, family problems or adjustment problems, the children start neglecting their studies, resulting in a sudden fall in their achievement.

If the teacher, child and parents do not come to know about this sudden fall in the achievement and the neglect of studies by the child continues for a longer period then it will result in poor achievement and a permanent deficiency in learning for the child.

The continuous evaluation helps in bringing awareness of the achievement to the child, teachers and parents from time-to-time. They can look into the probable cause of the fall in achievement, if any, and may take remedial measures in time, to help the child overcome it at their own level.

●By Continuous evaluation, children can know their strength and weakness. It provides the child a realistic self-picture of how he and she studies. It can motivate children to develop good study habits, to correct errors, and to direct their activities towards the achievement of desired goals. It helps an individual to determine the areas of instruction in which more emphasis is required.

●Continuous and comprehensive evaluation ascertains areas of aptitude and interest. It helps in identifying changes in attitude, character and value pattern.

●It helps in making decisions for the future, regarding choice of subjects, courses and careers.

●It provides information/report on the progress of students in scholastic and non-scholastic areas and thus help in predicting the future successes of the learner.

Formative Evaluation

The goal of formative Evaluation is to monitor student learning to provide ongoing feedback that can be used by instructors to improve their teaching and by students to improve their learning. More specifically, formative Evaluations:

- help students identify their strengths and weaknesses and target areas that need work
- help faculty recognize where students are struggling and address problems immediately

Formative Evaluations are generally low stakes, which means that they have low or no point value. Examples of formative Evaluations include asking students to:

- draw a concept map in class to represent their understanding of a topic
- submit one or two sentences identifying the main point of a lecture
- turn in a research proposal for early feedback

This process is used to measure and monitor the learning of students during the period of instruction.

Objective: Its main objective is to provide continuous feedback to both teacher and student concerning learning success and failures while instruction is in process. Feedback to students provides reinforcement of successful learning and identifies the specific learning errors that need correction.

Feedback to teacher provides information for modifying instruction and for prescribing group and individual remedial work. Formative evolution depends on tests, quizzes, homework, classwork, oral questions prepared for

each segment of instruction. These are usually mastery tests that provide direct measures of all the intended learning outcomes of the segment.

Methodology The tests used for formative evaluation are mostly teacher-made. Observational techniques are also useful in monitoring student progress and identifying learning errors. Since formative evaluation is used for assessing student learning progress during instruction, the results are not used for assigning course grades.

Summative Evaluation

It is used to find out the extent to which the instructional objectives have been achieved particularly at the end of a terminal period. The goal of summative Evaluation is to evaluate student learning at the end of an instructional unit by comparing it against some standard or benchmark.

Summative Evaluations are often high stakes, which means that they have a high point value. Examples of summative Evaluations include:

- a midterm exam
- a final project
- a paper
- a senior recita

Objective/Purpose: It is used primarily for assigning course grades or for certifying student mastery of the intended learning outcomes at the end of a particular course programme. Although the main purpose of summative evaluation is assigning grades, It also provides information judgment the appropriateness of the course objectives and the effectiveness of instruction.

Methodology/Technique: The techniques used for summative evaluation are determined by the instructional objectives. For this evaluation, there are external examination as well as teacher-made tests, ratings etc.

DIFFERENCE BETWEEN SUMMATIVE AND FORMATIVE EVALUATION

● Summative evaluation refers to the assessment of worth whileness of the instructional programme which has already been completed, while formative evaluation refers to the assessment or worth of the instructional programme which is still going on and can still be modified.

● A formative evaluator is a partisan of the instructional sequence and does everything to make teaching-learning better. A summative evaluator is an uncommitted non-partisan person who is to pass judgment on an instructional endeavour.

● A summative evaluator gathers information and judges the merit of overall instructional sequence to adapt that sequence. The audience of summative evaluation is the consumer of the instructional programme in contrast to the formative evaluator whose audience is the designer and the developer of the programme.

● Summative evaluation, judgmental in nature. Its purpose is to appraise the teaching-learning process and to distinguish it from formative evaluation. It is an end of the course activity concerned with assessment of the larger instructional objectives of a course or a substantial chunk of the course.

● Formative evaluation is developmental, not judgmental in nature. Its purpose is to improve students learning and instruction. Therefore, its major function is feedback to the teacher and student to locate strengths and weaknesses in the teaching-learning process in order to improve it.

● Summative evaluation is thus a judgmental activity focused on certification of students achievement. But formative evaluation is a means of determining what the pupils have mastered and what is still to be mastered, thereby indicating the basis for improvement of students learning.

ACHIEVEMENT TEST

Teachers teach and help the learners to learn. The learning that takes place is assessed or evaluated not only for the learner's benefit but also for the teacher to evaluate his /her own work. At the end of a lesson or a group of lessons, the teacher needs to get feedback on what the learner has achieved, as a result of the teacher's efforts and also, indirectly to assess his/her own achievement as a teacher. This feedback comes with the help of a tool, generally an achievement test. An achievement test is designed to evaluate a unit during the teaching-learning process.

PURPOSE OF ACHIEVEMENT TESTS

Achievement tests are universally used in the classroom mainly for the following purposes :

- To measure whether students possess the pre-requisite skills needed to succeed in any unit or whether the students have achieved the objective of the planned instruction.
- To monitor students' learning and to provide ongoing feedback to both students and teachers during the teaching-learning process.
- To identify the students' learning difficulties- whether persistent or recurring.
- To assign grades.

TYPES OF QUESTIONS

There are mainly three kinds of questions - essay, short answer and objective type.

Essay Type

The essay type questions are still commonly used tools of evaluation, despite the increasingly wider applicability of the short answer and objective type

questions. There are certain outcome of learning (e.g. organising, summarising, integrating ideas and expressing in one's own way) which cannot be satisfactorily measured through objective type tests. The importance of essay tests lies in the measurement of such instructional outcomes.

An essay type question may give full freedom to the students to write any number of pages. The required response may vary in length. Limit may be imposed by restricting the content and the length of student's response in the statement of a question. Restricted response type items are quite useful for testing learning outcomes which require interpretation, application of outcomes which are specific and clearly defined in nature. Such types of questions help to reduce subjectivity in marking, which is considered to be the major drawback of essay tests.

In extended response type questions full freedom is given to the student to exercise his-her competence and demonstrate the best he/she possesses, of course, pertaining to the area of the subject. There is freedom to select, organise, integrate, evaluate and express in any way one likes or deems appropriate. Such questions, although useful for measuring global type of abilities, are not suitable for measuring specific learning outcomes, besides being difficult to grade.

Short Answer Questions

Short answer questions generally require exact answers and, although taking many forms, they share the following distinctive features.

- i) They usually take less than five minutes to read and answer, many take less than a minute.
- ii) They include some guidance on the extent of the answer required e.g. the size of answer, space or specific instruction such as "In not more than 20 words ..."
- iii) The answer is supplied by the pupil, not pre-selected as in objective questions.

They can be grouped into two broad categories :

- a) extended answer
- b) insert and completion

Extended Answer Type

The extended answer version includes questions which require pupils to write a brief description, draw a map, make a list, perform a calculation, translate a sentence, write down a definition or formula and so on. They are probably the commonest form of questions used in schools and are frequently used by examining Boards. They are deceptively easy to set and usually difficult to mark with any degree of speed and consistency.

Completion Type

The commonest form of completion questions is one where the pupil is required to add one or two words to complete an incomplete statement correctly. Where the missing words are in the body of the statement to be completed it is usually called an insert type. A completion type is where the words are required at the end of the statement. The use of insert or completion questions is not, however, limited to written statements and can be used to prepare extremely good questions based on incomplete maps, drawings, diagrams, formulae, calculations, and the like.

Objective Type Questions

What is an objective question? Simply, an objective question is one which is free from any subjective bias - either from the tester or the marker. Confusingly, in educational jargon, the adjective 'objective' usually means 'not subjective' while the noun 'objective' usually means an aim, a goal, target or intention. This sub-section is not about course objectives-aims, intended learning outcomes, etc. -but about testing which is free from subjective elements. There can only be one right or objective answer to an objective question. Objective questions can take various forms, but invariably they require brief answers with little or no writing. A simple tick or a quick oral answer may be enough.

Simple Recall

The most common used objective type question by teachers as part of their day-to-day teaching is simple recall. The teacher asks a short question, expecting a quick one-word answer or a simple statement completed.

Multiple Choice

A Multiple choice-item consists of three parts -a stem, a key and a number of distractors. The key and distractors together are often referred to as options. The stem can be either a direct question or an incomplete statement; the key is the correct answer and the distractors are plausible but incorrect answers.

True-False

As its name implies, the basic true-false item requires the pupil to select either 'true' or 'false' as the answer. It is usually written in the form of a statement which the pupil must decide as being either 'true' or 'false' or alternatively choose between other word pairs relating to the statement such as greater than-less than, plus-minus, often-rarely, same different, 'faster slower' and so on. It is the possibilities offered by these other pairs which make the true false form a particularly useful one.

Matching Block

The matching block format consists of two lists and the pupil is required to correlate correctly one or more entries from one list with one or more entries from the other so that correct matching by elimination is not possible.

Audio Visual Aids/ Instructional Media/ Teaching Aids In Teaching

Introduction:

Audio visual material must be seen in their relationship to teaching as a whole and to the learning process as a whole, until the teacher understands the relationship between audio visual material and teaching learning process.

Audio visual materials are produced, distributed and used as planned components of educational programs. It helps the process of learning that is motivation, classification and stimulation. A.V. aids are multi-sensory materials which motivate and stimulate the individual. It makes dynamic learning experience more concrete realistic and clarity. It provides significant gains in thinking and reasoning.

Audio visual aids are sensitive tools used in teaching and as avenues for learning. These are planned educational materials that appeal to the senses of the people and quicken learning facilities for clear understanding.

Definitions:

1. According to Kinder S. James: Audio visual aids are any device which can be used to make the learning experience more concrete, more realistic and more dynamic.

2. According to Burton: audio visual aids are those sensory objects or images which initiate or stimulate and reinforce learning.

3. According to Carter.v.Good: audio visual aids are those aids which help in completing the triangular process of learning that is motivation, classification and stimulation.

4. According to good's dictionary of education: audio visual aids are any thing by means of which learning process may be encouraged or carried on through the sense of hearing or sense of sight.

5. According to Edger Dale: audio visual aids are those devices by the use of which communication of ideas between persons and groups in various teaching and training situations is helped. These are also termed as multi sensory materials.

Purposes of Teaching Aids:

- To supplement and enrich teachers own teaching to make teaching-learning more concrete.
- To serve an instructional role in itself.
- To create interest among the group.
- To make teaching as an effective process.

Advantages of Teaching Aids :

1. Teaching Aids helps in effective perceptual and conceptual learning.
2. Teaching Aids helpful in capturing and sustaining attention of students.
3. Teaching Aids arouses interest and motivates students to learn.
4. Teaching Aids is helpful in new learning.
5. Teaching Aids helps in saving energy and time of both the teacher's and students.
6. Teaching Aids provides near realistic experience.
7. Teaching Aids can meet individual demands.
8. Teaching Aids is useful in for education of masses.

Characteristics of good teaching aids:

Teaching aids should be

- Meaningful and purposeful
- Motivates the learners
- Accurate in every aspect
- Simple and cheap
- Improvised
- Large in size
- Up-to-date
- Easily portable

CLASSIFICATION OF A.V.AIDS:

The audio – visual aids have been classified in a number of ways according to different approaches,

1. Technical Approach:-

They have been classified into two types viz, audio aids and visual aids.

a. Audio – aids:-

The aids involving the sense of hearing are called audio – aids e.g; radio, tape-recorder, records player etc.

b. Visual aids:-

Those aids which use sense of vision are called as visual aids, e.g; models, pictures, maps, bulletin board, slides, epidiastroscope, overhead projector etc.

2. According to 2nd approach,

the audio – visual aids have been classified into two types viz; projected and non- projected teaching aids.

a. Projected aids:-

Teaching aids which help in their projection on the screen are called as projected aids. For example, film strips, slides, film projector, overhead projector, epidiastroscope etc.

b. Non –Projected aids:-

Teaching aids which do not help in their projection on the screen are called non-projected teaching aids. For example, chalk board, charts, actual objects, models, tape – recorder, radio etc.

Non –Projected Aids

- ACTIVITY AIDS
- DISPLAY BOARDS
- DIMENSIONAL AIDS
- GRAPHIC AIDS
- AUDITORY AIDS

PRINCIPLES FOR THE EFFECTIVE USE OF TEACHING AIDS:

- Audio visual materials should function as an integral part of the educational program.
- Teaching Aids should be centralized, under specialized direction and leadership in educational programs.
- An advisory committee consisting of representative from all areas of curriculum should be appointed to assist in selection and coordination Teaching Aids.
- An education program should be flexible.
- Teaching Aids should be carefully located to eliminate duplication, easy accessibility and convenient use.
- Teaching Aids should be available whenever and wherever they needed for effective utilization as an integral part of curriculum.
- Budget appropriations should be made regularly for a.v. education programs.
- Periodic evaluation to be done to assess the function of, utilization and expenditure of the program.

ACTIVITY AIDS

There are certain learning situations in which student participation through direct experiences can be easily incorporated, these are called activity aids. The activity teaching aids are really of great value as they put students in a role of active seekers of knowledge. There are five important activity teaching aids, which are listed below:-

- 1) Field trips
- 2) Demonstrations
- 3) Experiments
- 4) Dramatizations

FIELD TRIPS

Types of field trips: -

Depending on the place of visit and its duration, field trips are mainly of the following four types, namely:-

- a) Local school trips
- b) Community trip
- c) Educational trips
- d) The natural hunt

Advantages of field trip:

Field trip provides learning experience in the real life situation by direct contact with objects, process, and systems and thus has many advantages which are enumerated as follows:

- It provides accurate information objects, process, and systems in their real life setting.
- It provides meaningful direct experience and hence results in lasting learning.

