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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Online Collaborative Learning Project (OCLP)

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Unit 1

Aims and Objectives of Teaching Science

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JIHADA

*Aims and objectives of teaching Science

*broad national goals

*Bloom’s taxonomy

*Cognitive, affective and psychomotor domain

AIMS AND OBJECTIVES OF TEACHING SCIENCE

■BETTER UNDERSTANDING OF THE NATURE OF SCIENCE - The first and obvious reason for teaching science is to give information about the world in which we live.The student should understand the cumulative nature of scientific knowledge. After studying science, the pupil should understand the inter relationship and interdependence of different branches of science.

■DEVELOPMENT OF SCIENTIFIC ATTITUDE - Formation of scientific attitude is an important outcome of science teaching. Attitude is a condition of readiness for a certain type of activity. Some characteristics of scientific attitude are :

•

Open-mindedness

•Curiosity

•Freedom from superstitions

•Judgement based on scientifuc facts alone

•Honest reporting

■DEVELOPMENT OF INTEREST AND APPRECIATION-The teaching of science should enable the pupil develop and enjoy personal interest related to science.The pupil should be able to recognize and enjoy scientific aspects of natural and man-made environment.

■

- **ACQUISITION OF SKILLS-Exposure to scientific knowledge both in the classroom and in the laboratory leads to the acquisition the following skills:**

1.Laboratory skills - skills for handling apparatus, preserving chemicals etc.

2.Mathematical skills-computation, graphing, tabulating etc.

3.Social skills- to get on with people, working efficiently in groups.etc

4.Safety skills- avoiding accidents

■TO HELP PUPILS TO BECOME GOOD INDIVIDUALS IN THE SOCIETY

■TO HELP PEOPLE CHOOSE CAREERS IN SCIENCE.

BROAD GOALS OF TEACHING NATURAL SCIENCE

■ **DEVELOPING SOCIETY WITH SCIENTIFIC TEMPERAMENT**

-Through natural science teaching it is possible to develop a community with scientific temperament in all walks of life.

■**SELF SUFFICIENCY IN FOOD PRODUCTION - Science education should meet this requirement by the production of new hybrid varieties and high yielding disease resistant crops.**

■**CONTROL OF DISEASES - The awareness of public about the different diseases,it's causes,management and control to great extend helps to reduce the frequency of the diseases.**

■**REVOLUTION IN LIFESTOCK AND FISHERIES** - Rearing practices in poultry farming,sericulture,apiculture,horticulture,floriculture and fisheries are some of the emerging areas.

■**BETTER NUTRITION** - Problems due to malnutrition and over nutrition is a biggest threat to the nation.The causes of malnutrotion,disorders and deficiency diseases,food adulteration,preservation techniques etc. should be emphasized.

■**SUSTAINABLE DEVELOPMENT AND PRESERVATION OF NATURAL RESOURCES** - The natural resources like water,soil,air,minerals and the like is to be made available for the present generation and for the future.The quality of these resources need be sustained for the next generation as well.

BLOOM'S TAXONOMY OF INSTRUCTIONAL OBJECTIVES

■ Benjamin S. Bloom(1956) of University of Chicago proposed the classification of Educational objectives.

■The objectives of all types of instruction are to bring behavioural changes.

■However there are different types of behavioural changes brought about.

■Some of them are concerned with changes in the thinking while others are related with emotion or feeling.

■Bloom and his associates tried to systematically organize these behavioural changes under different categories.

■A goal of Bloom's Taxonomy is to motivate educators to focus on all three domains,creating a more holistic form of education.

DOMAINS OF EDUCATIONAL ACTIVITIES/LEARNING

■According to Bloom all behavioural changes fall under three domains viz.,

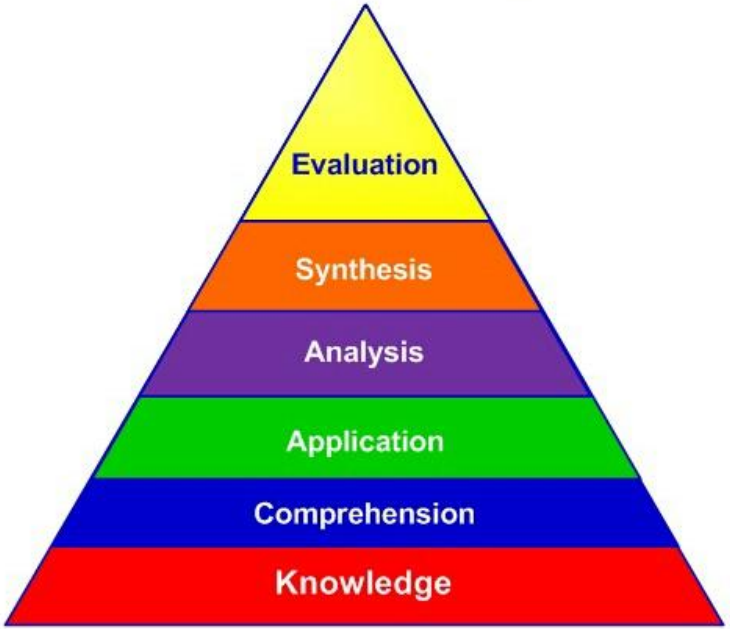
- ***Cognitive Domain***
- ***Affective Domain***
- ***Psychomotor Domain***

- Cognitive domain deals with thinking and information processing and is concerned with changes in the head region.

