QCLP

Farook Training College Innovative Academia (FTCIA)

Online Collaborative Learning Project (OCLP)

Pre-Edited Version of Study Materials.

(Chance for minor errors)

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Unit 1

Pedagogic analysis

PEDAGOGIC ANALYSIS

MEANING AND DEFINITION

- The word '**Pedagogy**' comes from the the Greek word "**paidagogos**" in which 'paida' means child and **'agog**' means "**lead"** literally translated "**to who lead the child".**

Contd...

- Pedagogy is the science and art of education specifically instructional theory

- Pedagogic analysis means the logical and systematically breaking up of the curriculum from the point of view of a pedagogue(Teacher) for the purpose of its effective transaction

NEEDS OF PEDAGOGIC ANALYSIS

- Pedagogical analysis is selection of appropriate objectives and strategies in various instructional situations to assess the level of actual teaching at the end
- A comprehensive vision of required task strategies for realisation of specific goals facilitate effective teaching so pedagogical analysis offers enormous potential for improving the delivery of information in all form of education
- It involves various logical steps of breaking down the content into comprehensible pieces.
- It also helps the students to to understand the concept principle and phenomena.

OBJECTIVES OF PEDAGOGIC ANALYSIS

- To analyse the curriculum content into meaningful components that constitutes the curriculum in its totality.
- To anticipate comprehensive instructional objectives appropriate to each component of the content and the developmental level of the learner.
- To identify the prerequisites essentially needed for assimilating the curriculum materials and experience.

Contd...

- To anticipates probable difficulties and derive strategies for remediation and compensation wherever needed.
- To carry teaching activity as smoothly as possible.
- To ensure maximum output in terms of expected behavioral outcomes.

STAGES AND STEPS OF PEDAGOGIC ANALYSIS

1. **Major and Minor Concepts**

    - The first process of pedagogic analysis of a unit
    - Number of major concepts includes in a unit determines the depth of the unit.

2. **Analysis of concepts into attributes**

    - Most difficult and important aspect of pedagogic analysis.
    - In this teacher examines the analysed minor concepts one by one and analyse into its essential attributes.
    - This analysis help the teacher to find out suitable examples of the concepts.

3. Identification of terms and explanation of the meaning imbedded in them

- Teacher lists the new terms in the unit and more important effort is to explain them-the root meaning of the terms,additional meaning if any.

4. Identification of principles in the unit and analysis of these principles into component concepts and their relationship

5. Identification of processes in the unit and analysis of these processes into hierarchical steps as well as the principle behind each step.

6. Identification of Pre- requisites needed for assimilating the new analysed concepts,principles etc..

CONTd……...

14. Identifying portions/topics/items from the curriculum itself with which new learning material could be linked or correlated.

15.Identifying historical anecdotes/events and current events that could enrich the learning of new material.

16. Listing most probable errors/difficulties/misconcepts expected.

17. Listing situations of practicals/projects

18. Listing situations for outdoor activities.

19. Listing items of home assignments.

20.Preparation of unit plan and lesson plan.

CONTd……

21. Preparation of different types of test items.

- Simple recall type
- Completion type
- True false type
- Multiple choice type
- Matching type
- Short answer type
- Essay type
- Practical test for skills

ANALYSIS OF LEARNING OBJECTIVES / LEARNING OUTCOMES

★ **Major instructional objective and specification in science.**

Man has three domains of behaviour- cognitive,affective and Psychomotor.These three domains are inter-related to each other.Different objectives specified in the taxonomy of particular domain might overlap with certain aspects.On the basis of that there are certain instructional objectives to be taken care at the time of instruction by a science teacher. They are :

- Acquisition of knowledge
- Development of understanding
- Application of knowledge

CONTd….

- Development of skill
- Development of interest
- Development of attitude
- Development of appreciation

1. **ACQUISITION OF KNOWLEDGE (Knowledge level)**

   Objective : The learner acquires knowledge of terms,facts…

   Specification : The learner
   - ❖ recalls the term ……
   - ❖ recognises the term ….

2. DEVELOPMENT OF UNDERSTANDING (understanding level)

Objective : The learner develops understanding of terms,facts, concepts, principles, processes.

Specifications : The learner

- describes phenomena
- define concept
- Illustrate phenomena
- Point out characters,errors etc
- Identifies relation
- Compares related concepts etc.
- Gives own examples

CONTd….

- interprets situations
- discriminates between concepts etc.
- differentiate between concepts
- gives reason for an agreement
- writes details systematically
- supports arguments
- rectifies errors or gaps
- detects errors
- summarises details
- criticises viewpoints

3. APPLICATION OF KNOWLEDGE (Application level)

Objective: Learner applies the acquired knowledge and understanding to unfamiliar situations

Specifications: The learner

- analyses complex situations
- verifies the conclusion,results etc.
- interprets relations
- draws inferences from analysed data
- predicts probable consequences
- relates principles etc to draw conclusions
- makes generalisations out of observed phenomenon.
- suggests alternative method to solve a problem

4. DEVELOPMENT OF SKILLS

Objectives: Learner acquire practical skill in a particular area of science.

Specifications : The learner

- Draws charts,tables,graphs etc.
- Translate data from one form to another.
- Solves the problem with speed and accuracy.
- Prepare models,different type of materials etc.
- Detect errors with speed and accuracy.

5. DEVELOPMENT OF INTEREST

Objective : Learner develops interest in studying science and dealing with various aspects and activities related to science.

Specifications : The learner

- ❖ Closely observes scientific processes
- ❖ Spends leisure time in various activities related to science
- ❖ Discusses and readily communicate various aspects concerning scientific issues and their implications.
- ❖ Writes articles and brochures related to science.
- ❖ Collects information about different branches of science

6. DEVELOPMENT OF ATTITUDE

Objective: Learner develops desirable positive attitude towards issues related to science.

Specifications : The learner

- ❖ Shows willingness to consider new ideas
- ❖ Shows clarity and precision in statement and activities related to science
- ❖ Respect teacher of science
- ❖ Record and interprets observations related to science honestly.
- ❖ Does independent thinking about issues in science
- ❖ Shows spirit of teamwork self help and self reliance.
- ❖ keeps collected information regarding science in a systematic manner.

7. DEVELOPMENT OF APPRECIATION

Objective: Learner develops appreciation of systematic precise and scientific dealing in scientific endeavours.

CONTd….

Specifications : The learner

- Shows respect and admiration towards great scientists.
- Appreciates the social value of science as a discipline
- Shows appreciation of system rhythm etc noticed in scientific phenomena
- Enjoys in organising programmes on science.
- Eagerly observes and approves all desireable developments in science

★ Specific objectives or specifications

- The observable and measurable behavioural changes as a result of realising an objective is termed as **specific objectives** or **specifications.**
- Consider the measurement of temperature. Temperature is not directly measurable. But we observe and measure the expansion of mercury due to rise in temperature
- Similarly the teacher can determine the level of achievement of any specific educational objective from the observable and measurable behavioural changes resulting from the realisation of the major object.

- The specific objectives are also known as **performance objectives, behavioural objectives**, and **measurable objectives** or **merely specification.**
- An objective can have more than one specification.

Eg: If one has acquired knowledge of a term he will be able to

a) Recall it's meaning.
b) Recognise it from others.

★ Criteria for writing major instructional objective

1. The statement of objective should contain a non action verb.
2. The statement should indicate a worthwhile objective
3. The statement should be in the form of student's achievement and not in the form of teacher's intention.
4. The objective should be written in the form of achievement of every single learner and not in the form of achievement of a group of learners.
5. The statement of objective should contain one ability to be developed or achieved or modified.

★ Criteria for writing specification

1. The statement of specification should contain an action verb.
2. The statement of specification contain two parts - a modified part and content part
3. The other criteria which are applicable to statement of major instructional objectives are applicable here also.
    - ❏ The statement of specification should indicate a worthwhile specification.
    - ❏ The statement should be in the form of learners achievement.
    - ❏ Statement should be in the form of achievement of every single learner.
    - ❏ Specification should contain only one behaviour to be developed or modified.
    - ❏ Specification should reflect the general characteristics warranted namely specificity,observability,and measurability.

★ Learning Outcomes

- Learning outcomes are the aim to be achieved by the learner during the various stages of school education.
- Precise and accurate statements based on the knowledge skills,attitudes,values etc..to be acquired by a learner in a particular subject area are called **learning outcomes**
- Some of the learning outcomes can be acquired in a short time while some can be acquired only over a long period of time.
- Learning outcome should be stated based on performances that can be observed and measured
- The statement of learning outcome should be simple,lucid ,precise and logical.
- Learning outcome should be stated from the point of view of a child

★ Writing of learning outcome

- A statement of a learning outcome/objective contain a **verb** and an **object.**
- The verb generally refer to the intended cognitive process.
- The object generally describes the knowledge students are expected to to acquire or construct.

For writing learning outcomes ,Bloom's taxonomy model proposed like :
" The students will be able to…"

Example : List of primary and secondary colours ----- Remember + Factual
: Recalls how to perform CPR ---------- Remember + Procedural

CONTENT ANALYSIS

Planning of instruction helps the teachers achieve the desired objectives. A scientific and systematic planning enables the teacher to be fully in command of instruction. For this the teacher has to utilize his imagination,creativity, insight and subject competency. Content analysis is the life blood of instructional planning.

Content analysis is a very important task,it will help systematise teaching.It is about listing the most important ideas and essence of content portion.

Continue...

A teacher analyses the content to decide what objectives he can develop in his pupils based on the content. We know that knowledge does not respect any boundaries. Any topic can be extended beyond its limits. But a teacher has to delimit the contents to be taught according to the educational and learning needs of pupils. This can be done if the teacher analyses the content ro be taught to a particular class. Content analysis is the breaking of the content into its constituent parts.

The syllabus is only a an indication of the prescribed content and as such does not prescribe the order in which topics should be dealt with. Therefore, the teacher has to analyse it properly, and ensure that it is technically accurate and

Continue...

upto date. Thus content analysis help in refining and limiting the content according to the needs and interest of the pupils.

Usually a beginner teacher may find the content analysis as a rigorous and worthless task, however a systematic content analysis help the teacher to prepare himself to comprehend the general outline of the content portion and to devise a mental plan for transacting it.This analysis also remains the teacher to emphasise the important terms,concepts and ideas of the lesson without skipping or under playing while teaching.

Basis components of the content analysis are:

- Terms
- Facts
- Concepts
- Principles
- Processes
- Theory
- Law

TERMS

Term is a new word with a scientific meaning. During content analysis only new terms need be listed.A term introduced in an earlier lesson need not be listed. It is actually a label of a concept.

when we teach the topic sound, Induced vibration, Hertz, Decibel etc. are trems.

FACTS

Fact is a true simple statement which act as bases for the formation of a new concept-principle-law. New subject matter is always build upon an earlier and familiar content.Therefore only those relevant statement which are essential and lead to a new concept-principle-law may be listed as facts.

- Water boils at 100 degree Celsius
- Iron is a hard metal
- Density of mercury is greater than water

These are facts to a high school students as the word boils,metal and density are familiar to them.Hence facts are simple observable truth which can be realized,at a particular stage, without further learning.

CONCEPTS

Concepts are abstract ideas that are generalised from facts or specific relevant experiences.Some time an object / relation ship /event / process / feature/ phenomenon / situation represents a class of such things. This generalised idea that represent a class of things is referred to as concept.A concept has five elements viz name,exemplers,attribute,attribute value and definition.

A concept has some specific characteristics which describes the common features of the class which represents, these characteristics are called attributes. There are essential and non essential attributes. Essential attributes are critical in describing the concept under consideration.

e.g :- Acceleration,Chemical change,Planet and Sun

PRINCIPLES

Principles are more complex ideas based on several concepts.It is a statement predicting inter relationship among concepts. It establishes relationship between at least two concepts. So the principles are broad generalisation which means the same for all irrespective of their age and experiences.

e.g:- When volume increases pressure decreases

Temperature increases with increases in pressure

PROCESSES

Process are really a series of tasks with a sequential order of occurence.These sequences of steps may be controlled by certain principles.

e.g:- Hybridisation

Preparation of Hydrogen sulphide

Formation of an electric circuit

THEORY AND LAW

Broadly related principles that provide an explanation for phenomena are known as theory or laws. They are used to explain, predict and relate various facts and phenomena. Theories confirmed by various scientific experimentation by scientists over a period of time become laws.

e.g:- Newton's laws of motion

Boyel’s law

CONSTRUCTIVISM

Constructivism is rather heterogeneous idea we invents our own concept and ideas linked to what we already know. In constructivism learners construct their own knowledge by testing ideas in the light of new experiences. Learning is active reconstruction and reinterpretation of experience. Learner construct knowledge using previous knowledge newly assimilated experience and newly developed insights. Learner autonomy and initiative is accepted and encouraged in constructivism. Students learn how to learn and teachers give training for students in taking initiation for their own learning experiences.