- The students learning can be easily diverted towards effective learning.
- Field trips are valuable aids to what students are curious about the natural and man-made process and objects.
- field trips can effectively supplement the classroom learning through application and reviewing the experiences of student.

Limitations of field trip:

- A field trip may be occasional activity which at best supplement some learning segments of the syllabus.
- They can be expensive and out of reach for many disadvantaged and poor students.
- Field trips require proper and detailed planning to make them meaningful otherwise the trip leads to confusion, and fails to fulfill the requiremen

DEMONSTRATIONS:-

Demonstration method is a concrete visual aid, because of its wide use in the teaching of science. In nursing education, it is used for this purpose and also for clinics, conferences, laboratory classes, symposia, autopsies, and teaching of health to patients. The demonstration method teaches by explanation and exhibition. In short, it is a performance to show a process or activity to others. When a teacher demonstrates, students observe and imitate to learn

Advantages of demonstration:-

The following are the advantages of demonstration method.

- It activates several senses. This increases learning, because it gives a better opportunity for observational learning.
- It clarifies the underlying principles by demonstrating the 'why' or 'how' of the procedure.
- It provokes interest by use of concrete illustrations.
- It correlates theory with practice engages student's attention and concentration.
- It encourages student's participation in learning through questions and answers as the teacher performs.

EXPERIMENT

An experiment is a learning activity in which students collect and interpret observations using measuring instruments to reach some conclusions. In science subjects experiments are used invariably used as instructional aid as they encourage learning by doing. While giving a lesson on an experiment, the teacher should organize the instruction so as to make the students aware of the following steps of the experiments:

- 1) Objectives of the experiments
- 2) Apparatus required

- 3) Procedure or methodology
- 4) Observations of data
- 5) Computation (totaling) of the observations made.
- 6) Results or conclusion
- 7) Precautions
- 8) Ideas for future work

DRAMATIZATION

Dramatization is a very potent method of keeping the class room instruction lively and interesting. When a teacher dramatizes a lesson, the students become both the spectators and participants. This makes learning easy and permanent.

Types of dramatizations suitable for class room instruction:-

- 1) Role-play
- 2) Play lets
- 3) Pageant
- 4) Pantomime
- 5) Tableaux

Advantages of dramatization:

- Dramatization gives an added advantage of students working as both observers (spectators) and doers (participants) unlike in experiment where there are just doers and in demonstration where there are just observers.
- Dramatization makes learning a pleasure children love to act and show off.
- Dramatization involves students totally and they appreciate the lessons remember it better
- Dramatization develops the social skills required for them such as cooperation, co-ordination, punctuality, and human relations etc.
- Dramatization makes students creative, sensitive, and alert.

DISPLAY BOARDS

CHALK BOARD

DEFINITION

A chalkboard or blackboard is a reusable writing surface on which text or drawings are made with chalk or other erasable markers. Blackboards were originally made of smooth, thin sheets of black or dark grey slate stone. Modern versions are often green or brown and are thus sometimes called a green board or brown board instead.

A blackboard can simply be a piece of board painted with matte dark paint (usually black or dark green). A more modern variation consists of a coiled sheet of plastic drawn across two parallel rollers, which can be scrolled to create additional writing space while saving what has been written. The

highest grade chalkboards are made of a rougher version porcelain enameled steel (black, green, blue or sometimes other colours). Porcelain is very hard wearing and chalkboards made of porcelain usually last 10-20 years in intensive use.

Blackboards have Disadvantages:

- They produce a fair amount of dust, depending on the quality of chalk used.
- Some people find this uncomfortable or may be allergic to it, and there has been speculation about links between chalk dust and respiratory problems.
- The dust also precludes the use of chalk in areas shared with dust-sensitive equipment such as computers. However, these alternative methods of displaying information have drawbacks of their own.
- The scratching of fingernails on a blackboard is a sound that is well-known for being extremely irritating.

Blackboards are also used in many establishments (typically public houses) as a form of advertising often for upcoming events and menus - as well as to keep the score in darts matches

FLANNEL BOARD

Sometimes called a flannel graph.

This teaching tool is called by different names: Visual Board , Frick Board, Slap Board, Felt Board, Coherograph, Video graph. Flannel graph is a storytelling system that uses a board covered with flannel fabric, usually resting on an easel. It is very similar to Fuzzy felt, although its primary use is as a storytelling medium, rather than as a toy

How to use

The principle involved is the inter looking of fibers of two rough or bairy surfaces, so that the pieces pressed on to a background which is hard and vertical will stay. It can be illustrated on a larger scale by pressing two tooth brushes or hair brushes together, so the bristle inter-look. In case of flannel graph similar principle of friction helps an object to cling to the surface of the board.

The flannel board is usually painted to depict a background scene appropriate to the story being told. Paper cutouts of characters and objects in the story are then place on the board, and moved around, as the story unfolds. These cutouts are backed, either with flannel, or with some other substance that adheres lightly to the flannel background, such as coarse sandpaper.

Advantages:

- Permits numerous and varied arrangements of visual materials.

- Permits the use of either chart or small pieces of material Materials can be packed and transported complete notes. 3) Permits the development of a complete story.
- Promotes conscientious planning, which must precede the development of the material in the first place.
- Challenges one to develop symbols to portray such things as abstractions.
- Easier to construct materials for flannel board than to make slides or movies.

Disadvantages:

- Transportation and storing of boards and materials is a problem. Suitable tables to support boards must be available.
- Time and cost of making material for presentation present a problem.
- Cost of boards themselves can't be overlooked.
- Presentation is limited a new idea involves a lapse of time before the new material can be added
- Might tend to deter one from using other more effective methods and techniques when it is evident that other methods might be more appropriate.
- To tell a complete story it often takes either too much board space or smaller designs and materials some of which cannot be seen well.

BULLETIN BOARD

DEFINITION

It is a soft board which will hold pins or tags almost suitable. Simple device placed either indoor or outdoor. Items generally displayed are photographs, publications, posters, news paper cut outs.

Advantages

- Explains important events Reports special activities

Disadvantages

- Not effective for illiterate group.
- Takes lot of pre-planning and preparation

A bulletin board (pinboard, pin board or notice board in British English) is a place where people can leave public messages, for example, to advertise things to buy or sell, announce events or provide information. Dormitory corridors, well-trafficked hallways, lobbies, and freestanding kiosks often have cork boards attached to facilitate the posting of notices. At some universities, lampposts, bollards, trees, and walls often become impromptu poster sites in areas where official boards are sparse in number.

PEG BOARD

It is a type of board which contains small holes to fix certain letters into the holes which is used especially in the offices to display certain items, name of the personal or faculty member.

MAGNETIC BOARDS

It is a framed iron sheet carrying porcelain coating in some dark color generally black or green. It can be used to display pictures, cutouts and light objects with disc magnets or magnetic holders.

DIMENSIONAL AIDS

MODELS

Definition: a model is a recognizable representation of a real thing three dimensionally, that is height, width, and depth is felt as reality.

Types of models:

1. Solid models: it is the replica of an original thing made with some suitable material like clay, plaster of Paris, wood, iron etc. to show the external parts of the things. Ex: globe, clay model of human and animal.

2. Cutaway and x-ray models: are the replicas of the original things to show internal parts of a thing. Cross sectional models are difficult to make in the class room or institutions as they require expertise to construct them. Ex: cross sectional model of human body.

3. Working models: these models are either actual working things or their miniature replicas. For illustrating an operation. Ex: a motor, a generator.

4. Sand models: made by using sand, clay, saw dust, ex: a tribal village, a forest area.

Advantages:

- Models heighten reality of things and make learning direct and meaningful as they are three dimensional.
- Models illustrate the application side of certain principles and laws.
- Models explain the complex and intricate operations in a simplified way and thus make comprehension easier.
- Models are lasting and ultimately work out to be cheaper teaching aids.
- Still models are easy to make with the help of discarded materials like empty boxes, pins, clips, nails, and clay.
- Models are to reasonable size and convenient to handle.
- Models involve the use of all the five senses and thus make learning effective.

Limitations:

- It requires expertise to make.
- Time consuming.
- Some of the models may be very expensive.

OBJECTS AND SPECIMENS

Definition:

A collection of real things for instructional use refers to objects.

A specimen is a sample of the real object or a material.

Using objects and specimens:

while using the specimen and objects as teaching aids, a teacher must keep the following points in her mind.

- Plan your teaching with certain simple and direct observations of the object or specimen being referred to.
- Ask questions from the students to elicit more details of the features of the object or specimen under observation.
- Clarify and emphasize important structural details of the object or specimen under observation
- Provide review and practice to make learning permanent.

Sources of objects and specimens:

- Local markets
- Manufacturers and factories
- Discarded material from the houses
- Specimen found in the nature can be collected by students from field trips and nature hunt
- Plasters casts can be purchased
- Wild flowers, leaves shells, stones butterflies moths, insects can also be procured.

Mounting the objects and specimens:

Objects and specimens should be mounted in shallow boxes in an artistic way and the boxes should be covered with cellophane paper. Also label each object or specimen using self adhesive paper.

Advantages of objects and specimens:

- Collection of objects and specimens by students requires interaction with others leading to development of social skills and values.
- Students when collect and display objects and specimens derive satisfaction of contributing to the school and teacher something worthwhile.
- Student's power of observation and first hand experiences is enhanced by collection of objects and specimens.
- Student's personal collection of objects and specimens can be good source of doing investigatory projects.
- Collection of objects and specimens become an interesting educational pursuit of the teacher and students alike.
- It arouse some interest among students in learning
- Objects and specimens involve all the five senses in the process of learning
- It heighten the reality in the class room
- It makes teaching lively.

EXHIBITIONS

Many times in the school, a department of the school or a class put up their work for showing it to the people out side the school, and such a show called exhibitions.

The pieces of work done by the students for an exhibition are called exhibits.

Requisites for exhibition:

- The exhibition should have a central theme with a few sub themes to focus attention to a particular concept
- The exhibits should be clean , labeled properly
- The concepts of contrast in color and size should be used for lying out the exhibitions
- The exhibits should be so placed so the most visitors , can see them
- The place and exhibits should be well lighted
- To capture attention and interest of visitors , both motion and sound should be utilized
- The exhibition should have some exhibits with operative mechanism such as switches, handles, to be operated by the visitors to observe some happenings.
- The exhibition should include lot of demonstrations as they involve deeply the students and the visitors
- The exhibition should be able to relate various subjects' areas to provide integrated learning.

Advantages:

- Exhibitions inspire the students to learn by doing things themselves and they get a sense of involvement
- Exhibitions give students a sense of accomplishment and achievement
- Exhibitions develop social skills of communication , cooperation, coordination
- Exhibitions foster better school community relations and make community members conscious about the school
- Exhibitions couple information with pleasure
- Exhibitions foster creativity among students.

Disadvantages:

- Requires thorough preparation
- Time consuming
- Require funds or budget.

MUSEUMS**Definition:**

A museum is a building displaying a collection of historical relics, antiques, curiosities, works of arts, works of science, literature and other artifacts of general interest.

Museums can be useful both for public education and specific class room instructions.

Setting up school museum:

- School should have enough space
- Take the help of students, collect old and new objects and articles
- Accept donations from various organizations who donates the articles
- Students can be guided to prepare the exhibits
- All the collected and prepared articles should be displayed and labeled
- A detailed report book should be maintained giving a brief description of each museum pieces
- The museum rooms should be well lighted

- It should be cleaned and maintained timely.

Dioramas:**Definitions:**

A diorama is a three dimensional arrangement of related objects, models, and cut outs to illustrate a central theme or concept.

The objects and models are generally placed in a big box or show case with a glass covering and background printed with a shade or a scene. Ex: a harvest scene, a planting scene etc.

Advantages:

- Provide a good opportunity to learn
- It gives the appearance of actual things which can not be brought to the class room
- Interesting and enhance creativity
- Live things also can shown in diorama ex: aquarium
- Provides students to do project works

Disadvantages:

- sometimes cost effective
- Needs expatriation for the preparation
- Require budget
- Sometimes it may misguide the student if is not the replica of actual thing.

MOCK UPS

It emphasizes the functional relationship between the device reality and its workability. Certain element of the original reality is emphasized to make it more meaningful for the purpose of instruction.

In common usage, a mockup is a scale model of a structure or device, usually used for teaching, demonstration, testing a design, etc.

Mockups are also used in the Consumer goods industry, as part of the product development process, when the size, impression and/or artworks have to be tested and approved.

Mockup is also a frequently used term when talking about an early layout or sketch of a Web site or GUI program.

PUPPETS

One of the old and popular arts in Indian villages is puppetry. Puppetry is an education cum entertaining aid in which puppets manipulated by the performer is a person termed as a characters in a story to be depicted.

Definition:

A puppet is a manipulative doll dressed as a character and the performer is a person termed as a puppeteer. A good puppeteer has to blend his art with dramatization to produce the desired effect. It is used as an effective teaching aid for languages and social sciences.

Types of puppets

1. String or marionettes puppets:-Marionettes consist of puppets with hinged body parts which are controlled by nine strings produces required movements in the puppet. These puppets are mainly manipulated by professional puppeteers.

2. Stick puppets: - stick puppet are the painted cutouts attached by sticks. The actions of these puppets are manipulated by the teacher and students by hiding behind a screen so that only puppets are visible to the audience or the class.

3. Shadow puppets: - shadow puppets are silhouettes of cardboard which produce shadows on white screen. The motion of these silhouettes is manipulated by the teacher and students.