- Affective domain is related with attitudes,emotion and values.In other words affective domain deals with changes in the heart.

- Psychomotor domain indicates the motor changes in the individual.

COGNITIVE DOMAIN



Instructional Objectives under Cognitive Domain

- Cognitive domain includes objectives of teaching and learning related to intellectual abilities.
- It deals with thinking,knowing and problem solving.
- The individual is exposed to a variety of information and has to process it differently.
- Cognitive domain includes six categories and they are arranged in a hierarchical order.

Categories under Cognitive Domain

a) KNOWLEDGE

b) COMPREHENSION

c) APPLICATION

d) ANALYSIS

e) SYNTHESIS

f) EVALUATION

Categories...

Knowledge : It is the lowest level in the cognitive domain.Here information processing is only at superficial level.Knowledge involoves recalling and remembering facts,events or objects.

Comprehension : It is the next level in the order of hierarchy of cognitive domain.This denotes understanding of facts and ideas by organizing,comparing,translating,interpreting etc. Further it denotes,ability to summarize,interpret data in different ways and translation of graphs and and pictures in meaningful ways.

Categories...

Application :It refers to the ability to use learned material in new and concrete situations. This may include the application of such things as rules,methods,concepts,principles,laws and theories.Learning outcomes in this area require a higher level of understanding than those of comprehension.

Analysis :Analysis refers to the ability to break down material into meaningful components so that its organizational structure may be understood.This may include identification of parts,analysis of relationships between parts and recognition of the organizational principles.Learning outcomes here present a higher intellectual level than comprehension and application.

Categories...

Synthesis :**It refers to the ability to put parts together to form a new whole.This may involve the production of a unique communication,devising a plan of operations etc. The learning outcomes in this area show creative behaviour with major emphasis on production of a unique communication,production of a plan,proposed set of operations,derivation of a set of abstract relations etc.**

Evaluation : **Evaluation refers to the ability to judge the value of material for a given purpose.The judgements are based on definite criteria. Learning outcomes in this area are the highest in the cognitive hierarchy.**

PSYCHOMOTOR DOMAIN...

●Psychomotor domain includes those objectives which deal with neuro-muscular coordination.The level of the coordination influences speed,accuracy and grace of body movements.Dave's classification of psychomotor domain is as follows.

a)Imitation - It represents the early stage in learning a complex skill. It indicates an overt behaviour or a readiness to take a particular type of action. It includes repeating an act that has been demonstrated or explained. This is done through trial and error until an appropriate response is achieved.

PSYCHOMOTOR DOMAIN...

b)Manipulation - Here the individual continues to practice to the next level of perfection. It involves differentiating among various movements and selecting the proper one.

c)Precision : it refers to doing an act with accuracy and speed at a desired level of proficiency.

d)Articulation : it refers to coordinated series of actions,achieving harmony and internal consistency.

e)Naturalization : it refers to the level of perfection where action becomes natural without needing to think much about it.