DEFINITION

According to Brader-Araje and Jones(2002) - Constructivism can be defined as “the idea that development of understanding requires the learner to actively engage in meaning-making “

According to Brook- Constructivism is really a philosophy, it is an epistemology,it is a wa2of looking at teaching and learning,it is a way of looking at how people construct understanding of our world.

characteristics of a constructivist classroom

1. Learner construct knowledge through individual and social activity
2. Emphasis is on learning rather than instruction
3. The priority on how to learn rather than what to learn
4. Encourage spirit of inquiry
5. Important is to the learning context
6. Learner performance is given importance in evaluation
7. Provides opportunity for creation of idea and concepts
8. The environment is democratic and support collaborative learning
9. The activities are interactive and student centered

Continue..

In the constructivist classroom students work primarily in groups and learning is interactive and dynamic. There is greater emphasis on social and communication skill.There is collaboration and exchange of ideas.This is contrary to the traditional classroom where students work primarily alone where learning is achieved through repetition and the subject are strictly adhered to and are guided by a text book.

Role of teacher in constructivist classroom

- In the constructivist classroom the teacher role is to prompt and facilitate discussions
- The teachers main focus should be on guiding students by asking questions;it will lead them to develop their own conclusions on the subject
- Encourage group activities in the classroom
- Teachers give training for students in taking initiation for their own learning experiences

Benefits of constructivism in teaching

- Children learn more and enjoy learning
- Promote divergent thinking
- Boost the confidence of learners
- Promote collaborative learning
- Constructivism concentrates on how to think and understand
- Education works best when it concentrates on thinking and understanding rather than rote memorization

Tips for making constructivist lesson plan

- It should be activity centered, learner centered and it should encourage open ended thinking
- It should begin with a puzzling activity and it create interest in the topic
- Activity should be structured and short to avoid confusion in the classroom
- Avoid same type of activity
- Group activities along with individual activities is desirable
- Consolidate each activity with appropriate teacher intervention
- Provide opportunities for creativity like poster design ,sketching diagram and role play

CRITICAL PEDAGOGY

"Critical pedagogy as habits of thoughts,reading,writing and speaking which go beneath surface meaning to understand the deep meaning,root causes,social context,ideology and personal consequences of action,event,object,process,experience,text,subject matter,policy or discourse"- (IRA SHOR)

In critical pedagogy the classroom is a site where new knowledge grounded in the experiences of students and teachers is produced through meaningful dialogue.critical pedagogy challenges our long held assumptions and encourages learners to ask questions.It considers knowledge as life process in the classroom and integrating students personal experiences in to classroom lessons.

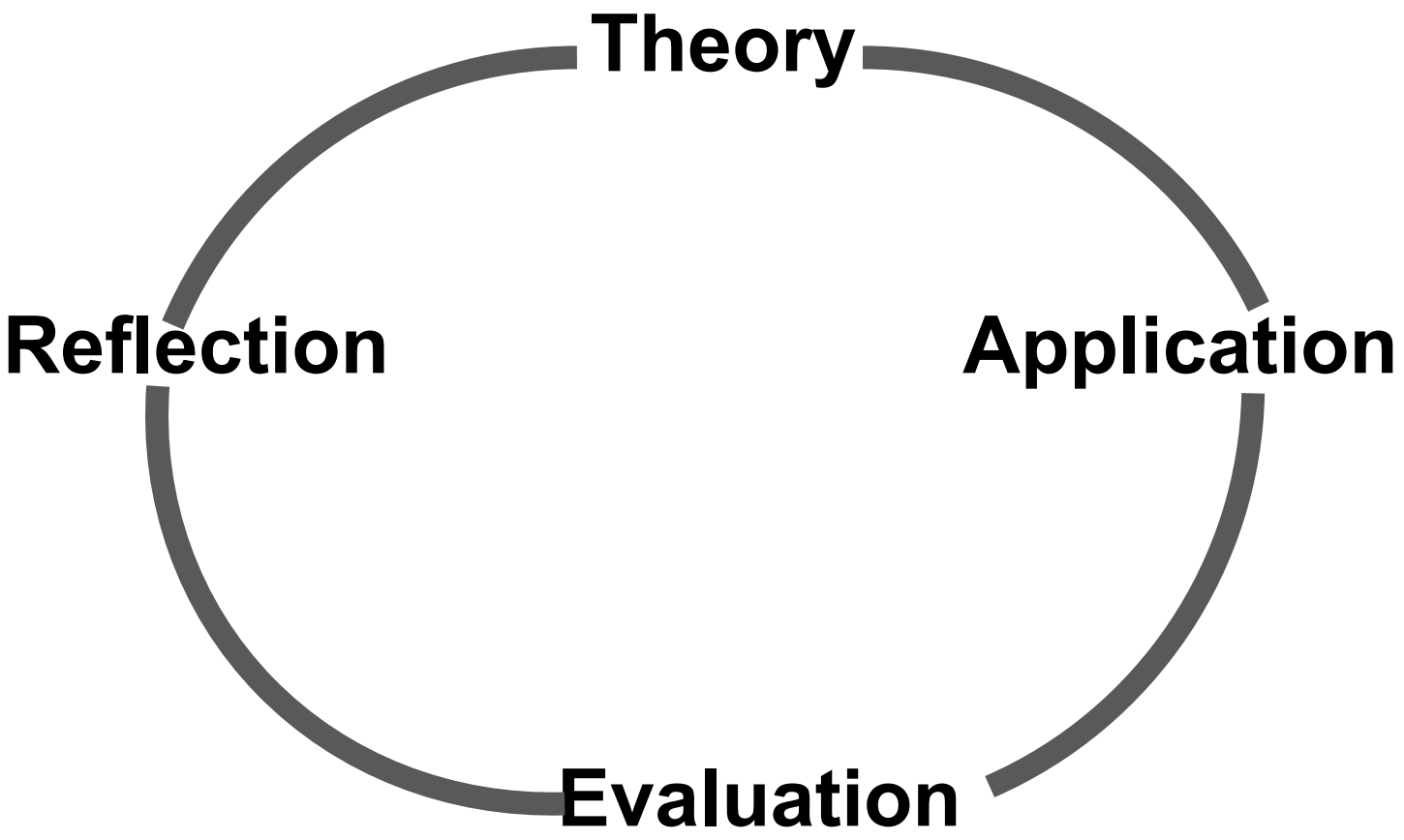
FEATURES OF CRITICAL PEDAGOGY

- **Praxis** as synthesis of theory and practice in learning process

It means use of theory in a practical way, knowledge emerges through invention and reinvention.A concept of praxis used in critical pedagogy means an ongoing reflective approach to take an action in order to transform the world.Praxis involves engaging in a cycle of theory,applications,evaluations,reflection and then back to theory.

A teacher practices this model put the theory in the light of critical thought and encourage students to learn in a critical way by evaluating and reflecting upon theories.

PRAXIS



- Dialogue as pedagogical tool

It is a cooperative activity involving mutual respect,in which teachers and students learn together.It begins with experiences of learners.

- Co-construction of knowledge

New knowledge is produced in the classroom from the interaction between students and teachers knowledge.

- Child centered pedagogy
- Its approach is issue based or problem solved
- Egalitarian teacher-student interaction

The major attributes of critical pedagogy in classroom includes:-

1. Integrating students personal experiences in to classroom lessons
2. De-constructing student teacher hierarchy
3. Avoiding the banking method of education
4. Acknowledging the political nature of education and de-constructing the idea of knowledge as neutral
5. Making social justice a clear focus in the class
6. Teacher must provide a safe space for children to express themselves.

LEARNING ACTIVITIES

Learning activities are activities designed or deployed by the teacher to bring about or create the conditions for learning.The pedagogical effectiveness of a learning element can be achieved by:-

1)The mindful selection of learning activities

2)Establishment of direct links between activities and objectives

2)Careful sequencing of these activities

When an activity is deliberately planned for students in selected situations to achieve certain defined learning objectives it is said to be learning activity.

PRINCIPLES IN SELECTING LEARNING ACTIVITIES

- Learning activities must be interactive
- It should engage students with the most direct experience possible
- It should fit the time and context of the teaching situation
- Learning activities should relate back to the lesson objective
- It must be multi-level varied,and well sequenced
- It must also suit the subject matter at hand
- Learning activities must suit the learner level

SEQUENCING OF LEARNING ACTIVITIES

Sequencing is the efficient ordering of content in a such a way as to help the learner achieve the objectives.Proper sequencing helps to avoid inconsistencies in the content of the instruction.Some of the techniques used in sequencing are:-

1)From simple to complex

Objectives may be sequenced in terms of increasing complexity

2)critical sequence

Objectives are ordered in terms of their relative importance

3)Known to unknown

Familiar topics are considered before unfamiliar ones

4)Dependent relationship

Mastery of one objective requires mastery of another

5)Supportive relationship

Transfer of learning takes place from one objective to another,usually because common elements are included in each objective.These should be placed as close together as possible so that the maximum transfer of learning can take place.

INCLUSION OF DIVERSE NEEDS OF THE LEARNER

Every student you teach has a diverse set of learning needs. These can be cultural,personal,emotional and educational.To be an effective teacher, must address these needs in lessons and activities.

Materialising the needs and requirements of students in terms of individual differences calls for certain provisions in school. Providing adequate schooling or learning experience for every learner according to his/her individuality is not a simple task. However the following suggestions can be helpful for teachers.

1. **Proper knowledge of the individual's potentialities**

- Knowing the abilities, capacities, interests, aptitude and other personality traits of individual student.

- This can be done through frequent assessment in the form of intelligent tests, cumulative record card,interest inventories, attitude scale, aptitude tests and measures of assessing personality traits.

2. Ability grouping

- The children in a class or area of activity can be divided into homogeneous groups based on the results of tests conducted to know the individual differences in terms of individual potentialities in various dimensions.

3. Adjusting the curriculum

- Curriculum should be as flexible and differentiated to meet the requirements of the individual differences among pupils.

- It should have provision for a number of diversified courses and activities.
- It should provide adjustments to suit the local requirements and potentialities of students of different groups.

4. Adjusting the methods of teaching

- Every teacher should be free to formulate their own plans and strategies and adopt different instructional procedures suitable to different pupils.

5. Adopting special programmes or methods for individualising instruction

- School may adopt special programme or methods of teaching like Dalton Plan, Winnetka Plan, Project method or use programmed learning material for enabling the students to learn at their own individual place.

6. Other methods of individualised instruction

- The student strength of the class or section should be safe as small as possible .
- The teacher should try to pay individual attention .
- The teacher should consider individual differences while engaging students in drill or practice work in the class room or assigning home work.
- Special coaching and guidance programmes for both dull and gifted children should be given in case where ability grouping is not possible.

Role of teacher

- Engaging all learning styles in every lesson.

1. Auditory
2. Visual
3. Kinesthetic

- Provide freedom to respond.
- Address problem of the learner.
- Usage of variety of teaching methods -Demonstration method, Laboratory method, Lecture method, Problem solving method, Project method etc.
- Giving opportunity for ego involvement.
- Encouraging originality and flexibility.
- Wiping out fear and hesistation.

- Removing blocks to creative thinking.
- Using modern techniques to foster creativity -Brain storming, Role play etc.
- Provide group activities.
- Motivate and appreciate student’s talents.
- Interaction with family.
- Club activities.
- Provide variety of extra curricular activities.