4. Finger of hand puppet: - Hand puppets are round balls painted as heads with overflowing colorful costumes. These are worn on fingers which operate their movements. These are operated from below the stage.

Advantages:

- 1) Creates interest
- 2) Gives the knowledge in a brief period
- 3) Puppet is an effective method in teaching.
- 4) Motivate students
- 5) Easy to carry and operate

Disadvantages

- 1) Needs group cooperation and coordination
- 2) Requires skills in preparation and supply
- 3) Skills needed in presentation

NON PROJECTED A.V. AIDS (GRAPHIC AIDS):

It is a combination of graphic and pictorial material designed for the orderly and logical visualizing of relationships between key facts and ideas ex: comparisons, relative amounts developments, processes, classification or organization. It includes the following:

CHARTS

These visual symbols used for summarizing, comparing, contrasting or performing other services in explaining subject matter. A chart is a combination of pictorial, graphic, numerical or vertical material, which presents a clear summary.

Purposes:

- Ø To visualize an item, it is otherwise difficult to explain only in words.
- Ø To highlight important points.
- Ø To provide outline for materials covered in presentation.
- Ø To show continuity in process.
- Ø For creating problems and stimulating thinking.
- Ø For showing development of structure.

Types of charts:

Ø **Narrative chart:** Arrangement of facts and ideas for expressing the events in the process or development of a significant issue to its point of resolution or we can show an improvement over a period of years.

Ø **The cause and effective chart:** Arrangement of facts and ideas for expressing the relationship between rights and responsibilities or between a complex of conditions and change or conflict.

Ø **The chain chart:** arrangement of facts and ideas for expressing transitions or cycles.

Ø **The evolution chart:** facts and ideas for expressing changes in specific items from beginning data and its projections in to future.

Ø Strip tease chart:

- it enables speaker to present the information step by step
- It increases the interest and imagination of the audience.
- The information on the chart is covered with thin paper strips to which it has been applied either by wax, tape or sticky substance or pins.
- As the speaker wishes to visually reinforce a point with words or symbols, he removes the appropriate strip or paper.
- It produces interest.
- It increases learning and aids recall.

Ø **Pull chart:** it consists of written messages which are hidden by strips of thick paper. The message can be shown to the viewer, one after another by pulling out the concealing strips.

Ø **Flow chart:** diagrams used to show organizational elements or administrative or functional relationships. In this chart lines, rectangles, circles, are connected by lines showing the directional flow.

Ø **Tabulation chart:** it shows the schedule of an activity or of an individual ex: time-table of a class. These are very valuable aid in the teaching situation where breakdown of a fact or a statement is to be listed. Also it is a useful aid for showing points of comparison, distinction, and contrasts between two or more things. While making the table charts the following points must be kept in the mind.

The chart should be 50 X 75 cm or more in size.

The chart should be captioned in bold letters.

The vertical columns should be filled in short phrases rather than complete sentences.

Ø **Flip chart:** a set of charts related to specific topic have been tagged together and hang on a supporting stand. The individual charts will carry a

series of related materials or messages in sequence. The silent points of specific topic will be presented.

Ø Pie chart: a circle will be drawn and divisions will be made into different sections, each section will be coded differently and code key will be given at right corner of the chart as legend. The circumference is divided into suitable sections.

FLASH CARDS

Definition:

“Flash cards are a set of pictured paper cards of varying sizes that are flashed one by one in a logical sequence.”

Purposes:

1. To teach the students.
2. To give health education.
3. Useful for small group.
4. Used in group discussions.

Principles:

- The messages can be brief, simple line drawing or photographs, cartoons and the content will be written in few lines at the back of the each card.
- 10” X 12” or 22” X 28” is commonly used size.
- 10-12 cards for one talk can be used. It should not be less than 3 and more than 20.
- Prepare a picture for each idea which will give visual impact to the idea.
- The height of writing on the flash card is to be approximately 5cm for better visualization.

Using the flashcards:

For class room instruction, the flash cards is to be properly used. The following steps are used while displaying flash cards.

1. Give brief introduction about the lesson to students.
2. Give instructions to students about their actions while you flash the cards.
3. Flash the card in front of the class by holding it high with both your hands so that all the students can see it.
4. Let the student respond as per instructions already given.
5. Review the lesson by selectively using flash cards.

Advantages:

- Flash cards can be used to introduce and present topics.
- It can be used to apply information already gained by students to new situations
- It can be used to review a topic.
- Can be used for drill and practice in elementary classes

- To develop the cognitive abilities of recognition and recall of students.
- It can work as a useful supplementary aid and can be effectively used with other material.

Disadvantages:

- Can not be used for a large group
- Prone to get spoiled soon
- Preparation is time consuming.

POSTERS**Definition:**

“Posters are the graphic aids with short quick and typical messages with attention capturing paintings.”

Purposes:

- To provide general motivation.
- To create an esthetic or atmospheric effect.
- To communicate a more general idea. To thrust the message for leading to action.
- For the class room and community.

Preparation and rules:

- To do a special job.
- To promote one point.
- To support local demonstration.
- Planned for specified people
- Tell the message at single glance.
- Use bold letters.
- Use pleasing colors...
- It should place, where people pass or gather.

Features of a good poster:

- Brevity: message should be concise
- Simplicity: message should be easily understandable
- Idea: should base on single idea and it should be relevant.
- Color: suitable color and combination should be used to make the poster attractive and eye catching.
- Display: while displaying one should be sure to find a place where there is adequate light and where the larger population will see it.

Advantages:

- It attracts attention.
- It conveys the message very quickly.
- It does not require a detailed study.
- Good poster leads to action with good motivation
- It can stand alone and is self explanatory.

Disadvantages:

- Poster does not always give enough information

- When a poster is seen for longer time it may not be attractive. So it should be dynamic

GRAPHS

Definition:

Graphs are the visual teaching aids for presenting statistical data and contrasting the trends or changes of certain attributes.

Method of preparation:

- Before making the bar chart make a rough sketch of it in a notebook.
- For drawing the bar graph use the chart paper of 50x 72 cm size.
- Use two different color shades for the two contrasting groups.
- The bars should be equi-spaced.
- Write the key to the bar graph in a box on the right hand side corner of the chart paper.
- Numbers specifying the magnitude of the bars should be on the top of the bars.

TYPES:

Pie graph:

- These are called as circle diagrams. The data are presented through the sections or portions of a circle.
- In determining the circumference of a circle we have to take into consideration a quantity known as pie.
- The surface area of a circle is to cover 360 degrees.
- The total frequencies or values are equated to 360 degrees and then the angles corresponding to component parts are calculated.
- After determining their angle, the required sectors in the circle are drawn.

Bar graph:

The graphic presentation extends the scale horizontally along the length of bars. Each bar must be of the same width, height of the bar over a period represents the corresponding time of the variable. Graphs are available in 2 forms that is vertical and horizontal

Line graph:

To show the trends and relationships ex: single line shows the relation and the variation in the quantity. Quantitative data are plotted or when the data is continuous. The concepts are represented with the help of lines drawn either horizontally or vertically. The plotted points are connected to one another, instead of the base thus producing the curve.

Pictorial graph:

It is an outstanding method of graphic representation. Pictures are used for the expression of ideas; they are more attractive and easily understood. Vivid pictures will be used to create rapid association with the graphic message; each visual symbol may be used to indicate quantity.

MAPS

Definition:

A map is a graphic aid representing the proportionately as a diagram, the surface of the earth, world or parts there of. It conveys the message by lines, symbols, words and colors.

Types of maps:

Ø **Political maps:** these maps show political divisions of the world, a continent, a nation.

Ø **Physical maps:** shows the physical contour of a place, area, and region.

Ø **Relief maps:** it shows the actual elevations and depressions in a place, area, and region.

Ø **Weather maps:** shows the amount of rains, temperature extremes, humidity in an area, region country.

Ø **Population maps:** shows the distribution of population in various parts of region, country.

Ø **Picture or tourist maps:** shows historical spots monumental sites.etc..

Ø **Road maps:** shows the roads of a region connecting various parts and points together.

Ø **Railway maps:** shows the railway links between various points.

Ø **Air maps:** shows the air routes between various points.

Ø **Sea root maps:** shows the sea routes between various sea ports

CARTOONS

The word cartoon has various meanings, based on several very different forms of visual art and illustration. The term has evolved over time. The original meaning was in fine art, and there cartoon meant a preparatory drawing for a piece of art such as a painting.

Principles:

- The quality of the drawing should be high primarily for visual effectiveness.
- The symbols used should be familiar and represent a concept or idea to which students can react intellectually.

Advantages:

- A cartoon can be effectively used to initiate certain lesson.
- It can be used for making a lesson lively and interesting.
- Fantasy
- Satire
- Exaggeration.

NEWS PAPERS

It can furnish health messages in local languages which can reach to the public easily. The information will be available in low cost, easy to read and understand simple language .the people may learn to read and interpret the contents along with pictures to enhance easy grasping.

Advantages

- Ø Best method to reach a large group
- Ø Pictures will help in easy understanding
- Ø Attractive and easy to understand
- Ø Lot of information can be obtained in various fields

Disadvantages

- Ø useful for literates only
- Ø detailed information cannot be produces

COMIC STRIPS**Definition:**

A comic strip is the graphic depiction in a series of pictures or sketches of some character and events full of action. This medium of communication is found very interesting and exciting by children.

Uses:

- Comic strips fire the imagination of children
- It boosts the courage of children and builds up the spirit of adventure.
- It communication detailed and vivid.
- It stimulates reality and involvement.

Limitations:

- Comic strips misguide children by depicting characters with supernatural powers divorced from the hard realities of life.
- Comic strips hamper the development of language of children.
- Classics brought out in the form of comics develop the tendency in children to ignore or by pass the original work.
- Comics can soon become an obsession with young children and they tend to avoid serious studies

Auditory Aids in Teaching-Learning Process

These are also an effective aid, usually radios, recorders, gram phones come under this category.

Using a record player for teaching:

1. A record player can be used in the following ways in the actual class room situation
2. A record player can be used to supplement a lesson.
3. A record player can be used for an appreciation lesson in music.
4. A record player can be used for an appreciation lesson in literature.
5. A record player can be used for students to acquire the singing ability, deliver a speech properly, and recite a poem in the right way.
6. The player can be used to end or conclude a lesson;
7. Introduce a lesson and review a lesson.
8. A record player can be used for physical exercises accompanied with music

TAPE RECORDER:

A tape recorder is a portable electronic gadget to record, reproduce, erase and re record sound on a magnetic tape. This device can be used without

much fuss by any body by operating the following press buttons attached to the recorder, viz, stop, play, wind, rewind, record, pause, and eject.

Advantages of Tape-Recorder

1. It can be used to improve pronunciation and recitation, prose reading stress, intonation etc.
2. A series of recorded tapes on English pronunciation, conversation, speech and other language exercise are available. These can be used for giving required training to the students.
3. The great advantage of a tape recorder is that the habitual mistake maker can hear his speech and can improve it.
4. It records the voices of pupils and it before him reproduces. Then teacher tells him where he has committed a mistake.
5. Even the best speech models can also be recorded and preserved in a tape and reproduced at will. A tape recorder thus serves a linguistic refrigerator.
6. A tape recorder can be used record a story, a talk, a song or a play from the radio.
7. Moreover, the same tape can be used indefinitely, if the recording is not meant to be permanent for any material, can simply be erased by recording again on it.
8. It can also be used for giving drills to the students.
9. Tape-recorder can also be used for learning spellings of the words. In the class room, the students may be ear-minded.
10. It can be sent from one place to another.

Thus, a tape recorder has many uses as an essential language tool. It is a very useful aid for self examination, self criticism and self-education.

Radio

Radio is the most prominent audio teaching aid used for teaching purpose. Through radio broadcast, educational, cultural and social knowledge can easily be communicated. Seminars, lectures, workshops can be disseminated through the radio channel effectively

There are a number of merits and demerits of radio as instructional materials which include:

The advantages of radio as an instructional medium include:

- a) It is far less expensive than T.V,
- b) A very wide coverage of audience is possible through radio lectures,
- c) It can broadcast events immediately as they happen.

The disadvantages of radio as an instructional medium include:

- a) It does not allow students the opportunity to ask questions during educational broadcasts,
- b) Radio speakers talk at their own speed without knowing if the listeners

are following,
c) Educational broadcasts usually come on at odd times

PROJECTED A.V. AIDS

OVER HEAD PROJECTOR:

The over head projector is the most used in all a.v. aids. It projects transparencies with brilliant screen images suitable for use in a lighted room. The teacher can write or draw diagrams on the transparency while he teaches; these are projected simultaneously on the screen by the OHP.

During presentation:

- Ø Keep the screen above the heads of the participants.
- Ø Keep the screen in full view of participants
- Ø Make sure you are not blocking any ones view when presenting.
- Ø Darken the room appropriately by blocking out sunshine and dimming near by.
- Ø Turn the screen off between slides if you are going to talk for more than two.
- Ø Talk to the audience, not to the screen

Purposes:

- Ø To develop concepts and sequences in a subject matter area.
- Ø To make marginal notes on the transparencies for the use of the teacher that can carry with out exposing them to the class.
- Ø To test students performances, while other classmates observe.
- Ø To show relationships by means of transparent overlays in contrasting color.
- Ø To give the illusion of motion in the transparency.

Advantages:

- Ø It permits the teacher to stand in front of the class while using the projector, thus enabling her to point out features appearing on the screen by pointing to the materials at the projector it self and at the same time, to observe the students reactions to her discussion.
- Ø Gains attention of the student

OVER HEAD TRANSPARENCIES:

Transparencies are popular instructional medium. They are simple to prepare and easy to prepare and easy to operate with the over head projector which is light weight.