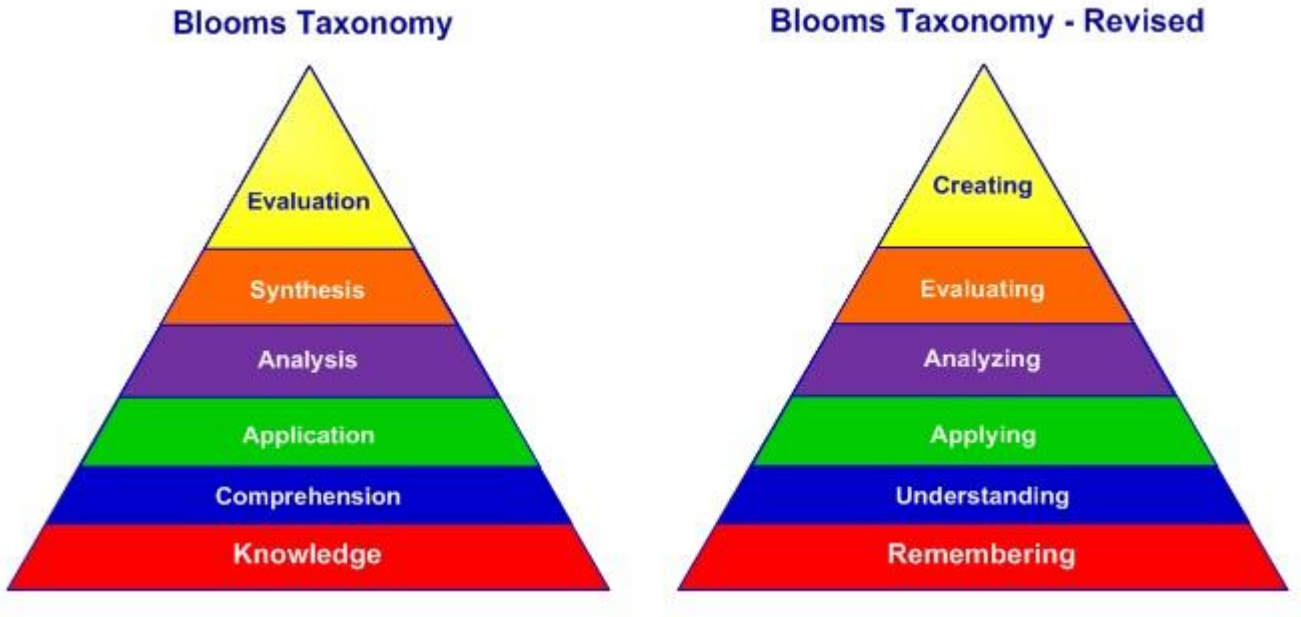
REVISED BLOOM'S TAXONOMY

During the 1990's, Lorin Anderson and a group of cognitive psychologists updated the Bloom's taxonomy. The revisions they made appear fairly minor, however, they do have significant impact on how people use the taxonomy. The changes can be divided into three categories: terminology, structure, and emphasis.

Changes to Terminology

- The revised version changes the names of each of the six levels. For example, the lowest level of the original, "knowledge" was renamed and classified as "remembering."
- It is also important to note the change from nouns to verbs to describe the different levels of the taxonomy.

- The names of the major cognitive process categories were changed to indicate action because thinking implies active engagements.

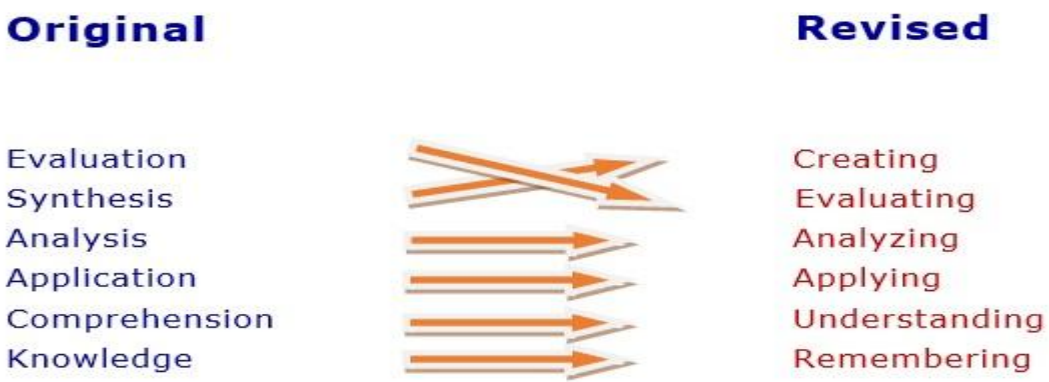


Changes to Structure

- The top two levels are essentially swapped from the old to the new version. This revised taxonomy moves the “evaluation” stage down a level and the highest element becomes “creating.”
- At the second to the highest level of the revised version, people defend, support, justify and evaluate their opinion on this information.
- And at the highest level, people generate new ideas, create a new product, or construct a new point of view.
- This change was made because the taxonomy is viewed as a hierarchy reflecting increasing complexity of thinking, and creative thinking (creating level) is considered a more complex form of thinking than critical thinking (evaluating level).
- A person can evaluate information without being creative, but creative thinking requires some level of evaluation or critical thinking (i.e. you need to evaluate the effectiveness of your new idea).

Changes in Emphasis

- The revision emphasizes the use of taxonomy as a tool for alignment of curriculum planning, instructional delivery, and assessment. Additionally, the revision is aimed at a broader audience.
- The original taxonomy was viewed as a tool best applied in the younger grades at school. The revised version is more universal and easily applicable at elementary, secondary, as well as adult training.



LEVELS	DESCRIPTION
Remembering	Retrieving, recognizing, and recalling relevant knowledge from long-term memory. This level is simply remembering or recalling previous learned information.
Understanding	Constructing meaning from oral, written, and graphic messages through interpreting, exemplifying, classifying, summarizing, inferring, comparing, and explaining. This is essentially demonstrating understanding of information by explaining ideas or concepts.
Applying	Carrying out or using a procedure through executing, or implementing. Basically, this is using the information in another familiar situation.