2 Mark Questions & Answer key words

1. What is constructivism ?
2. Role of teachers in constructivism
3. Basis components of content analysis

4 Mark Short Essays & Value Points

1. What is the importance of inclusion of diverse needs of the learner in teaching -learning process?
2. Recent changes in physical science teaching in the state of kerala
3. what is the importance of content analysis in teaching and learning process
4. characteristics of the constructivist classroom

10 Mark Essays & Value Points

1. Explain content analysis in detail and give an example

Unit 2
Planning of Instruction

Group members

- Hridya
- Arshad
- Nesmiya
- Nada
- Reshmi

Planning of instructional objective

Need and importance of planning

- We can present the learning material in a logical systematic and effective way
- We can obtain adequate coverage of subject
- We can achieve the instructional objective within time limit
- We will develop self confidence and pride in our work
- We will get opportunities to experiment with our own ideas
- We can achieve economy in time material and effort

Types of planning

1. Year planning
2. Unit planning
3. Lesson planning

1) Year planning

- It is a long term planning of instructional process
- Here at the beginning of academic year all the teachers make a plan for organizing the years work
- In this design the total course material is divided into units &units into daily lessons
- Year plan in a subject should contain the purpose,& objectives of the course,units,number of lessons,the time schedule for dealing with each units, method of teaching,details of equipment & aids etc.

Importance of year planning

- It indicates the total weightage to be given for various instructional objectives &content
- It points out the way of achieving these objectives & the method and approaches to be adopted for each topic
- It gives suggestion to make teaching interesting economic and effective
- It make evaluation objective based
- It promote professional cooperation & mutual exchange of ideas as the teachers of a school plan for the year jointly

Format of a year plan

School
Subject

standard
year

No	Units	Time required in periods	Month when planned to teach	Special methods if any	Preparations and aids necessary	Percentage of objectives to be achieved

2) Unit planning

- **A large segment of subject matter having a common fabric knowledge.**
- **It is not just blocks cut out of the total subject matter**
- **It is the meaningful whole taken out from the curriculum, which can be effectively dealt with for realisation of a set of anticipated objectives.**
- **A unit in fact is a compound of lessons and not a mixture of lessons.**

DEFINITION OF UNIT PLANNING

- **‘ As large block a block of related subject matter as can be over-viewed by the learner ‘**

  - *Preston* -

- **‘ The teaching unit is a group of related concepts from which a given set of instructional and educational experiences desired.Unit normally range for 3 to 6 weeks long ‘**

  -Hoover -

Characteristics of a good lesson plan

- **Aims should be clear and well defined.**
- **It should provide activities for students**
- **Can be completed within the time limit**
- **Provides for projects, field trips, etc.**
- **Teaching aids to ne used are very specific**
- **Provision for evaluation and follow up activities.**
- **Flexibility to provide for individual difference**

Advantages of unit planning

- **It provides a basic course structure around which specific class activities can be organised**
- **It enables the teacher to to integrate the basic concept and related areas in to various teaching experience**
- **It enables the teacher to break away from traditional textbook teaching.**
- **It is economical in terms of time**
- **It helps to develop skills in students in a systematic manner**
- **It helps cater to the need, nature and aptitude of students**

● STEPS IN UNIT PLANNING

- Content analysis or content overview
- Objectives and specification
- Learning activities
- Testing procedures

LESSON PLANNING

- **A lesson is defined as a blue print or a plan for action for transacting a compact portion of the curriculum, within the duration of a period.**

DEFINITION OF A LESSON PLAN

“ An outline of the important points of a lesson arranged in the order in which they are to be presented. “

- CARTER. V. GOOD -

“ A plan of action implemented by the teacher in the classroom”

- LESTER. B. STANDS -

- **CHARACTERISTICS OF A GOOD LESSON PLAN**

1. content well analysed
2. Broad frame of methods of teaching.
3. Summarisation techniques.
4. Well thought out items for evaluating learning.
5. Objective, particularly specific objectives need to be stated.
6. Relevant motivational device selected.
7. Suggestive list of activities for learners.

PRINCIPLES OF LESSON PLANNING

- Principle of clarity and definiteness of the objective
- Principle of knowledge of entry behaviour
- Principle of motivating the students
- Principle of maintaining interest in the lesson
- Principle of availability of resources and conditions
- Principle of appropriateness of teaching methods and techniques.

- Principle of mastery over the subject matter and related activities
- Principle of active participation of the students
- Principle of providing feedback and reinforcements
- Principle of adequate class control and discipline
- Principle of appropriate evaluation
- Principle of adequate fixation of the learning
- Principle of flexibility.

ADVANTAGES OF LESSON PLANNING

- It makes the work regular and systematic
- It enhances self confidence and self reliance of the teacher
- It ensures appropriate use of aids at the appropriate time
- It ensures proper assignment according to the mental level of students
- It prevent wastage of time, as every step has been planned with forethought.

• WRITING LESSON PLAN

1. **Steps of a lesson plan based on behaviourist approach**

- Instructional objective
- Content analysis

a) Terms
b) Facts
c) Concept
d) Principle etc.

- Previous knowledge
- Teaching aids

- Content / steps

a) Introduction

b) Statement of aim

c) Presentation

- Review
- Black board summary
- Assignments

2. Steps of lesson plan based on constructionist approach

- Curriculum objective
- Terms, facts, concepts, principles
- Process skills / competencies
- Learning Aids / learning Resources
- Learning strategies
- Previous knowledge / prerequisite
- Learning activities

a) Introductory activity
b) Developmental activity
c) Concluding activity
d) Follow up activities

- Self reflections

3. Steps of leson plan based on learning outcome based approach

- Learning outcomes
- Ideas, facts, concepts, principles
- Process skills
- Language elements (only for languages)
- Discourse (only for languages)
- Attitude and values
- Learning resources
- Learning strategies
- Previous knowledge
- Expected products.

- **Learning process**

a) **Introductory activities**

b) **Developmental activities**

c) **Concluding activities**

d) **Follow up activities**

- **Reflections**
- **Extended activities and remedial measures**

● HERBARTIAN STEPS IN LESSON PLANNING

Lesson planning is associated with the name of John F Herbart

Herbart suggested four steps in the educative process

1. **Clearness**
2. **Association**
3. **System**
4. **Method**

Later his followers modified it in to six steps they are..

1. Preparation / introduction
2. Presentation
3. Association / comparison
4. Generalisation / systematisation
5. Application
6. Recapitulation

2 Mark Questions & Answer key words

- What are the advantages of lesson plan?
- What are the characteristics of a good lesson plan?
- Define Lesson plan?
- Define year planning?
- Advantages of unit planning?

4 Mark Short Essays & Value Points

- **Write down the principles of writing lesson plan?**
- **Write down the herbatlan steps in writing lesson plan?**
- **What are the major difference between unit plan and year plan?**
-

10 Mark Essays & Value Points

- **Explain the steps of lesson plan based on behavioural approach**

(meaning and importance of lesson plan, meaning of behavioural approach, steps and its explanation)

- **Explain steps for the construction of year plan**

(meaning and importance of year plan, definition, format of year plan, advantages and its characteristics)

Unit 3

Resources of teaching and learning physical sciences

Group members

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1 .PHYSICAL SCIENCE TEXT BOOK

- **Textbook is an economical device for teachers and students as it gives direction and save time and energy**
- **A text book should be designed for pupil rather than teachers**
- **Science textbook help to cultivate scientific attitude among pupil**

FUNCTIONS OF SCIENCE TEXT BOOK:

- Inculcate scientific attitude
- Help to form correct understanding of basic concept and principle of science

- It should help pupils in doing home assignment
- It should help the pupils for systematic and speedy revision of the lessons they have finished
- It should contain past discoveries and some thrilling experience made by scientists
- It should provide for the development and practice of skills
- It should acquaint the pupils with a wide variety of application of scientific knowledge

Characteristics of a good science text book

1 Authorship

- Only such person who have experience of teaching the subject should be allowed to become author of school science textbook
- Certain qualifications also be prescribed for the author

2 Mechanical features of text book

- The paper,the binding,the print and the type of letters should be attractive
- The size of the print, spacing, and the length of the lines should correspond to the visual capacity of the pupils
- Science textbook should be well illustrated with diagrams , sketches,photographs etc , that should be attractive and clear

3 The subject matter - it's nature and organisation

- The subject matter should cover the whole syllabus
- Subject matter should be developed in psychological sequence
- There should be a central theme correlating the content of the textbook as a whole
- The text book has to be organised into units which are based on student interest and probability of use
- Inductive approach is to be used in introducing new topic
- Each unit should begin with an introduction and end with a summary
- At the end of each unit there should be assignment

- The text book prefer simple and compound sentence than complex sentence
- It should contain a glossary of technical terms used in the text book
- The textbook should stress social significance of science
- Science text book should contain detailed table of content and index
- Heading and sub - heading should be in bold type
- Important principles should be set in italics
- Each text book should be accompanied by a laboratory manual and pupil’s workbook
- It must be supplemented by a teacher's hand book

Vogel’ s criteria for selection of science text book

- **Vogel developed an evaluation scale called Vogel's score card for selection of science text book**

- There are 10 criteria suggested in Vogel's score card
    i. Qualifications of the author
    ii. Organisation
    iii. Content
    iv. Presentation of materials
    v. Accuracy
    vi. Readability
    vii. Adaptability
    viii. Teaching aids
    ix. Illustrations
    x. Appearance

2 .PUPIL'S WORKBOOK

- Science workbook is an adjunct to science text book
- Pupil's workbook, is in fact a practice material for pupils
- The content of work book is arranged in the order of text book
- A workbook contains summary of each chapter of the textbook, exercise of different kinds,key to exercises and suggestions for practicals , assignment and improvisation

Advantages of work book

- Workbook supplement classroom learning
- It promotes self learning and self assessment
- It provides for working out different types of assignment
- It gives practice of classroom learning and thereby reinforces learning
- It promotes scientific thinking

3 . TEACHER'S HAND BOOK

- It is prepared by SCERT along with text book
- It is an excellent reference material for teachers for effective science teaching
- Teacher’s hand book is a resource material for teachers
- It contains summaries of chapters, instructional objectives, specification, explanation of specific terms, assignment, teaching aids,co-curricular activities, seminar, projects etc

Advantages of Hand book:

- Help teachers to get theoretical knowledge and practical knowledge of what is to be taught
- It provides suitable learning experience for different instructional situations
- It helps teachers to adopt appropriate methods and approaches of Teaching
- It helps the teachers prepare various instructional materials
- It helps the teachers to evaluate by using relevant and standard tools of evaluation

4. REFERENCE BOOKS

- Reference books are used to supplement knowledge gained in the classroom
- It helps to acquire new knowledge
- These includes dictionaries, year books, government reports, journal, encyclopaedia etc
- Students must be given special training in the use of reference books
- Teacher should ensure that the reference materials are easily comprehensible, readily available and appropriate for the age level of the pupils

Advantages of Reference books

- It supplements classroom learning
- It facilitates self habit and spirit of self effort
- It helps the pupils to workout assignment
- It stimulates scientific thinking and inculcate elements of scientific attitude

5 . SUPPLEMENTARY READING

- The interested learners can utilise supplementary books to deepen their subject competencies
- It supplements and integrates the classroom learning
- Supplementary books stimulate additional reading in the same or related topics
- Supplementary books include :
    - Magazine
    - Article
    - News paper
    - Periodicals
    - Books on different aspects of science, brochure etc

Eg : of periodicals for students and science teachers

In English

- Junior science Digest
- Junior scientist
- School science
- Science Reporter
- Science Today
- The science Teacher

In Malayalam

- Sastrskeralam
- Vignanakairali
- Eureka
- Sastrakauthukam
- Manasasthram

Advantages of supplementary books

- Supplements classroom learning
- Inculcate self study habits
- Promote independent learning
- It strengthens linguistic ability and develop literary taste
- Science related supplement books promote scientific attitude
- It encourages thinking and discussion
- It stimulates scientific interest in pupils
- It gives insight into social implications and contributions of science

Criteria for selecting supplementary science book

Qualities of the book

- It is accurate and authoritative
- It is fair and sincere in its presentation of controversial subject matter
- Its enrichment material goes beyond that of secondary text books
- It has good literary standard- clear style, grammatically correct,easy to read
- Its general theme and tone are wholesome
- It is a book of lasting value- one worth owning and going back to

PHYSICAL SCIENCE LAB AND ITS ORGANIZATION

ADMINISTRATION OF LABORATORY WORK

- Organising and conducting practical work
- Students should be made to form appropriate groups
- Preparation is required for individual and group working
- Laboratory rules and discipline should be laid down
- Instruction to pupil are to be specific and clear
- Pupils records and observation book are to be properly maintained