A 10*10 inches sheet with printed, written or drawn material is placed on the platform of the projector and a large image is projected on a screen behind you. The projector is used from near to the front of the room with the teacher standing or sitting beside, facing the student.

Guidelines for making effective transparencies:

- Have one main idea an each transparency.
- Include only related figures and diagrams.
- Use simple lettering style in writing.

- Use diagrams in proportion to its lettering.
- Keep the message clear and simple.
- Emphasize the key messages.
- Use color and lettering with discretion.

Advantages:

- Permits face to face interaction with the students.
- Can be used in daylight conditions.
- Can present information in systemic developmental sequences.
- Requires limited planning and can be prepared in variety of inexpensive methods.
- Easily available.

THE OPAQUE PROJECTOR

Opaque projector is the only projector on which you can project a variety of materials ex: - book pages, objects, coins, postcards, or any other similar flat material that is non-transparent.

The opaque projector will project and simultaneously enlarge, directly from the originals, printed matter, all kinds of written or pictorial matter in any sequence derived by the teacher. It requires a dark room, as projector is large and not reality movables.

Advantages:

- Stimulates attention and arouses interest.
- Can project a wide range of materials like stamps, coins, specimen, when one copy is available.
- Can be used for enlarging drawings, pictures and maps.
- Does not require any written or typed materials, hand-written material can be used.
- Helps students to retain knowledge for longer period.
- Review instructional problems.
- Test knowledge and ability.
- Simple operation.

Disadvantages:

- Costly equipment.
- Needs to use it with care.
- Needs a dark room for projection

SLIDE PROJECTOR

A slide is a small piece of transparent material on which a single pictorial image or scene or graphic image has been photographed or reproduced otherwise.

Slides are a form of projected media that are easy to prepare. They are still pictures on positive film which you can process and mount individually yourself or send to a film laboratory. The standard size of the slides is 2 "X 2 "any 35mm camera will make satisfactory slides.

Types of slides

1. Photographic slides: 2" X 2"
3" X 4"
 - a) Black and white
 - b) Colored
2. Hand made slides: can be made with
 - a) Acetate sheet
 - b) Cellophane
 - c) Etched glass
 - d) Plain glass
 - e) Lumarith

Slides can be made from photographs and pictures by teachers and pupils taking photographs and snapshots when they go on fieldtrips for historical, geographical, literacy or scientific excursions.

The arrangement of slides in proper sequence, according to the topic discussed, is an important aspect of teaching with them.

Advantages:

1. Requires only filming, processing and mounting by self or laboratory.
2. Results in colorful, realistic, reproduction original subject.
3. Preparation with any 35mm camera for most uses.
4. Easy to revise and up-date.
5. Easily handled, stored and re-arranged for various uses.
6. Can be combined with tape narration or can control time for discussion.
7. May be adapted to group or individual use

FILMSTRIPS

Film strips are sequence of transparent still pictures with individual frames on 35mm film. A tap recorded narration can be synchronized with film strip. Each strip contains from 12 to 18 or more pictures. It is a fixed sequence of related stills on a roll of 35mm film or 8mm film.

PRINCIPLES

1. Preview filmstrips before using them and selected carefully to meet the needs of the topic to be taught.
2. Show again any part of the filmstrip needing more specific study.
3. Use filmstrip to stimulate emotions, build attitudes and to point up problems.
4. It should be introduced appropriately and its relationship to the topic of the study brought out.
5. Use a pointer to direct attention, to specific details on the screen.

Types of filmstrip:

1) Discussion filmstrip: it is continuous strip of film consisting of individual frames arranged in sequence usually with explanatory titles.

2) Sound slide film: it is similar to filmstrip but instead of explanatory titles or spoken discussion recorded explanation is audible, which is synchronized with the pictures.

Advantages:

- 1) Are compact, easily handled and always in proper sequence.
- 2) Can be supplemented with recordings.
- 3) Are inexpensive when quantity reproduction is required.
- 4) Are useful for group or individual study at projection rate are controlled by instructor or user.
- 5) Are projected with simple light weight equipment.

LEARNER-DIRECTED INSTRUCTIONAL INPUTS

Learner-directed instructional inputs refer to those methods, strategies or techniques in which learners organise the instructional environment with less intervention from the teacher.

According to **Woolever and Scott (1988)**, "An activity is student-directed (or independent) when each student is left to work alone or with a small group of other students with a minimum of teacher supervision or interruption."

A student-centered approach is also associated with positive effects on student creativity, self-concept, attitude towards school, and curiosity (**Walbergs 1979**).

Although the learner assumes a significant role in learner-directed instructional inputs, the teacher plans and designs the instructional activities. Learner-directed instructional inputs may be broadly divided into individualised instructional inputs and group-directed instructional inputs.

PLAY-WAY METHOD

Play is an innate, creative, joyful, non-serious, interesting and recreative activity. It is the activity in which natural urges of the child find spontaneous expression. It is regarded as the language of the child. What he cannot express through language, he expresses that through his behaviour and that behaviour is play.

According to Froebel, "Education is a development from which man's life broadens until it has related itself to nature, until it enters sympathetically into all activities of society, until it participates in the achievements of the race and aspirations of humanity. It is a process of unfolding child's innate powers and to awaken his spiritual nature which may enable him to realize his inner unity, achievements of race and aspirations of humanity. He clearly emphasized on natural release of the child's physical and mental powers through which he will develop a balanced personality. As he said, "play is the highest phase of child development and the source of all that is good."

All the educationists made efforts in order to bring play into the field of education. The Play-way was first used as a method of teaching by **Cadwell Cook**. This was first used for teaching the different plays of Shakespeare by Cook. He noticed that they took more interest in those plays where they themselves were involved in the activity. He said, “good work is more often the result of spontaneous effort and free interest than of compulsion and forced application. Effectiveness of learning lies not in reading and listening, but in action, performance and experience”. He further said, “the core of my faith is that only work worth doing is done in play; by play I mean doing anything with one’s heart in it. Only that child learns best who learns with interest and with a purpose and sees significance in what he does.”

Definitions:

a. Ross: “Play is joyful, spontaneous and creative activity in which man finds fullest self-expression.”

b. Thomson: “Play is impulse to carry out certain instinctive actions.”

c. Crow and Crow: “Play is the activity in which a person engages himself when he is free to do what he wants to do.”

d. Froebel: “Play is the highest phase of child development and the source of all that is good.”

Principles of play-way methods:

The following are the underlying principles of play-way method:

a. Learning by Doing:

Training of five senses makes all round development in an individual. The principle of learning by doing involves maximum usage of these senses. Any knowledge which a child gains through his head and hands becomes interesting and purposeful for him. The children experiment and discover themselves the required knowledge by means of play-way method.

b. Principle of individual differences:

The play-way method takes into account the individual differences of the learners. Every individual works according to his differences in different spheres like interests, attitudes, sentiments, capabilities, intelligence level etc. It makes the learning easy and understandable by involving every learner according to his differences.

c. Sympathetic Attitude:

Play-way method develops a congenial environment in teaching-learning process. It does not create artificial environment or any compulsion on the learners. Everyone is free to do and act according to his interests. Whenever children need suggestions, they accept them without any hesitation.

Procedure:

When we review all the progressive methods of teaching, we find that they contain the principles of play. All the progressive methods viz. Kindergarten, didactic method, project method, Dalton plan involves the procedure which is of play-way in nature. For example the Dalton plan follows the procedure like assignments or contracts, subject teacher, subject rooms, records, conferences, time budgeting and daily time schedule; involves the play-way principles in each step. Every activity is done according to the capabilities,

needs and interests of the learners. They are at liberty to move from one room to another according to their wishes. So, all the progressive methods follow the play-way procedure in their completion.

Practical applications of play-way method in progressive methods of teaching:

1. Kindergarten Method:

Kindergarten means 'garden of children'. In this method, children are provided with seven gifts called apparatus in order to develop the different ideas like shape, colour, number, weight etc. Children learn while playing and singing in a happy atmosphere of kindergarten. It is based upon the play urge of the children. Every activity is designed according to their interests.

2. Didactic Method:

This method was developed by Maria Montessori. It provides sense training to the individuals, because senses are the gateways of knowledge. In it, the children enjoy, play and learn.

3. Project Method:

As a method of teaching, it was used by J.A. Stevenson. In it the children choose their projects according to their interests, urges and capabilities and complete their projects only when they follow certain psychological principles of learning like law of readiness, law of effect etc. they learn in real life situations which becomes significant for them.

4. Dalton Plan: This method was devised by Miss Helen in Dalton USA. In it, complete freedom is given to children to complete their school work according to their interests and capacity.

5. Heuristic Method:

This method was devised by Prof. Armstrong. In it, the children discover things themselves. He experiments and finds out different principles or rules for himself. The child struggles to find out conclusions for an investigation which he chooses voluntarily and happily.

Play-way in teaching different subjects:-

a. Languages: Play-way method helps the children to acquire the free use of language. Debates, discussions, tutorials, class-meetings, school assemblies provides sufficient opportunities for expressing one's ideas thus help in acquiring control over the use of languages in different situations. Even pronunciation can be well taught in play-way spirit. The little children recite nursery rhymes in a singing manner even if they do not understand its meaning. So play-way method is very effective and significant at elementary level in order to make the use of language in different situations.

b. Mathematics: Different mathematical operations like addition, subtraction, multiplication and division can be taught through play-way method. Counting and simple calculations can be taught by organizing

projects like running a shop, managing a post-office, opening a co-operative store etc.

c. Social studies: It can be taught through dramatics, stamp collecting, drawing of maps, graphs, charts, pictures, globe-making, models, historical and cultural excursions and tours.

d. Science: Science can be best taught through play-way method. Different experiments, collection of specimens, manufactured articles, minerals, preparation of charts, models and graphs, photography, soapmaking, chalk making, preparation of squashes, jams etc. can be best taught through play-way spirit. Children love to make things for themselves so they should be given ample opportunities for activity and play.

PROJECT WORK

Project work, as a self-learning method, is less structured as compared to PLM, PSI and CAI. It is also called "project method". In schools, you may be giving assignments of various kinds to your students. Sometimes, certain assignments demand that students work on them for a longer period, say one week or two weeks, and produce something concrete or describe the process of certain experiences in the form of a report. Such assignments are called project work or project method.

The dictionary meaning of the project is a scheme or design. Through project works students get experiential learning. This provides the students an opportunity to learn at their own pace and time, while they do certain activities more or less independent of the teacher. A project is an enquiry, conducted personally by a student who is expected to use a variety of methods (e.g. analysis, interpretation, planning, etc.) to undertake a task or study a subject (in terms of knowledge, skill or attitude) and to write a report, or design and make a product, or organise an activity, or solve a problem, etc., in line with the objectives of the project. Thus, project work helps students plan, observe, analyse and synthesize. It tends to develop self-learning habits in the students. It provides real-life experiences to them. It aims at problem solving by them.

Aims of Project Work

The aims of the project work can broadly be classified into the following categories:

- Knowledge
- Skills
- Personality attributes

Knowledge : Project work helps the learner develop knowledge of the topic and learn the various techniques used in the area of study.

Skills : Project work develops the following skills in the students:

- Skills for independent work which includes planning one's work, hunting for sources, collecting data, selecting relevant materials, fabricating experiments, manipulating instructions, making keen observations, analysing results, synthesising findings, making generalisation and presenting findings for use and necessary action.
- skills for group work include working in a group, developing the ability to cooperate with others, developing fellow feeling and democratic spirit.
- Skills for communication include development of oral skills by argument and discussion with colleagues and supervisor (teacher in our case).

Personality attributes: Project work also develops personality attributes which may be higher mental abilities such as critical thinking, creative thinking, evaluative ability, analytical thinking, etc., and certain affective attributes like interest in the area of study, social Sensitivity, etc.

Types of Project Work

Project work may be of different kinds. In school context, it may broadly be classified as laboratory work, field work, and library work.

i) Laboratory work :

Laboratory work aims at developing certain skills in the student through activities conducted in controlled conditions. Such project work is carried out in science and science-related subjects. The students are required to undertake mini research projects, for example, carrying out small laboratory experiments, like preparation of oxygen, dissection of a frog, etc. Laboratory work involves skills of manipulation, organisation, experimentation and interpretation. Through lab work, students get real-life experiences, of course, in controlled conditions. The students get the opportunity to apply theoretical knowledge into practice.

ii) Field work:

Unlike laboratory work, field work is conducted in real-life conditions, and not under controlled conditions. The students are expected to go to the real-life situations where they observe a phenomenon, collect the relevant data, process and analyse the data and arrive at conclusions. Field work is appropriate for both the physical and the social science subjects. Community projects also come under field work. Students may be motivated to take up field work to gain first hand knowledge of the subject. Organising a literacy campaign in the community, visiting a nearby factory, visiting to a nearby slum, etc., are some examples of field work.

iii) Library work :

Sometimes students may be asked to undertake project work related to library studies. Such a project has potential to promote individualised learning. Though the students are not habituated to library work in schools, you can encourage them for it by assigning library projects. Library projects may be conducted in two ways:

- After introducing the topic and providing necessary information to the student in the class, you may tell them about the relevant books which

concern the topic selected for the project work. Students should go through those books and develop a report on their work.

- Another way of conducting library projects is first to ask the students to read the relevant books on the topic and then ask them to come with small reports on the basis of which you can hold discussions with them. Thus library project can develop the habit of self-study among the students.

How to Organise Project Work ?

Project work is an effective instructional method which requires participation of both the teacher and the students. Your role in project work as a teacher is very important because students at the secondary school level may not be competent enough to undertake project work on their own. With your initiative and direction the students can be fruitfully engaged in the project work. Let us discuss what is expected of you as a teacher while organising project work.