PURCHASE AND MANUFACTURE OF CHEMICALS, APPARATUS AND EQUIPMENTS

While making a list ,teacher should consider following factors

- Type of apparatus required
- Quantity of each item
- Choice of suppliers
- Finance
- The number of subjects taught
- The number of students and their level
- The capacity of the laboratory
- The knowledge and ability of the teacher

LAB RULES

- No pupil should be allowed to enter the laboratory in the absence of the teacher
- Every student has place assigned to him for his experiment
- Pupils should perform only those experiments assigned by the teacher
- No chemical should be used until proper instructions are received from the teacher
- Any breakage of apparatus or accident or injury must be reported to the teacher
- All unnecessary talk should be avoided and playing with the

- Apparatus should be prohibited
- The apparatus should be disconnected ,washed if necessary and replaced in their proper places
- Consider the safety of fellow students.A scientific atmosphere should be kept up in the laboratory

ACCIDENTS IN LAB

- The science teacher have a moral responsibility to ensure the safety of pupils in the lab
- Pupils must be made aware of the hazards of the experiment
- Pupils must be made aware of the laboratory rules

- Dangerous chemicals should not kept in open shelves
- The experiments should not started without the permission of the teacher

FIRST AID

- First aid make a patient secure and comfortable
- Every laboratory must be equipped with a first aid box
- The contents of the box must be regularly inspected
- All teachers should have a knowledge of simple first aids for common injuries in lab
- An accident report book should be maintained in lab

SCIENCE LIBRARY

- One of the important recommendations of Secondary Education Commission was that every school has subject libraries,which are under the control of subject teachers.
- It could help the teachers to enrich their teaching,making use of some collection of books on their subjects.
- Science being the most important part of curriculum,the content rapidly goes on changing both teachers and pupils have to constantly go on reading books in the subject.
- This provides a provision of a rich and updated science library in every school.

Organisation of a Science Library

- A well equipped science library under the charge of a science teacher should be set up in the school.
- The science teacher can develop a library depending on the availability of funds.
- For setting up a rich library the teacher should be aware of the latest and good books available in the subject.
- In a school library the teacher should select the books which cover a wide range of topics.
- With a view to cater to develop the affective domain of the science students,books on scientific discoveries,magic in science,experiments in science,fun in science,books about life of scientists etc must be there in the library.

TEACHING AIDS

- Teaching aids are the tools that teachers use them in the classroom.
- A teaching aid is a tool used by teachers to help learners improve reading and other skills ,illustrate or reinforce a skill,fact or idea,and relieve anxiety,fears,or boredom since many teaching aids are like games.

CATEGORIES OF TEACHING AIDS

1. Audio aids
2. Visual aids
3. Audio-Visual aids

Audio aids:The aids that involve the sense of hearing are called Audio aids. Eg:Radio,Gramaphone

Video aids: The aids which use the sense of vision are called visual aids.Eg:Models,Flash cards,charts etc

Audio visual aids: The aids which involve the sense of vision as well as hearing are called audio-visual aids.Eg:Television,Film projector.

Definition: 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”.

Purposes

- 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

Characteristics of Good Audio-visual aids.

Teaching aids should be:

*Meaningful and purposeful

*Motivates the learners

*Accurate in every aspect

*Simple and cheap
*Improvised
*Large in size

Need of Audio-visual aids

*Develops proper image when the students see,hear,taste and smell properly.

*Provide complete example for conceptual thinking.

*Helps the teacher to get sometime and make learning permanent.

*Provide direct experience to the students.

*Students can learn better when they are motivated properly through different audio visual aids

Importance of audio-visual aids:

- Motivation:Audio visual aids motivate the students so that they can learn better.
- Clarification:Through audio visual aids,the teacher can clarify the subject matter more easily
- Save Time and money:It saves a lot of teachers as well as students time.
- Classroom live and active:Teaching aid makes the classroom live and active.
- Direct experience:it provides direct experience to the students.

Principles in the use of audio-visual aids:

1. Principle of selection:
   -They should suit the age-level of learners.
   -They should be the true representative of the real things.
   -They should help the realisation of desired learning objectives.

2. Principle of preparation:

-The teacher should prepare the aids

-As far as possible,locally available materials should be used in the preparation of an aid

-The teacher should receive some training in preparing aids.

3. Principle of proper presentation:

-The aids should be displayed properly so that all the students are able to see it

-Teachers should be carefully visualise the use of teaching aids before their actual presentation.

- As far as possible distraction of all kinds should be eliminated so that full attention may be paid off.

4. Principle of response:

It demands that the teachers guide the students to respond actively .

5. Principle of evaluation:

It stipulates that there should be continuous evaluation of both the audio visual aids and accompanying the techniques in the lights of realisation of desired objectives.

TYPES OF AUDIO-VISUAL AIDS

1. Projected aids
2. Non-projected aids
3. Activity aids

1.Projected Aids: A projected aid is one in items in which items to be perceived are projected on screen using mechanical devices.The major projected aids that could be used in science are

Overhead Projector : The name overhead projector comes from the fact that the projected image is behind and over the head of the speaker.It is a simple and effective means of communication that enables the teacher to interact with the students.The lens of the OHP is designed to allow the placement of the projector

infront so that the teacher can face the class while using it.

Slide projector : It is an instrument equipped with a powerful light source and carrier for holding slides in suitable size.Usually a double slide carrier is filled into the projector so that when one slide is being projected on the screen,a second slide can be kept ready for projection.This aid is not only time saving but also helpful to add to the impression of the learning experience by combining audio and visual perception.

Film strip projector : A filmstrip is usually compiled from a number of individual pictures taken with a 35 mm. still camera.Film Strip is mostly 35mm film, color or black & white photographs in sequential order. Film strip projected on screen or on a wall. They use projector with film strip adapter. Film strips are in horizontal or vertical format. Projecting film strips especially along with the recorded commentary provides realistic and effective experience regarding a situation observed.

LCD Projector : LIquid crystal display is the most advanced projecting aid. It is used to present a topic infront of a large audience. We can demonstrate the real

world situations and its stimulations in the classroom.Now we can replace all the other projectors aids with only a single LCD projector.

2.Non-Projected Aids : Non projected aids are classified into Graphic aids,Display boards,Three dimensional aids and audio aids.

GRAPHIC AIDS: Graphics are instructional materials that summarize significant information and ideas through some combination of drawings,words,symbols and pictures.Major graphic aids are graphs,diagrams and charts.

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

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

Bar graph : It consists of bars arrange horizontally or vertically from an origin base. It is useful in comparing and contrasting two variables or two groups

Pie graph:it is usually shown on a disk (pie) or a circle divided into sectors of different angles to represent fractions or percentage of the division of a distributive nature

b) *Diagrams / Drawing:* It is a simplified drawing designed to show interrelation primarily by means of lines and symbols, e.g. stick figures, geometry drawings, facial expressions. Drawings can be done by hand to convey a variety of ideas, concepts and situations. It can be better used for summary and review.In science,a diagram is used to give a total mental picture of an electric circuit,cross section of stem etc.

Drawings are classified into:

1.outline drawings: It gives the exact shapes of objects,instruments

2.Mass drawings:They gave exact shape as well as solid look.They are outline drawings shaded or coloured.

3.Analytic drawing: Outline drawings in which internal parts are shown

4.Generalised drawings:Consist of many component drawings,all representing one idea or concept

5.Graphical drawings:They are graphical representation like histogram,bar diagram etc.

c)Charts:A chart is a graphical representation of data, in which,the data is represented by symbols.Charts are often used to ease understanding of large quantities of data and the relationships between parts of the data. Charts can usually be read more quickly than the raw data that they are produced from. They are used in a wide variety of fields, and can be created by hand or by computer.Chart is the graphic teaching material including diagrams, posters, maps, and graphics which presents a clear visual summary.

- Tree Chart: A chart made in form of branches from the trunk of a tree such that represents the main idea while the branches represents various development, relationship of sub parts of the main ideas. E.g.: family tree
- Stream Chart: It is a graphic aid showing the main thought, idea, concept in the form of a main river and it sub parts in the form of tributaries coming out of it. E.g. free hand drawing

- Table Chart:Table charts are very valuable aid in teaching situation to show comparison, distinctions and constant between two or more things. It should caption in bold letters, with different features in different colors. E.g. numerical data, descriptive observations.
- Flow Chart:It is a graphic aid of system requiring presentation in the form of connected lower divisions of the system in boxes and line to show their relative positions with respect to the higher position in the system. E.g. organizational chart.

DISPLAYBOARDS :The stereotyped atmosphere of the traditional classrooms,libraries,corridors of schools are recently giving way to attractive and educative surroundings with a wealth of display materials.displays that attract and appeal pupils stimulate their curiosity are motivational displays.Displays that add information and ensure active involvement of pupils in the development of a lesson are termed as developmental displays.Displays that are used for review and consolidation of a lesson are summary displays.In science education there is great scope for all these types of displays.

- BlackBoard:BlackBoard, or a specially painted surface which will “take” erasable white or colored chalk.A rigid surface painted black, on which one can write or draw with chalk
- Bulletin Boards:A bulletin board is essential when illustrations have been prepared on thin, flexible paper. It is usually helpful to have an assistant do the mounting, or the planner will have to turn his back to the audience and fumble with the material. A blackboard can be considered a bulletin board, with the aids mounted with tape rather than pins or tacks. It might be noted here that small visual aids can be enlarged by a photostatic process, at relatively small cost, for presentation on a bulletin board.
- Flannel board: A piece of flannel, flannelette, terry cloth or felt cloth attached to a rigid surface on which cut out figures will adhere if backed with flannel or felt cloth, sandpaper or glued sand.

- Markerboard:This is a large sheet of white plastic board with a surface texture suitable for writing or drawing with felt pens,markers or crayons.It can be sometimes used as projection boards also.

THREE DIMENSIONAL AIDS:Models,objects,specimen,moke-ups,diorama and puppets are major three dimensional aids used in classrooms.

- Models:Models are concrete representations of objects,their size being adjusted to make it handy and observable.Models can be handled,operated and seen from different angles,hence it is more interesting than charts and pictures.
- Objects:Objects may be defined as the real things that are collected from surroundings.
- Specimen:It may be defined as the typical object or part of an object which has been removed for convenient observation.It may be a representative of a class or group of objects.
- Mock-ups:A mock up is an operating model usually of a process,designed to be worked with directly by the learner for the purpose of specific training.It is the imitation of real process.It is very useful in giving training to complex skills

- Diorama:it is a three dimensional scene in depth,incorporating a group of modelled objects and figures in a natural setting.a Diorama scene is set up in a stage with a group of modelled objects that are kept on the foreground and blended into a painted realistic background.The objects in diorama are not made to a scale.For representation of depth ,objects kept at the background are made considerably smaller to create an illusion.
- Puppets:For thousands of years puppets have been used to stimulate reality,to entertain and to pass on knowledge.Most commonly used puppets are hand puppets,glove and finger puppets,rod puppets etc.

AUDIO AIDS:Radio and tape recorder are the most important audio aids used for teaching and learning.

1. Radio:It is a powerful medium for mass communication.It imparts instruction to school children through educational broadcast provided on specific days at specific school hours.Programmes are there for both teachers and students.Talks and classes based on prescribed syllabi of various subjects are given.

2. Tape recorder:A tape recorder is used to record sound on magnetic tapes which can be reproduced as many times as required.The recorded tapes consisting of lessons by eminent teachers are recorded and can be played in the class.

Activity Aids: Activity aids are the natural medium of instruction suitable for developmental education.These includes Field trips,Excursions,Exhibitions,Demonstration,Dramatisation,Museum,Planetarium,Aquarium etc.

- Field trips and Excursions:Excursion usually involves a tour by a person or a group of persons to some selected place.Excursions are mostly undertaken for recreation and pleasure.When an excursion is undertaken for gathering objective-based learning experiences it becomes a study tour.The tour made by a group is often known as field trip too.This provides direct experience leading to effective understanding.
- Exhibition:Exhibitions are effective modes of mass communication and instruction.If it is organised by the pupils themselves they get opportunity for self-activity.The exhibitions arranged in schools are visually planned to novel ideas to pupils,parents and public.