Preparation for project work:

When preparing for the project work, you should help the student perform the following tasks:

- Selection of appropriate subjects/skills/procedures/problems/topics for the projects.
- Offering students a choice of subject/skill/procedure/problem/topic (if feasible).
- Formulating or rather helping to formulate clear objectives of the project.
- Listing the resources and guiding how to locate and use those resources.
- Sequencing the work efficiently.
- Timetabling the project realistically.
- Organising an adequate record system.
- Organising and explaining the assessment schedule.
- Formulation of evaluation criteria.
- Outlining evaluation procedures.

With the preparation of the above tasks, you should be able to set the stage for implementation of the project. At the implementation stage also, you are expected to perform a number of tasks.

Tasks at the implementation stage:

The tasks performed by you during the implementation of the project are as follows:

- Organising a preliminary briefing session for the students.
- Forming groups for group projects.
- Helping every students select a topic/subject for the project
- Assisting every student to plan the project by checking the plan outline, eliminating weaknesses, correcting work sequences, suggesting optimal use of resources, checking feasibility of the timetable, suggesting appropriate sources of information, etc.

- Checking every student's progress regularly.
- Suggesting modifications to plans when necessary.
- Encouraging and assisting individual student frequently.
- Checking student's evaluation procedures.
- Assessing the project in accordance with the planned scheme.
- Evaluating the whole project with other students including the project report, project product or procedure.
- Organising an effective group debriefing session.
- Evaluating the efficiency and effectiveness of the project as a learning activity.

Evaluation of Project Work

Evaluation Of project work involves both the processes and the product of the project. The product of the project may be some concrete material or the project report.

Role of a Student in Project Work

The student has to play an important role in project work. Though you are there to help him throughout, the main responsibility of carrying out the project work lies with the student. There are three major stages the student has to work through while carrying out project work.

These are:

i) Planning stage :At the planning stage, the student has to consider the following tasks:

- The student should have a clear idea of the objectives and the criteria of the project
- If there is any ambiguity, he should seek your help.
- He should understand the scope and limitations of the project.
- He should carry out a task analysis of the project in terms of skill(s), problem(s) or procedure(s).
- He should design a suitable plan, strategy or method for dealing with the project.
- He should arrange the tasks in a sequence and fix a target date to complete the project .
- He should discuss with you various aspects of planning.

ii) Implementation stage :At the implementation the student should carry out the following tasks at this stage :

- Collect all necessary information .
- Decide about suitable methods of enquiry.
- Use resources such as equipment. materials, available expertise, etc., effectively.
- Cooperate with other students in case of group project
- Carry out the processes involved in the project, namely, analysis, synthesis, application, decision taking, problem solving, etc.

- Stick to time schedule prescribed for the project.
- Secure help and guidance from the teacher throughout the implementation stage.

iii) Reporting/presentation stage: The student is expected to carry out the following tasks at the reporting stage:

- Interpret information and use materials properly .
- Draw appropriate conclusions.
- Compile an effective project report.
- Present the report, product, procedure, decision or solution effectively.

Field Work / Excursions

Field work / Excursions is an important instructional method in social studies, It means taking the class into the "real" world. It is conducted in real life situation's where they observe a phenomenon, collect the relevant data, process and analyse the data and arrive at conclusions.

Field work should be related to an ongoing unit of work. For example, while teaching the means of production, the teacher can take students to a nearby factory where students observe the various processes involved in the production of goods. Field work / Excursions provides students first- hand knowledge and enables them to see how a number of skills and processes are integrated. The experiences which students get from field work contribute towards effective and permanent learning.

The Requisites of Travels and Excursions

While taking out the students for travels and excursions the teacher should keep the following points in mind.

(i) Discipline should be maintained while the students are going out. It can be done easily if the teacher continues to direct students properly and provide them an opportunity to see things in the proper perspective. If the students get interested in their observation they shall not be undisciplined.

(ii) While the students are being taken out to excursions they be made comfortable. For this they should be lodged properly and given proper food. If the students are not physically comfortable their mind shall not work properly and it shall not be possible for them to acquire knowledge in the proper manner.

(iii) The teacher should direct the students in proper manner. He should explain the importance of each and everything that the students have seen. He may also explain which things are used for map drawing and which things are useful for charts etc.

(iv) After the excursions or travels the teacher should point out the particular chapter that may have bearing on the excursion or the travel.

Such a reading will strengthen the experience and give a solid foundation to the knowledge.

(v) Students should invariably be asked and encouraged to carry a note book with them while they go out on excursions. They should also be encouraged to note down important things. Such things shall be useful in the classroom and proper study of the subject.

Organisation of Excursions

For organisation of successful excursion the following points are kept in mind:

- The excursion should be carefully planned and well in time. Such planning is done by teacher-in-charge with active participation of students.
- It is worth consideration that the journey is not too long, tiresome etc.
- A list of items to be carried by each student be got typed and distributed amongst the students. A broad programme of excursion is also included in it.
- Prior arrangements/approval etc., for places to be visited, conveyance, meals etc. are made.
- During excursion students be given enough freedom for self-study and observation so that they could derive reasonable entertainment and pleasure from these activities
- Committees are formed to look after various organisations work such as boarding, loading, photography conveyance etc.
- Proper accounts are maintained for the expenses incurred during excursions.
- Teacher should try to draw maximum educational advantage out of the excursion.
- Every excursion should have a definite follow up programme.
- Proper evaluation is made at the end of each excursion.

In this regard Prof. E. F. Macnee has rightly remarked:

"It is essential that the foundations of Geographical knowledge shall be laid in the field. No amount of reading from books can make up for a practical knowledge gained by looking at the earth which the child is studying. It follows that from the very early stages expedition should form part of the Geography course. In the lower schools there is usually plenty of time and many simple excursions can be made."

During such an excursion teacher should make an effort to show to students the various sources of supply of raw materials and also explain the significant contribution and impact of goods, exported to other countries.

Such an excursion will help the students to get an idea of the exact location of dams, projects, industries, ports and harbours etc. It also helps the students to properly assess resources of our country and the students

become more aware of availability of plenty of materials inside the country and their contributions on the revenue of the country as also about foreign exchange. Students also get an idea of how a particular region contributes in solving the problem of unemployment.

(c) Visits to Museum

It is no exaggeration to say that National museums and laboratories are excellent centres for giving real knowledge to students in various areas of learning. Planetariums such as Birla Planetarium at Calcutta provide good knowledge about heavenly bodies like the sun, the moon and other planets. Such knowledge is more stable and permanent.

Some of the important advantage of excursions is as under:

- (i) They provide direct source of knowledge and acquaint the student with first hand information.
- (ii) They provide an opportunity to the student for development of his aesthetic sense.
- (iii) By such excursion students become interested in the exploration of their environment.
- (iv) They help to develop in students a love for nature and to acquaint them with the real happiness in the outside world.
- (v) It helps in development of power of observations, exploration, judgment and drawing inferences, problem solving ability of students.
- (vi) It helps in developing qualities of resourcefulness, self- confidence, initiative and leadership amongst students.
- (vii) It helps in developing cooperative attitude and various others
- (viii) It helps in proper utilisation of leisure.
- (ix) It motivates the students for self-study and self-activity.
- (x) It helps in the development of creative faculties of the students.

Laboratory (Experiment) Method

In laboratory method students perform laboratory experiments by their own hands individually or in small groups, under the supervision and guidance of their science (Physics, Chemistry, Biology) teacher. So here students are more active and involved as compared to lecture - demonstration method, where teacher was performing experiments and most of the students in the class were just passive observers.

The role of the teacher when using this method in teaching science is that of a facilitator. The teacher goes to different individuals or small groups, observes them what they are doing, corrects them if they are doing something wrong, and he is always available to students when they really need him for any guidance. Unless students perform experiments themselves, they will never get to know what science really is. In this method they get an opportunity to do experiments individually or in small groups.

Generally lab experiments are of five kinds:

1. Experiments to illustrate scientific principles.
2. Experiments to find numerical results.
3. Experiments to produce something such as preparation of gases or biological slides.
4. Experiments to verify experiments carried out by other scientists like verification of Ohm's law.
5. Original work like investigatory science projects or open ended experiments.

In our science courses there are usually the first four types of experiments. Presently little importance has also been given by CBSE to the 5th type- investigatory science project at senior secondary level.

When teaching science by laboratory method, the following objectives should be kept in mind.

1. to develop manipulative skills
2. to arouse and maintain interest in science.
3. to encourage accurate observations and careful recording
4. to make biological, chemical and physical phenomena more real through actual experience
5. to train students in science processes
6. to give training in problem solving
7. to verify facts and principles already taught in theory
8. to give training in open ended experiments, scientific method and investigatory science projects

1. Equipment must be accessible to the students when needed
 - (a) waiting time should be minimum.
 - (b) material should be placed in such a manner that they can be easily found by students.
2. There should never be shortage of equipment and material needed for practical work.

Merits of Laboratory Methods:

a. Through this method, a science teacher can provide various kinds of learning experiences to the students, as a result of which information gained by them turns out to be of permanent kind.

b. In this method, individual differences and interest of all the students are taken into consideration, as a result of which, it is considered to be one of the psychological method of teaching. As more importance is assigned to students in this method, as a result of which, it is considered as child centred method. As no student is required to accept the beliefs and orders of the teacher and full freedom is provided to them to participate in the

laboratory activities, as a result of which they begin to learn various information by doing works themselves.

c. Through this method, students learn to explore various things on their own. They also learn to verify various scientific facts and principles. Such students become able to solve out various kinds of problems arising in their life own their own, as they possess of high level of self-confidence.

d. As the students directly get indulged in the experimental functions and handle the various complex instruments themselves, thus various kinds of practical skills and proficiency get developed in them to considerable extent, with the help of which they prove to be successful in earning their livelihood in the future.

e. Through this method, an intimate relationship got developed in between the students and teacher, as students are required to acquire necessary guidance for performing practical work from the teacher while the teacher provides proper individual attention to them, by which all of them come closer to each other.

f. With this method, teacher can develop various good habits among the students because of which it is known for inculcation of good virtues among the students by a majority of experts. An important good habit which gets developed among the student is that they learn to perform their work on their own and independently. Not only this, they have to work while maintaining cooperation with other students also, as a result of which habit of team work gets developed in them. In addition of these, qualities of honesty, sincerity and truthfulness also get developed among the students through this method.

g. When students get success in their experimental work, then they attain a sense of achievement, which helps them in improving their performance to considerable extent in all spheres of life.

Demerits of Laboratory Methods:

a. There are some kinds of knowledge which cannot be verified through experiments, as a result of which this method has limited applicability. Not only this, generally it is found that teachers do not allow the students to make experiments independently, as it involves certain kind of risk of occurrence of accident.

b. As all the students get involved in experiment works because of which it becomes necessary to provide them with separate equipment's and other materials, but it is not possible for the teachers to do so as the main problem in our nation is shortage of resources. It is an important reason that why this method is used to limited extent in schools.

c. For procuring the essential materials and facilities, a huge amount of funds are required, because of which this method is considered to be expensive. It is not possible to make use of such method in schools of our nation, especially in government schools.

d. As every student is expected to learn by performing experiments, thus it is felt by some experts that this method expects too much from the students. In this method, students feel heavy burden on themselves as a result of which they do not get involved in the exploration and investigation processes with their fullest capacities.

e. Not only the students feel lot of burden on them, but teacher also have the same kind of tendency. Sometimes, teacher find it difficult to attend to the individual needs of the students, as they differ from each other to considerable extent. As a result of this, students get discouraged, as a result of which, it becomes very difficult for teacher to provide timely help and guidance to them.

f. This method can only be used by experienced and well qualified teacher otherwise, probabilities of getting failure can be increased.

INDUCTIVE-DEDUCTIVE METHOD

Two very distinct and opposing instructional approaches are inductive and deductive. Both approaches can offer certain advantages, but the biggest difference is the role of the teacher. In a deductive classroom, the teacher conducts lessons by introducing and explaining concepts to students, and then expecting students to complete tasks to practice the concepts; this approach is very teacher-centred. Conversely, inductive instruction is a much more student-centred approach and makes use of a strategy known as 'noticing'. Let's take a closer look at the differences between inductive and deductive instruction,

What is deductive instruction?

A deductive approach to instruction is a more teacher-centered approach. This means that the teacher gives the students a new concept, explains it, and then has the students practice using the concept. For example, when teaching a new grammar concept, the teacher will introduce the concept, explain the rules related to its use, and finally the students will practice using the concept in a variety of different ways.

According to Bob Adamson, "The deductive method is often criticized because: a) it teaches grammar in an isolated way; b) little attention is paid to meaning; c) practice is often mechanical." This method can, however, be a viable option in certain situations; for example, when dealing with highly motivated students, teaching a particularly difficult concept, or for preparing students to write exams.

What is inductive instruction?

In contrast with the deductive method, inductive instruction makes use of student "noticing". Instead of explaining a given concept and following this explanation with examples, the teacher presents students with many examples showing how the concept is used. The intent is for students to "notice", by way of the examples, how the concept works.

Using the grammar situation from above, the teacher would present the students with a variety of examples for a given concept without giving any preamble about how the concept is used. As students see how the concept is used, it is hoped that they will notice how the concept is to be used and determine the grammar rule. As a conclusion to the activity, the teacher can ask the students to explain the grammar rule as a final check that they understand the concept.

Teaching methods can either be inductive or deductive or some combination of the two.

The inductive teaching method or process goes from the specific to the general and may be based on specific experiments or experimental learning exercises. Deductive teaching method progresses from general concept to the specific use or application.

- These methods are used particularly in reasoning i.e. logic and problem solving.
- To reason is to draw inferences appropriate to the situation.
- Inferences are classified as either deductive or inductive.

For example, "Ram must be in either the museum or in the cafeteria." He is not in the cafeteria; therefore he must be in the museum. This is deductive reasoning.

As an example of inductive reasoning, we have, "Previous accidents of this sort were caused by instrument failure, and therefore, this accident was caused by instrument failure.

The most significant difference between these forms of reasoning is that in the deductive case the truth of the premises (conditions) guarantees the truth of the conclusion, whereas in the inductive case, the truth of the premises lends support to the conclusion without giving absolute assurance. Inductive arguments intend to support their conclusions only to some degree; the premises do not necessitate the conclusion.

Inductive reasoning is common in science, where data is collected and tentative models are developed to describe and predict future behaviour, until the appearance of the anomalous data forces the model to be revised.

Deductive reasoning is common in mathematics and logic, where elaborate structures of irrefutable theorems are built up from a small set of basic axioms and rules. However examples exist where teaching by inductive method bears fruit

Heuristic (Discovery) Method

Meaning and Significance:

The word "heuristic" is derived from the Greek word **heurisco** meaning "I find out" and the "Heuristic Method" is one in which the pupils are left to find out things for themselves. Children are placed, as far as possible, in the position of discoverers and instead of being told the facts; they are led to find out things for themselves.

Through this method the pupils are made to learn. The Heuristic method was, for the first time, coined by **Dr. H. E. Armstrong (1888-1928), Professor of Chemistry at City and Guild Institute Kensington**. This method of teaching is of a very recent origin. First it was used in Science and its success led it to be adopted in the teaching of all subjects in the School Curriculum.

The aim of this method is to develop the scientific attitude and spirit in pupils. The spirit of enquiry prompts the pupils to learn. This method insists on truth, whose foundation is based on reason and personal experiences.

As a matter of fact there is no spoon-feeding or more acceptances of facts which are given by the teacher. An eminent educationist has pointed out that the object of the heuristic method is "to make pupils more exact, more truthful, observant and thoughtful to lay this solid foundation for future self-education and to encourage this growth of spirit of enquiry and research."

All the children in a class may be set to work simultaneously at this same problem in adopting the heuristic method. Each child with all attention strives to find out something for himself. Heuristic method aims at the pupils' own observations to satisfy as many questions as possible to be raised in the teaching- learning situation.

Much is demanded of the teacher in the heuristic method of teaching. He should be a great reader of books in order to obtain varied information. The teacher should possess much curiosity, observation, interest and spirit of scientific investigation, because these are the qualities he wishes to develop in pupils. The teacher should realize the responsibility of fostering in this pupils good habits of reading and collecting various information from books.

In the heuristic method, the teacher is a guide and also a working partner. As a friend of pupils, this teacher should proceed on the way to discover facts. He is to see that this class room is pervaded by an atmosphere of freedom and that the work provided to the children encourages self-development, spontaneity and self-expression.

This method is used not only in teaching scientific subjects like Mathematics, Physics, Chemistry and Nature Study, but in all subjects of the curriculum. A close study of this method reveals that it is in reality this heuristic attitude which should characterize teaching of all subjects. It is

opposed to dogmatic techniques of teaching, where pupils are passive learners. This may be applied to inductive as well as deductive lessons and thus heuristic method is problem- solving.

According to its author **Prof. Armstrong**, "Heuristic methods of teaching are methods which involve placing students as far as possible in the position of discoverers,—methods which involve their finding out instead of being merely told about things." This statement speaks very clearly that telling is in no teaching. The Heuristic method tends to set the learner himself on the track of invention and to direct him into the paths in which the author has made his own discoveries. Heuristic Method is learning by doing.

Psychological Basis or Principles of Heuristic Method.

The heuristic method is based on the following principles:

1. Principle of activity or learning by doing.
2. Principle of experience.
3. Principle of freedom.
4. Principle of play-way.
5. Principle of purpose.

History: Students may examine the sources and then complete an account of a historical event.

Geography: Students may observe different phenomena like days and nights-their duration at different times in the season and formulate general principles.

This method can be used in other subjects where inductive deductive approach has to be followed.

Merits of the Heuristic Method.

- It develops scientific and critical attitude of mind in the students.
- It arouses the spirit of enquiry in the students.
- It develops habits of hard work among the students by keeping them busy to find out the required solutions.
- It fosters self-activity in the students.
- It helps to develop the power of initiative, self-confidence and self-reliance among the students by encouraging them to draw their own conclusions through their own efforts.
- The students learn the art of planning their programmes.
- It makes learning more effective and permanent. The students learn facts through their own labour and therefore retain them much longer.
- It helps to develop good relationship between the teacher and pupils and among pupils themselves.
- This method provides enough training to the students to prepare themselves for life. The students learn how to handle different

situations and how to arrive at certain conclusions. This experience helps them in later life.

- The fear of the home task diminishes. The students are not to memories-facts at home but to find facts in the classroom or the laboratory.
- The students feel the pleasure and joy of achievement and sense of originality.
- The problem of discipline is solved as the students remain busy in their work.

Limitations of the Heuristic Method.

Following are some of the main demerits of the heuristic method:

- The pupils are immature and we cannot always put them in the position of discoverers or inventors.
- It is a very slow method and it is not possible to finish the syllabi in time. .
- This method requires teachers who are very enthusiastic in their work and who are very resourceful and hardworking. But this is a scarcity of such teachers.
- This method cannot be used in large classes as it involves a dose supervision on the part of the teacher.
- This method is not suitable for primary -classes.
- This method cannot be used at all occasions aria all the time. there will be numerous occasions when it becomes absolutely essential for the teacher to give direct information.
- We cannot expect all the children to become discoverers and inventors because there are many children who are mentally,deficient.
- Wrong generalisations may be arrived at and thus a lot of time and energy may be wasted.

Enquiry/Empirical Evidence

Inquiry based learning is mainly involving the learner and leading him to understand. Inquiry here implies on the possessing skills and attitude of yours, which allows you to ask questions about new resolutions and issues while you are gaining new information.

Dictionary meaning of Inquiry is seeking knowledge, information, or truth through questioning. All the people carry on with this process throughout their life, even if you might find it not very much reflecting. For example, infants use inquiry to build their sense of the world, the babies turn towards voices, put things in their mouths, grasp things, and observe faces that come near. The inquiry process is mainly the gathering of data and information and applying them to senses like smelling, tasting, touching, hearing and seeing.

Very sadly, our traditional ways of teaching discourage the process of inquiry. It makes the student get less prone to asking questions as they

move through their grade levels, they are just expected to listen and repeat the expected answers. This is due to the lack of understanding of inquiry based learning. Inquiry based learning is not just asking questions, but it is a way of converting data and information into useful knowledge. A useful application of inquiry based learning involves many different factors, which are, a different level of questions, a focus for questions, a framework for questions, and a context for questions.

Much mesmerizing information and facts are readily available, which needs an understanding of how to make sense out of it and turn it into useful knowledge. The teachers must be able to analyze that he or she does into only have to accumulate information and data but also have to generate it into useful knowledge, which can be easily done through inquiry based learning. Our country's success depending upon natural resources is the past; the future of our country's success now depends upon the workforce which works smarter.

Inquiry based learning can be applied on all disciplines which has been confirmed through different researches. Learners have different perspectives of viewing the world like economic, historic, scientific, artistic, etc. The disciplines can be interrelated through inquiry based learning, which ensures the integrity of different disciplines and the world views about them.

What is Inquiry-Based Teaching?

Inquiry-based teaching is a teaching method that combines the curiosity of students and the scientific method to enhance the development of critical thinking skills while learning science. As learners encounter problems they do not understand, they formulate questions, explore problems, observe, and apply new information in seeking a better understanding of the world. The natural process the learners follow when seeking answers and deeper understanding closely follows the generally accepted scientific method. Often, the answers proposed by learners lead to even more questions—much like the outcomes of research.

Students engage in five activities when they engage in inquiry learning and use the scientific method, as noted in the *National Science Education Standards* published by the National Academy of Sciences. Although these tasks occur in a logical progression, inquiry is a fluid process, and one task may lead back to a previous task. This process is illustrated in given picture. According to the National Academy of Sciences (1995), when students learn through inquiry, they:

1. question;
2. investigate;
3. use evidence to describe, explain, and predict;
4. connect evidence to knowledge; and
5. share findings.

Source Method:-

Source method means the teacher will tell the different sources from where some information can be received or collected. It an activity method of teaching social sciences and sciences. It provides first hand experiences and lead to better understanding of the subject.

It means the utilization of the available human and material sources capable of providing useful information and knowledge related to a particular subject or topic for the realization of the stipulated teaching – learning objectives in a particular teaching – learning situation. The different sources which are available for making content interesting and fruitful include written records, institutions of social interest, building and monuments, tools, rocks, metals and stone inscriptions, coins, literature etc.

Source method is an activity oriented method. It is generally used in social studies subject also.

Generally sources mean a person, books or document or picture or actual objects that can provide information for learning. It is learning directly from the actual sources for examples for social studies they can be- A contract with the bank – or studying the sample of stone collected from the moon or an object found from any ancient place can also be studied. One can also take students to museums to find the objects to study.

Education Significance:-

- It is helpful in the sense that it develops the habit of self-study, self – evaluation, i.e, it makes the learners research minded.
- It is very useful in the learning and teaching of the concepts, facts, principles, events, phenomenon related to different subjects.
- It develops the skills of collecting data, shifting the relevant and organizing the same.
- They get first hand experiences about different sources which retains for long time.
- It makes the teaching more realistic, more interesting and more vivid.

Types of Sources

There are three types of sources in this method.

- 1 Material resource: Ideas, machines, weapons etc.
- Oral resources: Songs, folk stories, traditions, customs etc.
- Written and printed resources: Records, reports, letters etc.

STEPS FOLLOWED TO USE SOURCE METHOD:

- 1 Demonstration or presentation by the teacher.
- 2 Locate related reading material and assign reading to the study.
- 3 Problem solving by students; with group discussion among the students.

ADVANTAGES OF SOURCES METHOD:

- It provides direct, first hand experience.
- It develops a sense of reality
- It creates motivating and interesting ambience in the class.

- It develops skill of data collection, thinking skill and observation skill.
- It makes the subject meaningful.

Observation Method

It is rightly believed that the observation under the careful guidance of a social studies teacher proves very effective in the process of learning, and facts, skills, and behaviour learnt are retained for a longer period. observation or direct experience or visits to actual places, say, a monument, a fort, a field, a river, a temple, an institution, etc. provide ample opportunities to students, for 'seeing; 'hearing', 'examining', 'gathering data' and 'asking' questions.

Visits to hospitals, telephone exchanges, telegraph offices, study trips to airports, etc. show how people and goods are transported from one place to another. Pupils understand better the working of markets, co-operative stores, and factories when they see their working and thus acquaint themselves with the processes of production, distribution, exchange, and consumption. Such experiences are most conducive to learning. The concrete data on cultural, industrial, political and geographical facts and relationship being more 'tangible: 'visible: and 'describable' serve as a great motivating force for further enquiry in social sciences. The observation lends vitality to the subject-matter of social studies.

Techniques of the Observation Method

The following techniques are adopted in the observation Method:

- Field trips of educational excursions.
- Community surveys.
- Community service projects.

It is not a specific method of teaching science. As a matter of fact, almost all science begins with observation. Several hundred years were devoted to accumulating a large amount of observed descriptions of nature. To the scientist, however, goes on to determine relationship between some of the observations made and the information's obtained through the success. The result of this process is an abstract mental picture which tends to see nature in an orderly man-made pattern, which comes under the purview of science of observation. This is the substance of which scientific theories are made. The scientist is mainly regarded as a person, who describes nature by careful observations. The descriptions which are based on direct observation represent correct facts.

The training of pupils in observation is really storing his mind with suitable experiences all thoroughly classified and digested. Science provided remarkable training in observation and reasoning. Learners reason from the once established facts and form concepts about further observed phenomena.

Educational Significance:-

- It is useful in the sense that students make new discoveries and conduct researches in the field of science.
- It develops the power of imagination, thinking, reasoning and drawing conclusions etc.
- It helps the students in clarifying and removing of doubts by obtaining empirical knowledge.
- It develops the different qualities in an individual like planning, organizing, executing and evaluating.
- It gives opportunities to the students to become a part of teaching – learning process. They do not remain passive listeners and indifferent observers.

Merits of Observation Method:

Students get direct experience through direct method. It activates and energizes their knowledge. It avails much information through easy direct contact. Students actively participate in direct observation. It also helps in presenting the bookish knowledge in an interesting way by mixing one's direct experiences with it. It is also interesting one.

Demerits of Observation Method:

This method is costly, time-consuming and not for all topics. Teacher's facility, skill, time is also a factor. Sometimes indiscipline may develop out of observation. But this method is more scientific that make geography teaching a concrete base in schools.

Programmed Instruction

Programmed instruction or programmed learning emerged out of the research conducted by B.F. Skinner on operant conditioning. Although Skinner's name is always associated with programmed learning, there were several efforts made earlier by some people in this direction. The Law of Effect propounded by E.L. Thorndike (1874-1949) has direct relevance to programming.

According to this law, learning which is associated with satisfaction is likely to be more permanent than learning not accompanied by satisfaction. Satisfaction in the form of reward reinforces the behaviour of the student to take interest in his/her learning. This is an important aspect in programming. In 1926, Sydney L. Pressey devised a teaching machine which required students to press keys to answer multiple-choice questions and the next question was presented only after the correct key had been pressed by the student. The idea behind such a teaching machine was that after being exposed to instruction, the student would go through a test presented by a machine and achieve mastery on all the questions (content) till (s)he ceased making mistakes.

The real landmark in the development of programmed learning was the work of B.F. Skinner. After conducting extensive research on rats and pigeons, Skinner developed a theory of learning called operant conditioning.