Demonstration: It is a technique which is used by all the teachers.Ideas,skills,attitudes and processes can be demonstrated.when the spoken words is supplemented with demonstration using various aids the learners get audio visual experiences.Demonstration must be purposeful,simple,specific and effective.

Museum:Museums are wonderful media for public education.They are institutions that collect and preserve original objects and specimen and use them for research and educational displays.Museums are repositories with an array of educative materials including rae specimens on a variety of subjects arranged in a logical order.

Planetarium:A planetarium consists of a dome usually mounted on the ceiling of a hall to represent the sky.A special projector is used to display images of the celestial bodies on the dome.The viewers who are seated below can see the projected images that will appear to be very realistic.The projector consists of various individual units for projecting the sun,moon,the planets and stars.Taped narration and sound effects add to the effectiveness of presentation.

• IMPROVISED APPARATUS

Meaning

Improvisation is the designing and production of ordinary laboratory apparatus and other instructional material from simple articles found in our surroundings. Whether this can be accepted as a common strategy for effective instruction depends on the ingenuity and resourcefulness of the teacher and his willingness to work.

The apparatus devised and made by a teacher or by pupils in the school laboratory or workshop is called improvised apparatus or homemade apparatus.

ADVANTAGES OF IMPROVISATION

- It is economical, Saves money
- Develops useful habits and dignity of labour
- Develops skill and clear understanding of basic principles
- Hand- head co-ordination
- Utilisation of leisure and resourcefulness
- Joy of creation and secures motivation
- Scientific thinking and independence of thought
- It makes the school self sufficient
- Based on learning by doing
- Develops scientific attitude
- Students appreciate the difficulties of early scientists
- Teacher can introduce variety into the nature of experiments.

- **Limitations**

- **The chances of error in the experiment increases**
- **The result obtained are approximate**
- **Uncertainty in the measurement arises**

CO- CURRICULAR ACTIVITIES IN SCIENCE

A.FIELD TRIP

- Field trips are organized visits of teachers and students to immediate or distant places to enrich learning experiences and to further instructional purposes of regular class room activities.
- It is distinguished by its concentration on learning particular aspects.
- Its success is judged by the fulfillment of pre determined goals.
- The chief purpose of field trips is to give students first hand experiences that cannot be had in the class room.
- It is an outdoor lesson in action.
- It provide opportunities for learning through the use of many techniques other than reading and speaking.
- It stimulate interest and increase appreciation.

- As it co-relates learning inthe class room with community, it develops better social awareness and social skills, in pupils.
- It provide enough raw materials that would promote development of senses, knowledge. Emotions and skills.

(a).<u>values of field trip</u>

1. Gives first hand experience
2. Supplements and enriches class room teaching
3. Creates spirits of scientific enquiry
4. Gives training in observation
5. Stimulates interest in nature and learning
6. Correlates the school life with the outside world
7. Provide opportunities for utilizing community resources
8. Gives relief from the routine class room work

B.STUDY TOUR

- Study tour is usually a long trip for a number of days.
- It provides an exposure to students to study and appreciate.
- It is an exposure trip to a place of educational and historical importance.
- It provides situations for the students to learn and get acquainted with the process of organising and understanding the environment around.
- It also develops social skills and values.
- Comparing to field trip the purpose of study tour is broad
- It provide an opportunity to the students for community livinh which is indeed a powerful means for education, entertainment and personality development.

Advantages

1. It provides direct and contrived experience to the learners
2. It gives an opportunity to observe the real life situation
3. It enables the students to retain the learning longer and to make the topic more interesting.
4. It avoids the monotony of regular classroom
5. Motivates children to learn science
6. Supplements classroom instruction
7. Provides opportunity to collect specimens and other useful material
8. Stimulate the spirit of collective working and sociability
9. Helps in the assessment of the importance of science
10. Fosters scientific enquiry.

Steps in Organization of Fied Trip/Study Tours

To be effective, the field trip must be planned carefully, otherwise it will be just wastage of time, energy and money. The steps involved in the completion of a field trip/Study Tours are as follows (Sharma &Sharma, 1971):

1. Planning
2. Preparation
3. Execution
4. Follow up
5. Evaluation

C.SCIENCE CLUB

- It is an organization which caters for the inculcation of scientific attitude, and a genuine interest in science, and also can supplement the work of the classroom and give the syllabus a practical dimension.
- Through activities of a science club, learning of science becomes joyful
- It caters to freedom for expression, where as the classroom atmosphere leads to conformity and repression.
- Science club activities improve students comprehension and help to develop scientific hobbies.

(a).Objectives of science club

1. To develop a general interest in science
2. To inculcate scientific attitude and provide opportunities for training in scientific method
3. To develop interest in scientific hobbies
4. To develop habits of exploration and creative faculties
5. To encourage individual and group activities
6. To develop in children a sense of healthy competition
7. To make the students and public science minded
8. To stimulate active participation and initiative among students in the learning process
9. To keep the students in touch with the recent advances in science
10. To provide challenging opportunities to the gifted

(b).Organization of science club

1. The senior science teacher may be the sponsor
2. Headmaster of the school may be the patron
3. The resources of the school should be made available to the club
4. An elective executive committee formed from the club members / students
5. A nominal membership fee should be charged from every member
6. Other committes may be formed depending upon the requirement of the club.

Other resources should be tapped by the club .The members of the club should be encouraged to extend the activities of the club in their locality.

c).Activities of science club

1. Organising lectures, debates, seminars, symposia, etc.
2. Holding science exhibition and fairs
3. Celebrating birth days of eminent scientists
4. participating in science fairs
5. conducting visual programmes of scientific interest
6. arranging visits to places of scientific interest
7. preparing of charts, postures, models, etc.
8. developing school garden
9. displaying science news
10. planting and growing trees and plants
11. managing a first aid squad
12. general reading of scientific literature

D.SCIENCE FAIR

- Science fair is purely an educative activity carried out in a systematic manner entirely for the advancement of science.
- It is an excellent device for acquainting the parents as well as other people in the community, with the science related work being done in schools
- It provides an opportunity for the display of valuable work done in the science club by the students and sponsors
- It help the students benefit from the achievement of others, and promotes a spirit of competition

(a).purposes and values of science fair

1. To stimulate and encourage interest in science
2. To focus attention on science experiences in schools
3. To provide situations for scientific hobbies
4. To recognize and encourage scientific talents
5. To provide opportunity for display of talents through exhibits
6. To stimulate greater interest in scientific investigation of the routine class work
7. To make the public science minded

(b).Organization of a science fair

1. **Planning:** It is essential that planning is thoroughly done.During planning the following aspects should be considered.

1. Objectives of the fair
2. Scope of the fair
3. Procedure
4. Financing
5. Location, time and duration
6. Other factors and facilities

2.Distribution of work: duties should be assigned to individuals and groups. Various committees are to be constituted, which are responsible for different programmes. While distributing the work, talents and interest should be taken into consideration.

3. Safety and First Aid: To ensure the safety of the projects, exhibitors and the public safety rules should be strictly followed as in electrical and fire safety rules.

3.Execution :programmes decided upon while planning are now to be organised systematically and put to action. Volunteers should be arranged for explaining the exhibits to the visitors.

4.Judging : The fair should be judged by an expert team. Separate criteria are to be developed for judging each item which may include:

- Scientific Approach
- Originality
- Technical skill and workmanship
- Thoroughness
- Dramatic Value
- Personal Interview.

5.Evaluation : When the fair is over, teachers and students should evaluate it and find out whether the objectives of the fair have been achieved or not. If not, trt to improve it next time.

LEVELS OF SCIENCE FAIRS

1. Institutional Level
2. District Level
3. State Level
4. Regional Level
5. National Level

E.SCIENCE EXHIBITION

- Exhibitions are familiar items in our environment today.
- Exhibitions that are arranged in schools are usually planned to communicate something valuable to parents, public and students.
- It is an organized presentation and display of a selection of items
- Usually occur within a cultural or educational settings such as museum, park, art gallery, etc.

Values of exhibition :

- It is one of the effective modes of mass communication and instruction on a large scale
- Self activity is fostered on the part of those who take part in the exhibition. Individual tastes, fancies and skills are exhibited.
- Special talents became known and creativity is fostered
- The outcome of different activities and processes are very well understood by pupils
- Team spirit is encouraged as conduct of an exhibition is a cooperative effort.
- Other values like vocational value, aesthetic value, cultural value, disciplinary value and ethical value are realised in the conduct of an exhibition in varying degrees
- Parents and visitors can have an idea of the work done by the pupils and as such it fosters parent school contacts.

F.SCIENCE DEBATE

- It is a method of presentation especially suitable to controversial themes
- It is a creative and collective process of eliciting all related facts of a topic
- In a debate there will be two groups, one for the proposition and the other against it and there will be a moderator also.

Advantages :

1. It enables the students to enrich their knowledge through healthy dialogues
2. The skills of critical thinking, positive interaction etc can be developed
3. It avoid stage fear of students
4. It enhances sustaining abilities of the learner
5. Students become creative and also promotes leadership qualities

G.SCIENCE PARKS

- It is a cluster of open science gadgets for play way learning of science.
- It is an innovative concept of teaching science in an informal way.
- The basic concept of science park is to enhance the tendency of the children to play more than to read.
- In a science park, aesthetically designed science gadgets are installed permanently to benefit every user by covering many topics in science.
- Ever since the first technology park(science park) was created near stanford university in the 1950s.

Advantages :

- Provide abundant space for growth
- Facilitate training sessions and include latest technology
- Promote rest and recreation

H.SCIENCE MUSEUMS

- Science museums are an educational hub.
- Visiting a science museum is a highly underrated science actuality
- Museums teach critical thinking, empathy and other generally important skills and dispositions
- Trips to museum help get kids excited about school subjects
- Museums are designed to maximize visitors experience of aesthetic values of the works of art by observing the object
- It tries to give an experience to visitors what scientists and innovators have experienced
- They often adopt the latest technology to maximize the excitement and joy of science

Benefits:

- It expand the general world knowledge of students
- It teach subject specific content and skills
- Access a ton of educational material
- Fun filled summer camp for students
- Plenty of hands- on exhibits to go around
- Properly use leisure times
- Create interest in school subjects
- Inculcate critical thinking in students

2 Mark Questions & Answer key words

1. Mention any four factors that should be consider while purchasing apparatus and chemicals to science lab?
2. Mention any four science lab rules?
3. Briefly describe the accidents in lab?
4. Define audio-visual aids?
5. Write difference between field trip and study tours
6. Explain the purpose of a science fair?

4 Mark Short Essays & Value Points

1. Describe about the science lab rules?
2. Describe accidents in lab and first aid?
3. Write a note on science library and its organisation?
4. Explain the principles for using an audio-visual aid?
5. Comment on different activity aids?
6. How can organize a science fair?
7. Write the advantages of a science debate?

10 Mark Essays & Value Points

1. Describe lab rules, accidents in lab and first aid?

Value points

- Description of science lab
- Points about lab rules
- Description of accidents in lab
- Description of first aid and first aid box

2.Write a note on audio-visual aids?
3.write a note on co- curricular activities in science?
4.write the main objectives of a science club?

Unit 4
Models of Teaching in Physical Sciences

Group members

- Ritu
- Sayooja
- Shahina
- Shifa
- Sneha
- Thanvi

MODELS OF TEACHING

- ***Meaning***
  - Models of teaching is simply the plans , pattern or blue print presenting the steps necessary to bring about a described outcomes
  - Models of teaching consist of guidance for designing educational activities and environment
  - Models are prescriptive teaching strategies, designed to accomplish particular instructional goals

MODELS OF TEACHING

Definition

“ A teaching model is a pattern or plan which can be used to shape curriculum or course to design instructional materials and to guide a teacher's actions “

- Joyce and Weil

Functions of Models of Teaching

- Designing curriculum
- Development and selection of instructional materials
- Guiding teaching activities
- Bringing desired outcome/ behavioral changes in learners
- Teacher - pupil interaction
- Creating favourable environmental situation for teaching- learning activities

Characteristics of Models of Teaching

- Models of teaching are some sort of plans or guidance of Teaching
- Models of teaching specify the criteria of acceptable performance expected from the students
- Models of teaching specify the learning outcomes or instructional objectives in terms of observable and measurable performance of students
- Models of teaching specify in definite terms the environment conditions under which a students response should be observed
- Specifies the mechanism of operation
- Based on a systematic procedure

FAMILIES OF MODELS OF TEACHING

There are many models based on empirical research, theories,postulates etc.

Joyce and Weil classified 26 models of teaching into four families

1. Information processing
2. Personal Development
3. Social interactions
4. Behaviour modification

1 Information processing family

- **This family of models aims at fostering the information processing ability in the learners**
- **It involves intellectual skills required to analyse information**
- **It include the ability to make observation,to generalize, to predict and to explain events**

Information processing Models are :

1. **Advance organizer Model** (*David Ausubel)*

   Goals: Designed to increase the efficiency of information processing capability of the learner

2 cognitive Growth Models *(Jeans Piaget)*

Goals : Designed to increase general intellectual development and logical reasoning

3 concept attainment Models *(Jerome S .Bruner)*

Goals : Designed to develop inductive reasoning and concept development and analysis

4 Inductive Thinking Model *(Hilda Taba)*

Goals : Designed primerly for the development of inductive mental process and academic reasoning or theory building

5 Memory Model *(Jerry Lucas)*

Goals : Designed to increase the capacity of memorisation

6 **Science Inquiry Model** (*Joseph.J.Schwab*)

Goals : Designed to teach the research system of discipline

7 **Inquiry training Model (** *Richard Suchman*)

Goals : Training in systematic Inquiry

8 Development Model (*Jean Piaget , Irving Sigel,Edmund Sullivan*)

Goals : Designed to increase general intellectual development especially logical reasoning

2 personal Development Family

- **This family of models stresses on personal development of an individual and the development of selfhood**
- **These models are more concerned with human feeling and emotion**
- **These models are try to move toward the development of an integrated functioning self**

Personal Development Models are :

1 **Awareness Training Model** **(** *Fritz pearls)*

Goals: Designed to develop ones self awareness and self exploration

2 **Conceptual System Model** (*David Hunt)*

Goals: Designed to develop personal complexity and flexibility

3 Non- directive Teaching Model (*Carl Rogers)*

Goals : Designed for personal development interms of self awareness, self understanding , self concept autonomy

4 **Synetic Model** (*William Gordon*)

Goals : creativity and creative problem solving

3 Social Interaction Model

- **The models of this family stress the development of social skills which help the individual to engage in democratic processes and to work productively in the society**

Social Interaction Models are :

1 Group Investigation Model **(** *John Dewey and Herbert Thelen)*

Goals : Designed for the development of social skills ,ie , skill for participation in social democratic process

2 Social Inquiry Model **(** *Byron Massials , Benjamin Borock*)

Goals: Designed for the development of social problem solving skills

3 Jurisprudential Model (*Donald Oliver, James p.shaver*)

Goals : Designed to teach the Jurisprudential frame of reference as a way of thinking about and resolving social issues

4 Laboratory Method model (*Bethel ,maine)*

Goals : Designed for the development of interpersonal and social group skills

5 Role Playing Model (*George shaftel ,Frannie shaftel*)

Goals : Designed to help the students to inquire about personal and social values

6 Social simulation Model (*sarene Borock*)

Goals: Designed to motivate the students to examine their own reaction towards various social issues

7 Classroom meeting Model (William Glaser)

Goals. : Development of self understanding and responsibility to one's self, one's in social group

4 Behaviour Modification Family

- **This models have evolved from attempts to develop efficient system for sequencing learning task and shaping behavioral by manipulating stimulus , response and reinforcement.**

Behaviour Modification Models are :

1 **Relaxation Model (** *Rinn ,Wolpe)*

Goals : Designed for the reduction of stress

2 Anxiety Reduction Model (*Rinn ,Wolpe)*

Goals : Designed for the substitution of anxiety in social situations

3 Assertive Training Model (*Lazarus, Wolpe, Slater)*

Goals : Designed for the development of direct and spontaneous expression of feeling in social situations

4 Direct Behaviour Model (*Lumsolaine)*

Goals : Designed for the development of behaviour and social skills among the learners

5 Managing Behaviour Model (*B.F.skinner)*

Goals : Designed for the development of social behavioural skills

7 **self control Model (** *B.F.Skinner)*

Goals: social behavioural and skills

8 **Programmed Instructions model** *(B.F.Skinner)*

Goals : Designed for the development of facts, concept,and principles

BASIC ELEMENTS OF A TEACHING MODEL

- **FOCUS**

  Goal or objectives of teaching.

- **SYNTAX**

  Sequence of activities which are called phases.
  Each model has distinct flow of phases.

- **SOCIAL SYSTEM**

1. **Description of student and teacher roles and relationship and the kind of norms.**
2. **Models varied from one another on the basis of its social system such as highly structured, moderately / semi structured or unstructured.**

- **PRINCIPLES OF REACTION**

1. **Guide the teachers to response to the learner**
2. **Teacher overtly tries to shape the behaviour of students**

- **SUPPORT SYSTEM**

Additional requirements beyond the usual human skills of capacities and technical facilities necessary to implement a model.

- **INSTRUCTION AND NURTURANT EFFECT**

Effects of model are of two types.

1. **Direct effect / instructional effect**
2. **Indirect / Nurturant effect**

Examples:

Nurturant effect

Inductive thinking - 1. Awareness of nature

2. Attention to logic

Instructional effect

Inductive thinking - 1. Specific concepts

2. Concept formation process

CONCEPT ATTAINMENT MODEL

- Developed by '*Jerome. S. Bruner'* and his associates '*Jacqueline Goodnow and George Austin'.*
- It is mainly about the nature of concepts and strategies of concept formation.
- It is a *information processing model*
- To develop inductive reasoning and concept development and analysis.

- **Theoretical background of the concept attainment model**

- **Meaning and importance of concept**

1. A concept is a generalized mental image which represents all the members in a particular category.
2. Concept related to the subject of study form the basic vocabulary of the language of that subject.
3. Concepts are the most fundamental aspects in the meaningful study of that subject.

- **The process of concept attainment formation and concept formation**

1. In order to combine different and unique items in to classes we may think of criterias.This process is called categorising.
2. Strategies used for categorising may differ from one another
3. Concept attainment and concept formation are two categories.
4. When one is able to classify certain items that satisfy set of common attributes, or will be able to say ‘yes or No’ about the inclusion of an item to the category, then one can be said to have attained the concept.
5. This process is known as ***concept attainment***

6. **When one casually observes items in natural situation, and tempted to form his own hypothesis and to do the categorisation or generalisation by him self then concept has to be formed by the learner it self.**

This process is known as *concept formtion*

7. **The major difference is that concept has to be formed by the learner himself, where as in concept attaiment categorisation, observation, analysis is done by the learner with the help of somebody.**

• Concept -a theoretical discussion

- According to Bruner, concept includes five elements. They are, ***name, exemplars, attributes, attribute values, and rule.***

1. **Name** - describes the concept for communication.
2. **Exemplars** - items that could be observed and studied in the process of categorisation. There will be positive examples and negative examples
3. **Attributes** - features or characteristics on the basis which a number of items could be categorised in to a particular group or class that represents the concept.
4. **Attribute value** - each attribute may have its value range.
5. **Rule** - definition formed to describe a concept.

- **A test of concept attainment.**

- **Ability to categorise exemplars and non exemplars**
- **Ability to describe the exemplars in terms of essential attributes and justify the categorisation.**
- **Ability to generate one's own examples and justifications.**
- **Ability to precisely define the concepts in terms of the essential attributes.**

- **Strategies for concept attainment**

- **Simultaneous scanning.**
- **Successive scanning**
- **Conservative focussing**
- **Focus gambling**

• DESCRIPTION OF THE MODEL

- SYNTAX

1. **Phase 1 - presentation of data and identification of concept**
2. **Phase 2 - testing the attainment of concept**
3. **Phase 3 - analysis of the thinking strategies.**

- **SOCIAL SYSTEM**

1. **Teacher controls action and as such the social system is highly structured.**
2. **In subsequent phases student interaction encouraged, social system moderately structured**

- **PRINCIPLE OF REACTION**

1. Teacher acts as guide, motivator, facilitator, etc
2. Supports pupil's hypothesis and creates an atmosphere of meaningful dialogue
3. Encourage different strategies.

- **SUPPORT SYSTEM**

1. Appropriate presentation of examples and non examples forms the most essential support system.

- **INSTRUCTIONAL AND NURTURANT EFFECT**

- **Instructional effect**

1. Getting clear notions about nature of concepts
2. Developing skills in using appropriate concept
3. Attaining the specific concepts
4. Develops skills in inductive reasoning.

- **Nurturant effect**

1. Sensitivity tological thinking
2. Tolerance of ambiguity and initial errors
3. A sense of using alternative perspectives.

INQUIRY TRAINING MODEL

- **Developed by *Richard Suchman* ,1962**
- **Useful for teaching students the art of independent inquiry in a disciplined way**
- **Objective of this model is to develop the scientific process skills -** observing,collecting and organizing data,identifying and controlling variables,making and testing hypothesis,formulating explanations and drawing inferences

The general goal of inquiry training is to help students develop the intellectual disciplines and skills necessary to raise questions and search out answers stemming from their curiosity

➢ Assumptions :-

1. All knowledge is tentative
2. There cannot be one answer to particular cause and effect question
3. People inquire naturally when they are puzzled
4. The process of inquiry can be taught to students
5. Student can become conscious of and learn to analyse their thinking strategies
6. Team approach is better than the individual approach tofind solutions to a problem

➢ Syntax :-

1. Encounter with the problem
2. Data Gathering : Verification
3. Data Gathering : Experimentation
4. Formulation of Explanation
5. Analysis of the Inquiry Process

➢ Social System :-

- Social system is co-operation
- Teacher Plays a dominant role in presenting the puzzling situation
- In the inquiry session teachers and students participate as equals
- It emphasises group activity
- This model requires an open classroom climate
- Role of Teacher :-Controller,Guide,Facilitator,Helper,Instructional manager and monitor

➢ Principle of Reaction :-

The tasks of teacher are :

1) **Ensure that the phrasing of questions is done correctly**
2) **Ask students to rephrase invalid or vague questions**
3) **Point out unvalidated statements**
4) **Use the language of the inquiry process**
5) **Neither approve nor reject student theories**
6) **Ask students to make clear statements of theories and provide support for their generalisation**
7) **Encourage interaction among students**

➢ Support System :-

Main requirements are:

- ❑ A set of discrepant events
- ❑ Teacher's knowledge of the inquiry process
- ❑ Resource material related to the problem

➢ Instructional Effects :-

- ★ Scientific Process Skills
- ★ Strategies for Creative Inquiry

➢ Nurturant Effects :-

- ★ Spirit of creativity
- ★ Autonomy in learning
- ★ Tolerance of ambiguity
- ★ Tentative nature of knowledge

2 Mark Questions & Answer key words

- Define models of Teaching?
- Write any 4 functions of models of Teaching?
- What you mean by families of models of teaching?
- Write any 4 models of information processing family?
- Write any 4 models of personal development family?
- Write any 4 models of social interaction family?
- Write any 4 models of behaviour modification family?
- What are the major difference between concept attainment and concept formation?
- Write down the meaning and importance of concept?
- Give the syntax of Inquiry Taining Model?

4 Mark Short Essays & Value Points

- Describe briefly the meaning , characteristics and functions of Models of teaching?
- Explain briefly the families of Models of teaching?
- Differentiation between personal development family and social interaction family of models of Teaching?
- Explain information processing family of Models of teaching with examples of Models?
- What are major difference between instructional effect and nurturant effect?
- Give the instructional and nurturant effects of Inquiry Training Model?

10 Mark Essays & Value Points

1) Describe concept attainment model?

(Value points : meaning and importance of concept, describe model - its syntax, support system, principle of reaction, social system etc)

2)Discuss the models of Teaching and families of Models of teaching

(Value points :Meaning & concept of Models of teaching, definition of Models of teaching, characteristics & functions of Models of Teaching, fundamental elements of Teaching model, different families of Models of teaching,eg for models include in families of Models of teaching

3) Explain Inquiry Training Model?