Styles of Programmed Instruction:

There are mainly two styles of programmed instruction - linear and branching. These styles aim at programming of subject matter and are widely used in instructional situations all over the world. However, there is yet another style which is used for programming of behaviour. This style is called mathematics. In our discussion, we focus on the first two styles.

Linear style:

The linear style of programming developed by B.F. Skinner is otherwise known as **Skinnerian style**. According to this style, the subject matter is broken into small pieces of information (steps) and is presented in a logical sequence of small steps. These small steps are called frames. The student is required to go through frames containing a bit or bits of information and respond to the question given at the end of each frame. The feedback in the form of correct answer is provided in the next frame. The frames are so designed and arranged that students' errors are kept to a minimum. In other words, programmed instruction ensures that the student makes/commits minimum errors.

Branching style :

The branching style of programming was developed by Norman, A. Crowder. His intention was to use the errors to direct the students to an appropriate explanation or remedial sequence. Therefore, he gave students some information followed by a multiple-choice question and provided a different response for each apparently correct answer (distractor) chosen. Students proceed through such a programme, following different routes or branches and care is taken to ensure that they understand each point before they proceed to the next. There are many similarities between linear style and branching style. However, branching style is different from the linear style.

Difference between linear style and branching style:

There are two main differences between the linear style and the branching style of programmed instruction.

- In branching style the student is presented with multiple-choice questions and (s)he has to select the correct response out of the given choices. Then he is routed through branches according to his response.
- This style is based on explanation and reasoning. Therefore, it has been more effective with brighter students.

Personalised System of Instruction

The personalised system of instruction (PSI) is another self-learning technique which emphasizes individualisation of instruction and learner-

controlled instruction. It is also known as **Keller Plan** and is widely used all over the world.

This technique is called PSI because instruction is designed according to the need and ability of the student. Like other individualised instructional methods, PSI also allows the student to move through course material at his/her own pace and requires mastery learning by him/her.

Features of PSI:

Keller (1968) identified five main features which distinguish PSI from conventional methods of instruction. These are:

- PSI is a mastery oriented learning technique.
- It is individually paced technique of teaching-learning.
- It uses a few lectures to stimulate and motivate the students.
- It uses printed study guides to communicate information.
- It uses tutors (or a teacher like you) to evaluate attainment of the objectives by the student.

Description of the technique:

In PSI, the student is given carefully prepared assignments which generally include programmed learning material, handouts and materials which are available in the library or at the learning resource centres. The materials include questions and exercises. The student is told about the nature of assignments. The student is also instructed about how to read and what to read. At a time, the student is expected to work on one unit only.

The tutors (not necessarily professional teachers) ensure that the student is provided with proper reading material, remedial material and necessary help whenever he faces any difficulty. When a student thinks that he/she has completed the material, he/she can come to you. You can conduct a short quiz or test in order to evaluate the student's mastery over the material. If you are not satisfied with the performance of the student, you should ask the student to re-study the course material. If you are satisfied, you should direct the student to proceed on to the next unit. The students should not be given punishment if s(he) commits errors or secures low score/grade in the assignment. Since the student in this technique learns at his/her own rate (self-pacing) in order to meet the individual differences in learning, a multimedia approach is followed in addition to written material.

As an instructional technique, PS I has proved to be a better technique in comparison to conventional teaching. Research evidence shows that PSI facilitates better performance, increases retention and promotes transfer of training.

COMPUTER-ASSISTED INSTRUCTION

One of the most important contributions of modern technology in the field of individualised instruction is the introduction of computers in the teaching-learning process. Although, its use has not yet been extended on a mass

scale to our schools, the future years may witness fast computerisation of the teaching-learning activities.

As teachers, we should know the role of computers in the teaching-learning process. A computer can record, analyse and react to students' responses. It can store and manipulate information on an extensive scale; it can control and manage a wide variety of learning materials; and it can simultaneously cope with learning requirements of many individuals. It can make a number of planning decisions also.

Computer-assisted instruction:

Computer-assisted instruction (CAI) is, in a sense, an extension of programmed learning material and the personalised system of instruction. In CAI, there is flow of information and interaction between the computer and the student. The computer provides instruction directly to the student and allows him/her to interact with it through the lessons programmed in the system. The student puts questions to the computer and feeds answers into it with the help of the keyboard. The computer provides feedback to the student on the basis of his/her performance. On the whole it may be said that the computer acts as a teacher to the student.

In order to carry out this teaching/learning function, the computer utilizes various instructional modes. Let us discuss these modes in brief.

Drill and practice: In this mode, the computer presents to the student a series of exercises which he or she attempts by giving some responses. It provides the student feedback on his/her answers in the form of congratulatory message, if it is right, or a corrective comment, if it is wrong. Thus, computer-assisted instruction provides endless drill and practice with repetition at a pace that can be controlled by the student. The computer allows the students to proceed further only when mastery has been achieved by him/her.

Tutorial mode: In the tutorial mode, as in programmed instruction, information is presented in small steps followed by a question. The student's response is analysed by the computer and appropriate feedback is given.

Simulation mode: Learning experiences related to the real life phenomena are provided to the student through this mode. For example, the study of genetics, experiments in town planning, the operation of a system, etc., can be shown to be student through the computer simulation

Discovery mode: This mode uses inductive approach to learning wherein the problems are presented and the student solves them through trial and error.

Gaming mode: In gaming mode teaching can be imparted through a playway mode.

Computer-managed instruction:

Computer-managed instruction (CMI) is another contribution of the computer to the domain of instruction. In CMI, the computer gathers, stores and manages information to guide the student through individualised learning experiences. The computer helps the student move through check-points (in the form of definite activities) in the education process at different times via different paths matching the individual capabilities. CMI achieves this individualised instructional process by a series of activities administering diagnostic tests, scoring them, prescribing the appropriate paths and monitoring the progress of individuals all along the route

GROUP-DIRECTED INSTRUCTIONAL INPUTS

Instructional techniques involving group-directed instructional inputs provide room for the learner's self-development and active participation in the teaching-learning process. In group directed instructional inputs, the learner is not only influenced by the stimuli, that is a part of the environment around him, but he can also in turn influence them as he too has a role in generating the stimuli. Group-directed instructional inputs, apart from the development of various higher cognitive abilities, do help in the development of affective attributes.

DISCUSSION

The simplest form of group based learning technique is the discussion, which can be used in a variety of situations in the secondary school context. Its value lies chiefly in the fact that it represents a type of intellectual teamwork, resting on the principle that the pooled knowledge, ideas, and feelings of several persons have greater merit than those of a single individual (**Jarolimeck, 1986**). The strength of discussion lies in the broad participation of members of the group. It is a process of thinking together that breaks down if one member or group dominates it. It is the responsibility of the teacher to encourage the more relevant students to participate. For example, situations like giving feedback on the responses of a class test, Clarifying the doubts of students at the end of a lecture, resolving the debatable issues raised during the lecture, generating alternative solutions to a classroom problem, and breaking the monotony of "teacher talk" are some of the situations in which the discussion technique could be used.

Organisation :

For effective utilization of this technique, the teacher should give sufficient background information so that they already possess it and are ready to use it in the discussion. This is a primary requisite for a discussion to take off. A discussion cannot operate in a vacuum of information. The ability of the teacher to initiate a discussion often decides the ability to postpone. He may give his judgment later on the issue being discussed and the responses of individual students. The teacher's judgment, through even a non-verbal clue, can affect the nature and pattern of responses.

Instructional potential :

It can develop higher cognitive abilities effectively apart from reinforcing knowledge. The uniqueness of this alternative lies in its simplicity, but its effectiveness is related to the abilities of the moderator or leader.

Skills associated with discussion :

Jarolimek (1986) has suggested certain skills which a teacher of social studies should develop in the learners participating in discussions. These skills are as follows:

- Listen attentively when others are speaking.
- Remain objective and do not become emotional.
- Be open-minded, respect and accept the contributions of others, but think independently.
- Assume responsibility for the discussion and be able to support ideas with factual evidence.
- Speak loudly and clearly enough for all to hear.
- Do not dominate the discussion; contributions should be stated concisely and briefly.
- Ask for clarification of ideas that are not understood; ask for evidence to substantiate statements.
- Recognise the problem of semantics in arriving at group decisions or in discussing a controversial issue.
- Assume responsibility for moving the group towards its goal.
- Have confidence in the ability of the group to come to a satisfactory decision and support the decision of the group once it has been made.

DEBATE

This alternative is specially suitable for controversial themes or issues and for developing certain skills like logical arguing, weighing evidence, &c., in students. In social studies, debate may be organised for topics like:

- Is liberalisation necessary for the economic development of a country?
- Is the Presidential form of government better than the parliamentary form of government?
- British rule in India was a boon for Indians.
- Should India go for a capitalistic economy?

Organisation :

The participating students could be divided into two groups, one for a proposition and the other against it. The remaining students can form the audience. Towards the end, the audience can involve themselves in a short discussion.

Instructional potential :

The uniqueness of this alternative lies in its ability to involve the students to a very high degree in terms of gathering information, processing it and presenting to the audience, proposing, arguing and counter arguing, specially by noting the points raised by the previous speakers.

SYMPOSIUM

This alternative is suitable for teaching topics or themes having various dimensions. In social studies, a symposium may be arranged on such topics as:

- Lord Buddha and his thoughts
- Co-operative movement in India
- Coalition. governments in India

Organisation :

Selected students and different staff members can form teams to make presentations. Each team would present a different dimension of the same theme, one by one, in a pre-planned sequence. It would then be thrown open to the "floor" for discussion. A chairman initiates and regulates the proceedings.

Instructional potential :

As mentioned earlier, the uniqueness of this alternative lies in its suitability for teaching multidimensional themes or topics and thus it provides a wider perspective to the learners.

PANEL DISCUSSION

When the themes or topics are of a very complex or controversial nature, a panel discussion is a good choice as it brings out difficult aspects in a constructive manner. In social studies, panel discussions may be organised on such topics as:

- Communism and its debacle in the world
- Future of the United Nations
- If Hitler had succeeded in conquering the entire world

Organisation :

Members of a panel could be selected students or teachers or both. Questions regarding a topic or a series of topics could be collected in advance from among the students. The questions are given to the panel members in advance depending on their expertise on the sub-themes or sub-topics so that they come prepared with answers/evidence etc. A moderator initiates the discussion by explaining the purpose and scope and raises questions in a predetermined order to various members of the panel, then the members of the panel present their views one after the other. Later on each member may also react to others' views. In the end, the different viewpoints and interactions are synthesised and summarised by the moderator.

Instructional potential :

The uniqueness of this alternative lies in its ability to resolve issues and seek clarifications of controversial and multidimensional topics and themes.

BRAINSTORMING

This alternative is useful in developing the creative abilities of students. Problems which demand creative or innovative solutions can be presented by the teacher to the students of brainstorming. For example, the social

studies teacher asks students to watch a television programme on "Population Problem". The next period he says to students, "we have watched the TV programme and can now find out certain solutions to the population problem of our country". The students come out with a *list* of solutions to overcome the population problem. The teacher lists them on the blackboard and does not give any judgement on the list. He asks students to select appropriate solutions from the list.

Organisation :

In a classroom, the teacher can select a problem-oriented topic and ask students to express themselves freely on various aspects of the topic. The teacher assures students that their expressions will not be criticised or commented on in a negative way. Students should be encouraged to freely come out with their viewpoints. The teacher takes note of all these expressions. After the session, or preferably on another day, the teacher may evaluate, elaborate and integrate the ideas exposed in order to encourage further thinking among the students along newer dimension.

Instructional potential :

This technique helps students to think creatively and is suitable for problem-oriented themes.

Lecture Method

The lecture is one of the most common teaching methods used by teachers of subjects at the secondary level. It is an example of "expository" teaching, in which the input is directly provided by the teacher who communicates the new information or process. Apart from its major function of giving information, it plays certain unique functions which cannot be performed by other inanimate sources. Firstly, the teacher may use it to motivate the students. It is through listening to lectures that students are attracted to different areas of studies in social sciences. Secondly, the teacher may use it to integrate various sources of information. The lecture follows some specific steps through which it is carried out. These are planning and delivery. The delivery of a lecture is again divided into three phases : introduction, development and consolidation.

Educational Significance:-

- It is an economical teaching device. No laboratory, apparatus, gadgets etc are required
- It can be used for a very large group of students without the use of other aids.
- It provides training to the pupils in listening and taking rapid notes.
- It is used to achieve the cognitive and affective objectives.
- It gives students good training and experience in the development of certain skills like learning by hearing, writing while taking notes, attending the auditory and visual presentation.

- It provides the opportunity to the teacher to use different techniques and methods like question –answer technique, discussion method etc. in order to capture their attention towards the lecture.

Planning of a lecture

Unlike what is commonly believed, the lecture does require systematic planning. Planning a lecture entails a number of activities. The teacher must prepare a lesson plan for the lecture to be delivered. This contains the instructional objectives to be achieved, the amount of -content to be covered, the kinds of additional interactional modes to be used, the feedback mechanism to be used, the kinds of audio-visual aids to be used, etc. Thus, planning a lecture boosts the confidence of the teacher in handling the class. He knows in advance what to do when, and what not to do. Sometimes, the teacher can plan for humorous interludes, jokes, etc; to make the lecture more interesting.

Delivery of a lecture

Delivery of a lecture may be done in three phases as follows:

Introduction of a lecture : Sometimes, the introductory phase is also called the warm up phase. The main task of the teacher here is to establish rapport with the students, create interest and motivation among them and gradually lead the learners to the next phase. At this stage the teacher relates the new topic to the one already taught and to the previous experience. The main function here is to arouse interest and motivate the students. The teacher also uses the blackboard or any other visual medium to highlight the theme.

Development phase : This is the most important phase of a lecture. The transaction of ideas and information between the teacher and the learner takes place at this phase. This is also called the presentation phase.