(Value points : objectives,importance,syntax,social system,principle of reaction,support system,instructional and nurturant effects of Inquiry Training Model)

Unit 5
Evaluation in Physical Science

Group members

- RITU
- SAYOOJA
- SHAHINA
- SHIFA
- SNEHA
- THANVI

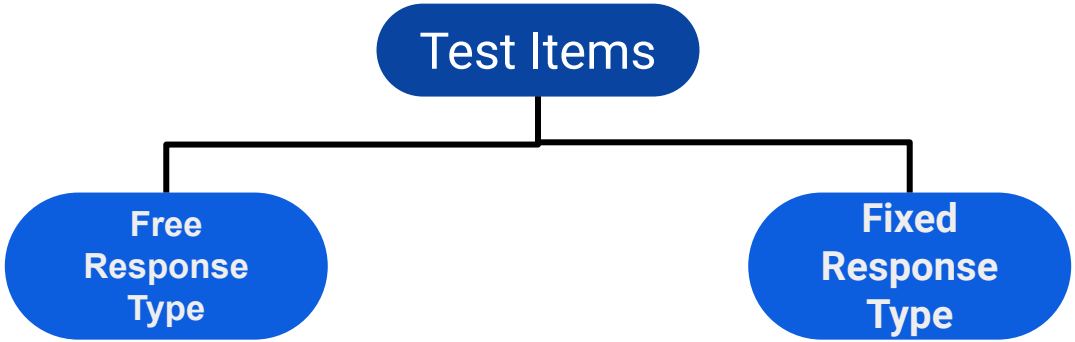
TEST

- An instrument used for measuring student's relative proficiency in a particular area
- It is a tool consisting of a number of questions for finding out the knowledge,understanding,aptitude and interest of the students
- It is based on a predetermined set of objectives
- A written test is composed of a number of items or questions.

"Test is an instrument or systematic procedure for measuring a sample behaviour"

-N.E.Gronlund(1985)

➢ Type of Test Items



Free Response Type:

- ➔ **Responses are free**
- ➔ **Freedom to respond in his own way**
- ➔ Short answer type
- ➔ Essay type

Fixed Response Type:

- ➔ **Responses are fixed**
- ➔ **No freedom to respond in his own way**
- ➔ **Response are being controlled by the constructor**
- ➔ Objective type or new type

- **Commonly used Test Items are:**
  1. **Objective Type**
  2. **Short Answer Type**
  3. **Essay Type**

1. OBJECTIVE TYPE TEST ITEMS:

- **Response is objective**

> **"One that can be provided with a simple predetermined test of correct answers so that objective opinion or judgement in the scoring procedure is eliminated"**
>
> **-R.L. Ebel and D.A. Frisbie(1985)**

Types of Objective Type Test Items

Broadly classified into two:

- ➔ **Supply Type**
- ➔ **Selection Type**

Supply Type:

★ **Respondents have to supply the response**

★ **They are:**

Simple Recall Type

Completion Type

➔ Simple Recall Type Test Items

- The respondent to recall a response to a direct question.
- response should be short preferably a word, a number or a small phrase.
- It eliminates the chances of guessing.

➔ Completion Type Test Items

- It consists of a series of sentences in which certain words are omitted and replaced by blanks.
- The respondents are expected to fill in the blanks with a word or a number or at the most a phrase.
- It completely eliminates the probability of guess work

Construction of Completion Type Test Items - Guidelin

- Avoid borrowing statements from the textbook
- Avoid ambiguous statements
- Try to anticipate all possible answers that might be marginally correct
- Omit keywords or phrases rather than unimportant details
- It is preferable not to begin with blank
- There should be only one correct responses for each blank
- Blanks should be of uniform length
- Do not omit too many words
- Avoid irrelevant clues like a,an, in,on,etc. before blank
- Avoid grammatical hints,especially concord

Selection Type:

- ★ **Respondents have to select the responses from among the given response**
- ★ **They are:**

  True – False type

  Multiple choice item

  Matching type

True – False Type Test Items(Alternate Response Type)

- Alternate Response Type Test
- Provides only two possible responses out of which one is correct
- The respondent want to identify whether the statement is True-False, Yes-No, right-Wrong, Correct-Incorrect,Agree-Disagree
- It tests the ability to discriminate between misconceptions and scientific truth

" A true-false item consists of a statement or proposition which the examinee must judge and mark as either true or false."

-A.J. Nikto(1983)

MERITS	DEMERITS
❖ Suitable for young children who have poor vocabulary ❖ Large sample of subject matter can be covered within a short period ❖ Easy to construct ❖ Objective scoring ❖ Time saving	❖ High degree of guessing ❖ Rote memorization ❖ These can be attempted by anyone who don't know anything about the subject matter ❖ Some statements are not entirely true or entirely false

Construction of good True False Items - Guidelines

- Avoid textbook language
- Avoid double negative statements
- Number of True statements should be approximately equal to that of the false statements
- Avoid linguistic clues
- Limit True or False statement to a single idea
- Avoid long statements and complex sentence structure
- Avoid ambiguous and indefinite statements
- Keep True and False statements approximately equal in length
- Statements should not be partly true or partly false

Multiple choice Test Items(Changing Alternative Type)

- Changing Alternative Type Test
- Consists of two parts
- First part of item is called STEM - Presented in the form of direct question or incomplete statements
- Second part of the item is called Options or alternatives or responses - usually 4 or 5 in number
- Among the options one is the correct response and others are incorrect
- Correct response is Key or Keyed response
- Incorrect responses are distractors or misleads or foils

MERITS	DEMERITS
❖ Elementary level to complex level of objectives ❖ Reduce effect of guessing ❖ Scored objectively and quickly ❖ Easy to respond ❖ Valuable diagnostic information	❖ Difficult to construct ❖ Cannot measure attitude or motor skills ❖ Check only limited Knowledge ❖ Do not permit examinees to express their own views ❖ More space per item

Construction of Multiple Choice Test Items - Guidelines

- Exclude obviously incorrect answer as distractor
- Avoid copied statements from the textbook
- Each item should have 4 or 5 alternatives
- Correct answer should follow a random order
- Be sure that only one correct or best answer is given
- Use same type of language in STEM and options
- Avoid double negative statements
- Avoid repetition of words or phrases in options
- Responses or options should not overlap,include or synonymous with one another
- Avoid distractors that do not fit grammatically with the STEM

- **Don’t give any unintentional clues to the correct answer**
- **It is preferable to include the term in the STEM and the definitions in the options**
- **Each alternative when read along with the STEM should present more or less the same general appearance**
- **Avoid using ‘All the above’ options**
- **Use the option ‘None of the above’ only when the keyed answer can be classified unequivocally as right or wrong**

Matching Type Test Items

- Two column format – Premises (stem) and Responses
- Requires the student to take a correspondence between the two
- The items in the column for which a match is sought – Premises or Stem
- Items in the column from which selection is made - Responses or Options

MERITS	DEMERITS
❖ Many questions in limited time ❖ Cover large content ❖ Easy scoring ❖ Easy to construct ❖ Less opportunity for guessing	❖ Difficult to get cluster of questions ❖ Provide clues

Construction of Matching Type Test Items - Guidelines

- Give clear instruction
- Avoid equal number of Premises and Responses
- The list should be neither too long nor too short
- Items in both columns should be relatively homogeneous
- Complete items should appear in one page
- Options should be in logical order
- Avoid grammatical differences
- If the test is in the “mark the answer in the test booklet” format ,options should be given on the left hand side

Advantages of Objective Type Items

- ★ It can be scored objectively and easily
- ★ It is a very good tool for ensuring coverage
- ★ Reduces the subjective element of the examiner to the minimum
- ★ Reduces the role of luck and cramming of expected questions
- ★ It promotes economy of time
- ★ It eliminates irrelevant factors such as speed of writing,fluency of expression,literary style,good handwriting,neatness,etc.
- ★ It creates an incentive for pupils to build up a broad base to knowledge,skills and abilities
- ★ It can measure the higher mental processes of understanding,application,analysis,prediction and interpretation

Limitations of Objective Type Items

- ★ Difficulty in preparing good items
- ★ Problem of guessing
- ★ Problem of cheating
- ★ Emphasis on testing superficial knowledge
- ★ Inefficiency in testing complicated skills
- ★ High printing cost

2. SHORT ANSWER TYPE TEST ITEMS:

- A question requiring more than one value point but not more than 4 is called a short answer type questions
- The term value point indicates a point to be given credit in the expected answer

Guidelines For Constructing Short Answer Type Test Items

- ❖ Make questions simple,short and grammatically correct
- ❖ Avoid qualitative terms like seldom,most,many,much,etc.
- ❖ Avoid absolute terms like always,all,none,never,etc.
- ❖ Avoid abstract statements deviating from the main context
- ❖ The item should deal with a single item of information
- ❖ Maximum length of expected answers should be precisely indicated
- ❖ Give clear,specific and complete directions
- ❖ Give due consideration to time allotted for the test
- ❖ Avoid subjective terms like ‘discuss’,’what do you know about,etc.’

Advantages of Short Answer Type Test Items

- A large sample of content can be covered
- Easy to construct
- It provides little opportunities for guessing
- It can be made quite objective by carefully fixing up the value points
- Useful in evaluating the ability to interpret diagrams,charts,graphs,etc.
- Used to evaluate higher order objectives like understanding,application and problem solving skills

Limitations of Short Answer Type Test Items

- More subjective than the objective type of items
- Excessive use may encourages a student to memorise facts and develop poor study habits
- Mechanical scoring is not possible

3. ESSAY TYPE TEST ITEMS:

- Free response test item
- Type of question calling for a rather long answer covering a number of points and a variety of objectives
- Helps in evaluating complex skills
- It is the only means to evaluate pupils ability to express facts in an organised manner,to assimilate and organise subject matter,to reason logically,to invite individual opininons and criticism
- The test should neither be too general nor too specific

Advantages of Essay Type Test Items

- Easy to construct
- Simple administration procedure
- Assess important abilities and complex learning outcomes
- It permit the examinee to write down comprehensively what he knows about something
- Promote originality and creative thinking
- Encourage grasp of language and ask for effective expression from the examinees
- Eliminates possibility of guess work
- Reduce chance of spot copying
- Helpful for appraisal of skills
- Encourages comprehension of the subject matter
- Enhances organization skill

Limitations of Essay Type Test Items

- Subjective in nature
- Limited content coverage
- Not possible to make proper evaluation of specific abilities of the student
- Since the number of items is limited,there is an element of chance
- Essay type examinations do not possess sufficient validity or reliability
- Time consuming

EVALUATION

- It is the process of assigning value to something
- This is possible only on the basis of specified predetermined goals
- From the point of view of the class teacher,instructional objectives act as the basis of evaluation
- It is the process of making judgement based on criteria and evidence

Functions of Evaluation

- ❖ Enhances the quality of teaching
- ❖ Helps in clarifying the objectives
- ❖ Motivates learners
- ❖ Guidance can be given on the basis of evaluation
- ❖ Help in bringing changes in the curriculum

Purpose of Evaluation

- Helps for promotion,classification,selection and certification
- Helps to assign proper marks or grades for placement of students
- Motivate students for better learning
- Diagnose strengths and weaknesses of students
- To locate areas where remedial measures are needed
- Judges effectiveness of instruction
- Helps in determining as to how far the learning objectives could be achieved
- It determines the rates of progress of students
- It predicts the success of students in future
- Helps in selecting the students for admission in different subjects and different levels

Types of Evaluation

- On the basis of the purpose and the time involved,the evaluation can be classified as:
  1. Formative Evaluation
  2. Summative Evaluation
- Both are complementary to each other

1) Formative Evaluation:

- Evaluation with respect to the anticipated objectives
- Weaknesses should be diagnosed and remediated
- This procedure will ensure mastery of the subject in terms of realisation of educational objectives
- Provides immediate feedback
- It results reinforcement and motivation
- Thus the instructional process becomes dynamic and effective through continuous formative evaluation
- Emphasis on the realisation of predetermined objectives

2) Summative Evaluation:

- It conducts at the end of a unit or at the end of a term
- Annual examination is summative in nature
- The result of summative evaluation will give a general picture of the level of attainment
- It helps to reinforce both teachers and the pupils
- It will make instruction more effective
- It may aim at placement,prediction,etc.of the learners

General Approaches to Evaluation

- There are different approaches used for classroom evaluation
- The present system of instruction is based on predetermined objectives
- In order to assess the degree of realisation of the objectives by the learner,the teacher has to conduct an Achievement Test

- ❖ It is also possible to determine the reason for the failure of the learner in achieving the objectives in terms of gaps,difficulties,etc.by conducting **Diagnostic test**
- ❖ By giving **Prognostic test**,the future prospects of success of a student in any selected area can be predicted

ASSESSMENT

- It is the process of estimating the status of pupils' development in different aspects of learning
- It can be done both in terms of quality or quantity
- In British literature **Assessment** is occasionally used as synonym to American term **Evaluation**

"Assessment is the process where by one person (usually a teacher)attempts to find out about the knowledge,skills and attitudes possessed by another (the learner)

ACHIEVEMENT TEST

Achievement Test

A test designed to assess the achievement in any subject with regards to a set of predetermined objectives.