The teacher explains the concepts and principles, provides facts, furnishes data, quotes figures, etc., to the learners. In order to explain the content matter, the teacher cites examples, uses communication aids, gives analogies and illustrations, etc. Where required, the "teacher also adopts different non-verbal communication techniques such as gestures, postures, etc., to facilitate teaching.

Consolidation phase : This is the concluding phase of a lecture. Here the teacher recapitulates whatever he has explained; then summarizes the main teaching points of the lecture either verbally or by writing them on the blackboard or by using an overhead projector (OHP). The teacher also asks a few questions on the content matter covered in order to evaluate the students' understanding of the lecture. Thus, the teacher gets to know the learning difficulties of students and accordingly modifies his teaching. The teacher also gives some assignments to the students which they are expected to complete and bring back for the teachers remarks. The teacher also informs the students what the next lecture would deal with.

Advantages of lecture method

The lecture method has certain merits for which it can be used in teaching subjects. Some of these are mentioned below:

- Lecturing can be used to impart knowledge pertaining to all branches of subjects.
- Lecturing is a method that can easily adapt itself to suit a wide range of personality characteristics.
- This alternative is adaptable to a variable teacher-student ratio.
- The lecture technique is very economical and can be made very effective with proper planning and execution.

Disadvantages of lecture method

- It provides little scope for pupil's activity.
- It does not take into consideration the individual differences of pupils.
- It is against the principle of 'learning by doing.'
- It spoon feeds the students without developing their power of reasoning.
- Speed of the lecture may be too fast for learners to grasp the line of thought.
- An average student may not be able to fix up his attention to a lecture.
- A lecture may become monotonous to students after a while.

Question Answer Method

Questioning is a powerful technique of teaching subjects. Through this technique, the teacher transacts lot of learning experiences. The teacher asks questions and the responses given by the students are strengthened and elaborated.

According to Lorber and Pierce (1990), Instructional Inputs in Subjects questions can be used to find out how well students understand a particular block of information, to shift student's attention from one point to another, to increase retention of important points by isolating and emphasizing them, and to put students in the right direction before starting assignments. Questioning facilitates high order thinking skills like analysis, synthesis and evaluation in the students.

In order to increase the effectiveness of questions you may take the following steps:

- **Stat the question clearly and precisely :**A question must be clear and precise. There should not be any ambiguity in the question. For example, a question like "What about Buddhism?" does not convey any meaning to the students. It would be better to ask "How does Buddhism differ from Jainism?"
- **Pause after asking the question and allow it to "hang overhead":** The teacher should ask the question clearly and then pause before calling on someone to respond. This helps students to think about their answer.
- **Call on students at random :** While calling on students, the teacher should not follow any specific pattern such as seating arrangement,

alphabetical arrangement, etc. Rather, he should call on students at random.

- **Provide immediate feedback to students :**The teacher should give immediate feedback after receiving students' responses. He should tell the students if the response is partially correct or wholly correct.

Questions could also be categorized according to their essential functions:

i. Probing questions :

Probing questions are meant for motivating students to go beyond their initial responses and help themselves in solving the problem. For example, to a response, like "Barter economy means exchange of goods for goods." the teacher may say "Good" and ask the student to provide an example of "barter economy".

ii. Open-ended questions :

These questions have definite right or wrong answer; Students are free to think on their own and provide answers with a logic. A question like "What will happen to the Island country of Maldives if the temperature on the earth increases ?" may be asked of the students.

iii. Convergent questions:

Convergent questions are designed to "converge" on a particular idea or point and are meant for inducing a principle or deducing an answer. An example of a convergent - 'How do farm subsidies affect consumer prices?'

iv. Divergent questions:

Divergent questions are helpful to draw a student's attention away from one point and allow it creative freedom to settle on a different but related point. "What present day parallels do we have, if any, to the Indus Valley Civilization?" is a divergent question which inspires students to think divergently on two analogous situations.

Advantages of Question-Answer Method

- (i) It can be used in all teaching situations.
- (ii) It helps in developing the power of expression of the students.
- (iii) It is helpful to ascertain the personal difficulties of the students.
- (iv) It provides a check on preparation of assignments.
- (v) It can be used to reflect student's background and attitude.
- (vi) It is quite handy to the teacher when no other suitable teaching method is available.

Disadvantages of Question-Answer Method

- (i) It requires a lot of skill on the part of teacher to make a proper use of this method.
- (ii) It may sometime mar the atmosphere of the class.
- (iii) This method generally is quite embracing for timid students.
- (iv) It is time consuming

Teaching Method: Guest Speakers

Inviting guest speakers to the classroom is another effective teaching strategy in subjects. In social studies, there are a number of experts whose rich experience, of knowledge and skills could be made use of in instructional activities. They not only provide students the experience of the real world but also motivate them for effective learning. For example, a political worker may be invited to talk on the national character of India and on the forces which act against the unity of the country. Similarly, an economist, when invited as a guest speaker, would provide comprehensive knowledge on the factors responsible for the economic growth of the country.

Though textbooks and classroom teaching in subjects do provide students knowledge on various content areas, lectures given by guest speakers strengthen the knowledge acquired by. Students from textbooks and classroom teaching.

Sometimes, guest speakers can also serve as role models for students. For example a freedom fighter, if invited to speak on the role of freedom fighters during the independence movement, would certainly act as a role model for students. Students would, thus, learn the virtue of patriotism and mould their character for the cause of the nation. Guest speakers could be chosen from any discipline or from any human occupations. They may be academicians, social workers, businessmen, religious workers, political workers, parents, etc.

Woolever and Scott (1988) have given certain guidelines which may be followed while selecting and preparing for an outside speaker. These are:

- Determine specific instructional objectives for the guest speaker person.
- Choose a speaker with acknowledged expertise.
- Select a speaker who can be effective with students and who won't talk over their heads or down to them.
- Communicate the expected learner outcomes to the speaker, and encourage him or her to tell you what is planned; make suggestions or additions or changes as appropriate.
- Encourage your guest to use audio-visual and tactile materials to enhance the value of the presentation.
- Check with the guest speaker to determine if any special equipment or material (overhead projector, paper and crayons, slide projector, etc.) will be required,
- Reconfirm the date and time a day or two before the scheduled visit.
- Prepare students for the speaker; establish motivation and a focus for learning from the guest.
- Follow up with one or more lessons to ensure that expected outcomes have been achieved.
- It is customary to send a classroom guest a thank you letter.

Demonstration Method

Demonstration is another useful instructional technique which is employed in teaching subjects. What is the meaning of demonstration? Demonstration means showing how something is to be done or not to be done. Through demonstration, a teacher models the behaviors of presentation, analysis and synthesis. The student's role is that of the observer and recorder of information and skills.

In schools, teachers can adopt this technique especially when something related to the development of skills is required. For example, how to draw a map of a country is a skill which has to be demonstrated. Demonstrations are most effective when followed by a corresponding student activity. A teacher demonstrating a measuring 'technique for determining distances on maps should be followed by students using the same technique in a follow-up activity. Demonstration involves the art of depicting the skills associated with an action. Sometimes, ideas, attitudes, processes and other tangibles are also demonstrated consciously

Preparing a classroom demonstration

While making preparation for a classroom demonstration the teacher has to:

- Plan a demonstration that will create interest among students.
- Plan every step in 'the task of demonstration carefully.
- Relate the task to be demonstrated.
- Outline the various steps of the task to be demonstrated on the chalkboard.
- Make sure that everyone can see and hear.
- Prepare written materials, handouts etc. on the task to be demonstrated.

Performing a classroom demonstration

The following points should be remembered by the teacher while demonstrating a skill.

- Communicate properly while demonstrating.
- Keep the demonstration simple and precise.
- Do not digress from the main theme.
- Do not hurry through the demonstration.
- Do not drag out the demonstration too much.
- Make sure that the demonstration is observed by all the students.
- Summarize as the demonstration goes on.
- Distribute handouts in the end.

The danger of the demonstration strategy lies in the passive role of the students who may or may not understand the concept or skill the teacher is demonstrating. The solution is to follow up the demonstration with replication by the class. Ideally, the students will perform exactly the same activity the teacher has demonstrated in much the same way the teacher has done. In some cases, however, that is not possible. For example you

may, using a chart, demonstrate the flow of wealth in our economic system. The follow-up might comprise record keeping by the students of how they spend money.

Advantages of Demonstration Method

1. This method of teaching serves as model laboratory instruction.
2. Experiment shown as demonstration points out this matter of observation and indicates this inference.
3. It makes the pupils familiar with the nature and use of apparatus.
4. Experiments requiring special skill will merely be shown by the teacher. In this method no time is wasted.
5. Teacher's time is properly utilized in watching the students doing experiments.
6. While doing practical, there remains no necessity for explaining except educating precautions.
7. This method proves more useful if the pupils are told beforehand that they are going to do practical in the laboratory.

Disadvantages of Demonstration Method

1. There is danger of students being dishonest when teacher has to play the main role in the discussion and demonstration of the topic.
2. Teachers may be tempted to lecture rather than to teach.
3. Teachers do not try for more experiments than those given in the text book prescribed.
4. Oral discussion may not be encouraged, since it will go to restrict the demonstration experiment.
5. Practical as required may not go hand in hand with demonstration work.

STORY-TELLING METHOD

Story-telling is an art and listening to stories is a passion with children. Stories which are woven round the unknown past, human adventures and man's quest for the unknown tickle children's imagination and satisfy their instinct of curiosity.

It has been rightly said by an expert: "As history is story and biography, in junior stage, it is mainly a question of telling the story well. The story should be told in vivid, graphic manner in the vernacular, observing the chronological order."

Types of Stories

Stories are of varied nature. Certain stories are matter-of-fact type while others mix curiosity and imaginative details with the known facts. So, we have:

(a) True Stories. These are stories which are based on and are replete with historical facts.

(b) Myths. Mythical stories are imaginative. These stories are not based on facts. They are the result of the flight of one's imagination. They have for their characters fairies, unknown animals, mythical gods and goddesses. They excite curiosity and heighten emotions.

(c) Legends. These are the stories which contain a fair element of historical facts and are based on events and incidents related to historical

personalities. The lives of such men of history as Alexander, Ashoka, Chandergupt Maurya, Chanakya, Razia and many more have become legends for posterity. However, such stories lack accuracy of details.

"Historical stories, then, whether they are facts or legends", says **Prof. Jervis**, "must be formulated by a truthfulness which is higher than mere accuracy of incidents."

Story-Telling Method (How to Tell Stories?)

Story-telling Method follows well-defined steps of procedure. These steps are:

- (a) Selection of the Story
- (b) Telling of Story
- (c) Use of Aids
- d) Black-Board Work
- (e) Reading from the Text-Book
- (f) Role of Children
- (g) Role of the Teacher

(a) Selection of the Story

(i) Stories should be selected lusciously, with an eye on historical facts or events, (ii) The stories may be about the early man, about historical personages, battles fought, won or lost and so on. (Hi) The selected stories should suit the mental level of the students; (iv) The selected stories should be absorbing and should maintain children's interest.

(b) Telling the Story

Story-telling is an art. While telling a story, the teacher must proceed in well-selected manner of articulation. Sometimes he/she should take a pause and sometimes he/she should express excitement. The manner of telling the story should be absorbing. Action is an essential ingredient of story-telling.

(c) Use of Aids

With the use of aids, story-telling becomes lively and all the more interesting. Use of flash cards, cut-out pictures, paper- strips showing sequence of events, puppetry, use of transparencies-all such aids create interest in the story. Charts, models and time-line graphs are also useful aids to story-telling.

(d) Black-Board Work

Black-board work is done to summaries the main points of the story. Black-board summary also helps the teacher to develop the story with the help of recapitulatory questions. The main points of the story help the children to write answers to the teacher's questions.

(e) Reading from the Text-Book

Reading from the text-book is helpful to the children to do revision work. It is likely that certain children miss at certain points on account of their inattentiveness. Text-book reading would compensate children in this regard. An illustrated text-book makes reading all the more interesting.

(f) Role of Children

Children play an important role in the success of the lesson an history is presented in the form of story-telling. The teacher should see to it that

children also participate in the development of the lesson. They can participate.

(i) by asking questions, and

(ii) by answering teacher's questions. Children may also be called upon to narrate a section of the story or the full story. Certain historical events may also be got dramatised in the class-room by the children.

(g) Role of the Teacher

The teacher plays an important role in the story-telling method. He should:

(i) Tell the story in an interesting manner, with appropriate gestures;

(ii) Lend an air of dramatisation to the story;

(iii) Lend an artistic and realistic touch to the story;

(iv) Not skip the main parts of the story. Each new part should automatically emerge out of the previous part;

(v) Take care that the selected stories have rich details which are vividly presented.

Merits of the Story-Telling Method

1. Good stories if narrated well tickle the imagination of children. Their historical sensibility is enriched.

2. Story-telling trains the creative faculty of children. Students may be encouraged to prepare models of caves, of battle-lines, historical buildings and so on. This also develops love for the subject of history in their minds.

3. By listening to the details of some of the historical events, students may dramatise them in the class-room or on the occasion of annual function of the school.

4. The students also learn the art of narration. They may be asked to narrate stories related to life histories of such persons as Alexander, Rama, Ashoka, Rana Partap, Shivaji and many other historical heroes.

5. Stories of great men infuse moral sense in the hearts of students.

6. Good historical stories help in producing in the pupils such traits of character as truthfulness, patriotism, valour, discipline, sense of sacrifice

Limitations of Story-Telling Method

- This method is not useful for all levels of students. Occasional story-telling is useful for high school students, but not the whole of teaching the subject of history.
- The social, political and economic issues of different periods of history cannot be presented in narrative form.

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