Characteristic of achievement test

- Measure how much a student has achieved
- Gives due weightage to objectives, content, forms of questions and difficulty levels in a general way

- Give proportional weightage to every topic in the content area in a broad manner
- It strictly observes the time factor
- Marks scored are crucial in achievement test

Functions of achievement test

- To see how effectively the teaching and learning have taken place
- To motivate students before a new assignment is taken up.
- To provide basis for promotion to the next stage.
- To help in determining the placement of students in a particular section.

CONSTRUCTION OF AN ACHIEVEMENT TEST

MAJOR STEPS :

- On the basis of revised Bloom's Taxonomy

1. Planning of the test,
2. Preparation of design
3. preparation of the Blue print
4. Writing of items
5. preparation of the scoring key and marking scheme
6. Preparation of questions wise analysis

1. **Planning of an achievement test :**

★ Before constructing a good achievement test the paper setter should think about the following aspects as part of planning .

★ The first consideration should be given to the intention of the paper setter.(certain outcomes of learning)

★ Then determine the maximum time , maximum marks and the nature of the test.

2. Preparation of a design :

Important factors to be considered;

- Weightage to content :

  This indicates the various aspects of the content to be tested and the weightage to be given to each aspects.

- Weightage to thinking skills:

  Weightage given to the thinking skill.

60% - lower order thinking skills

40% - higher order thinking skills

- Weightage to form of questions:

The form of questions to be included in the test and the weightage to each form of questions.

15 - 20 % : objective type

Up to 20 % : essay type

- Weightage to difficulty level :

Propriety should be shown with regard to the difficulty level of questions. The test should contain easy , average, and difficult.

- Scheme of option :

The option or choices given to the students to select certain questions. There may be external and internal options.

- Scheme of sections :

Arrangement of questions into separate division.

3. Preparation of Blue print

- Blue print gives the details of the design in concrete terms
- Prepared as a 3D chart indicating the distribution of questions - objective wise , content wise, form wise-
- Give framework for the test
- Indicates the board limit within which the test constructed

4. Writing of items

- The blue print give a clear idea about the no.of questions, forms and objectives.
- With the help of it the paper setter can start writing items according to the requirements.
- The difficulty level and time allotted are considered.
- Arrange questions in the order of their difficulty level.

5. Preparation of the scoring key and marking scheme.

- Scoring should be made in accordance with a pre designed scheme of evaluation.
- It is essential to prepare the scoring key and the marking scheme simultaneously with question paper.
- For objective type item - scoring key
- For short answer & essay type - marking scheme

- In marking scheme the examiner has to do is to list out the value points to be credited & fix up the mark to be given to each point.
- No partial credit is given for an objective type item.
- General instructions also are given at the end of the scheme of valuation in order to avoid subjectivity.

6. Preparation of Question- wise Analysis:

- A table is prepared which contains all relevant details of all the items of the test.
- This is done by making an analysis of each item in terms of content, thinking skills LOTS/HOTS,specific thinking skills,form of question.
- Check whether all the aspects envisaged in the design and blue- print are satisfied by the test in its final form .

- If some mistake is noticed it should be rectified at this final stage.

Types of test items

Principle for constructing test items

1. The test items should cover, as far as possible, the whole range of topics prescribed in the syllabus
2. No item or part of the items should be set which is outside the syllabus
3. The language of the items should be simple and within the easy grasp of studen
4. Items should provide clear direction to the students regarding the scope and length of responses
5. More items should be set to test higher objectives.for this items shold be in the context of new situations.

Test items

A. **SUBJECTIVE TYPE**
- Short answer type
- Essay type

B. **OBJECTIVE TYPE**
- Supply type
- Selection type

Short answer type

A question requiring four value points at the most may be defined as a shirt answer question.The term value points indicates a point to be given credit in the expected answer.Thus the length of the answer expected from a short answer question becomes very short. This diminishes subjectively.

Suggestions for constructing short answer type

- Make questions simple, short and grammatically correct
- Avoid qualitative terms like seldom, most, many, much etc.
- Avoid absolute terms like all, none, never, etc.
- Give clear, specific and complete directions.
- Give due consideration to time allotted for the test

ADVANTAGES

- A relatively large portion of the content covered in a test
- It is easy to construct, because it measures a relatively simple learning outcome
- It is useful in evaluating the ability to interpret diagrams, charts, graphs etc.

LIMITATIONS

- It is more subjective than the objective type of items.
- It is excessive use may encourage a student to memorise facts and develop poor study habits.
- Mechanical scoring is not possible because of the subjectivity involved

Essay type

- Traditional type
- Free response item
- Help evaluation of complex skills and similar behavioural patterns

- Question calling for long answer with a number of points and variety of objectives
- It is the only mean to evaluate pupils ability to express facts in an organised manner , to assimilate and organise subject matter, reason logically ,to invite individual opinions,criticism etc..

ADVANTAGES

- Simple to administer
- Easy to prepare
- Improve language
- Guess work can be eliminated
- Reduce spot copying
- Helpful for appraisal of skills

LIMITATIONS

- Subjective nature leads to different scores
- Selective study of content
- Cannot comprehensively cover the contents

OBJECTIVE TYPE

Definition

"One that can be provided by with simple pre-determined test of correct answers so that objective opinion or judgement in the scoring procedure is eliminated"

- R.L .EBEL and D.A.FRISBIE -

SUPPLY TYPE

Two types

A.**Simple recall type**

- Requires to recall response to direct question.
- Response is short like a word,number,phras
- Eliminate chances of guessing.

B.**Completion type**

- Consists of a series of sentences with certain words omitted and replaced by blanks.
- Respondents are expected to fill blanks using words ,phrases, number.
- Guess work is completely eliminated.

Selection type

Three types

1. True or false items
2. Matching type test items
3. multiple choice test items

True or false

- Alternative response type
- Accirnding to A.J.Nikto “A true or false items consists of a statement or proposition which the examinee must judge and mark as either true or false “
- Chances of guesses
- Emphasise rote memorization
- Can be attempted by those who are unaware of subject matter
- Large subject sample coveted in short time

MATCHING TYPE

- modified form of Multiple choice test item
- economised form of multiplie choice test items
- consists of two parallel columns consists of words ,numbers,phrases matched to each other' in respective columns
- Promises/stem- the items in column for match is sought
- Responses/ options- items in column from which selection is made

Multiple choice test items

- Consists of four or more responses which is either correct or better than others
- StEM-first part of item- Presented in the form of direct questions or incomplete statement
- OPTIONS /RESPONSE- usually four or five in number
- One is keyed response ,others are distractors or misleads
- The different forms of multiple choice test item in vogue are correct answer form, best answer form, multiple response form, etc.

Advantages of objective type items

1.can be scored objectively and easily

2.good tool for ensuring coverage

3.reduces subjective element to minimum

4.economic in time

5.it creates many skills and abilities

6.if carefully planned, it can be measure the higher mental process of understanding

Limitations of objective type items

1.difficulty in preparing good items

3.problem of guessing

3.problem of cheating

4.emphasise on testing superficial knowledge

5.high printing cost

6.inefficiency in testing complicated skills

DIAGNOSTIC TEST

- To locate the specific weakness in the learning of pupil, teacher can construct a test, which is known as *Diagnostic test.*
- It measures how much a student has not been able to achieve in the normal teaching- learning process and why.
- *Remediation,* it is nothing but the re teaching giving fresh learning experiences meant for the removal of difficulties.
- It would be better to administer a parallel diagnostic test, after the remediation programme to ascertain the effectiveness of the remediation.

- **Prognostic test**

- **A test which predicts the future performance of a student in a particular area is known as a *prognostic test.***
- **It would help to avoid wastage that is likely to occur when a student who is sure to be misfit in a particular course of study gets admitted to that course.**

STEPS IN THE CONSTRUCTION OF DIAGNOSTIC TEST

1. Identification of the problem areas - purposeful planning.
2. Detailed content analysis.
3. Analysis of the content or teaching units /ideas / concepts.
4. Essentials are listed in terms of learning outcomes
5. Listing all learning points/ ideas/ concept
6. Arranging the learning points / ideas / concept in the logical sequence
7. Writing test items for each learning ppint
8. Clubbing the items around the learning points / ideas /concepts.

9. **Presenting each item with clear instruction.**

10. **Preparing scoring key and marking scheme**

11. **Providing the time limit as required by the individual students**

12. **Administration of the test.**

- ***Identifying performance and weakness***

13. **Itemwise analysis of performance of each student.**

14. Qualitative and quantitative analysis for identifying strength and weakness.

15. Identification of the causes of learning difficulties.

16. Preparation of diagnostic test

- ***Remediation***

17. **Remedial teaching**

18. Planning and implementing highly individualised remedial programme.

19. Evaluating the effectiveness of the programme.

- **DIFFERENCE BETWEEN DIAGNOSTIC AND ACHIEVEMENT TEST**

ACHIEVEMENT TEST

- Measures how much a student has achieved
- Strictly observes the time factor
- Marks scored are equal
- Construction is comparatively easy.

DIAGNOSTIC TEST

- Measures how much a student has not been able to achieve
- Not concerned with the time factor
- Marks scored are not very important
- Construction requires more ingenuity and imagination.

WRITING HIGHER ORDER TEST ITEMS

Questions can be classified as :

- Lower order questions.(LOQ)
- Middle order questions.(MOQ)
- Higher order questions.(HOQ)

We are familiar with revised Bloom's Taxonomy. According to Bloom's taxonomy cognitive domain is classified into six major classes.On the basis of these classes LOQ,MOQ and HOQ are defined.

LOQ – Remember

MOQ – Understand,Apply

HOQ – Analyse,Evaluate,Create

Higher order thinking is required to solve a higher order question.

- Higher order thinking goes beyond memorizing,recalling and comprehension of data and facts.

- Higher order thinking can be developed through open ended questions essays and discussions.

Writing HOT items to enhance higher order thinking

Real World Scenerio

Connect questions with real world

• Analysis of Visuals

Asking learners to analyse or interpret the information from visuals.

• The answer plus the reason

Ask the learner to synthesize what they have learned into explanations. Allow them to follow the reasons behind everything that happens in nature

Why Use HOT?

Help a child to use the knowledge beyond the classroom and apply the knowledge in their life

- Higher order thinking takes thinking to higher levels than restating the fact.
- Higher order test items Improves the cognitive level.
- Higher order test items also filter competitive aspirents for selected fields of study.

In entrance exams like NET, JEE ,NEET..etc...Most of the questions will be higher order questions.This is to filter most suitable students to the course or stream

2 Mark Questions & Answer key words

1. What is meant by Achievement test?
2. What is prognostic test?
3. What is remediation?
4. Explain the functions of Evaluation?
5. What are the different types of Evaluation?
6. Define objective type test item?
7. Define True-False Test Item?
8. What do you meant by Assessment?

4 Mark Short Essays & Value Points

1. Explain the importance of preparing a blueprint in a achievement test.
2. Explain different steps involved in the construction of an achievement test.
3. What are the steps in the construction of diagnostic test?
4. What are the major differences between diagnostic test and achievement test?
5. Give suggestions for the construction of good true false items?
6. Explain completion type test iem and its construction?
7. Advantages and limitations of objective type items?
8. Explain short answer type items and its construction?
9. What are the advantages and limitations of short answer type test items?
10. Explain essay type test items?

10 Mark Essays & Value Points

1. **Explain diagnostic test**

(meaning of diagnostic test, need and importance, steps what is major difference between diagnostic and achievement test)

2. What are the Different types of Test items? Explain in detail

(objective type,its classification,,short answer type,essay type,,advantages and limitations)

3. Prepare an Achievement Test on any topic in Physics or Chemistry.