Analyzing	Breaking material into constituent parts, determining how the parts relate to one another and to an overall structure or purpose through differentiating, organizing, and attributing.
Evaluating	Making judgments based on criteria and standards through checking and critiquing. This includes justifying a decision or course of action.
Creating	Putting elements together to form a coherent or functional whole; reorganizing elements into a new pattern or structure through generating, planning, or producing. This includes generating new ideas, products, or ways of viewing things.

McCormack and Yager Taxonomy...

McCormack and Yager (1989) developed a new “Taxonomy for science Education” that broadens the view of science education beyond the two domains of content and processes. The domains which come under McCormack and Yager Taxonomy are

- Knowing and Understanding (Knowledge Domain
- Exploring and Discovering (Process Domain)
- Imaging and Creating (Creativity Domain)
- Using and Applying (Application Domain)

Domain I:Knowing & Understanding(Knowledge Domain)

Science aims to categorize the observable universe into manageable units for study and to describe physical and biological relationships. Ultimately, science aims to provide reasonable explanations for observed relationships.
The knowing and understanding domain includes

- Facts
- Concepts
- Laws (Principles)
- Existing hypotheses and theories being used by scientists.
- Science and societal issues.

Domain II- Exploring and Discovering(Process Domain)

This domain focuses on the use of the processes of science to learn how scientists think and work. Some processes of science are

- Observing and describing
- Classifying and organizing
- Measuring and charting
- Communicating and understanding communication of others.
- Predicting and inferring
- Hypothesizing & Hypothesis testing
- Identifying and controlling variables
- Interpreting data
- Constructing and using instruments, simple devices and physical models.

Domain III – Imaging and Creating (Creativity Domain)

Little formal attention has been given in science programs to development of student's imagination and creative thinking. Some human abilities important in this domain are

- Visualizing- producing mental images
- Combining objects and ideas in new ways
- Producing alternate or unusual uses for objects
- Solving problems and puzzles
- Fantasizing
- Pretending
- Dreaming
- Designing devices and machines
- Producing unusual ideas.

Domain IV – Using and Applying (Application Domain)

Some dimensions of this domain are:

- Seeing instances of scientific concepts in everyday life experiences.
- Applying learned science concepts and skills to everyday technological problems.
- Understanding scientific and technological principles involved in household technological devices.
- Using scientific processes in solving problems that occur in everyday life.
- Understanding and evaluating mass media reports of scientific developments.
- Making decisions related to personal health, nutrition and life style based on scientific knowledge.
- Integrating science with other subjects.

Domain V- Feeling and Valuing (Attitude Domain)

This domain includes;

- Developing positive attitudes towards science in general, science in school and science teachers.
- Developing positive attitudes towards oneself.
- Exploring human emotions.
- Developing sensitivity and respect for the feelings of other people.
- Expressing personal feelings in a constructive way.
- Making decisions about personal values.
- Making decisions about social and environmental issues.

Process skills in science at secondary stage:

13 process skills approved by UNESCO.

- Observing
- Classifying
- Measuring
- Communicating
- Using number relations
- Using spatial relations
- Inferring
- Predicting
- Making operational definitions
- Formulating hypothesis
- Identifying and controlling variables
- Interpreting data
- Experimenting.

Process skills...

1 Observing

IThrough observation the learner acquires knowledge through his sense organs. Observation should be objective and meaningful. Thus observations become an integral part of the method of science.

2 Classifying

IClassification means recognizing more and more properties (collected information) and ordering them. The skill of classification varies with age, standard, and mental growth of the learners.

Process skills...

3 Measuring

Measuring is a part of scientific investigation process. The skill of measuring can easily be practiced along with other skills rather than in isolation.

4 Communicating

- Acquisition of knowledge becomes fruitful only when the gathered knowledge is communicated to others.
- Different ways for communication - oral, written, etc.
- More effective , when it is done through the most scientific way and with supporting material.

Process Skill...

5.Using number relations

This process skill refers to the ability to illustrate the available data using mathematical language.
6 Using space time relationship

Ability to find out the relationships, between size, shape, distance, movement, speed, directions, time etc.

7 Inferring

Ability of drawing conclusions by analyzing the data properly.

Process Skills...

8 Predicting

- Ability to forecast what would happen in future
- It is based on data obtained so far
- In science, prediction is valid only with the support of scientific evidences.

The students of science should develop skill of prediction based on the science concepts acquired by them so far.

9 Making operational definitions.

- Define a scientific concept operationally,
- The definitions, he makes may reflect his experiences also.

Process Skills...

10 Formulating hypothesis

Hypothesis can be referred to as a temporary intellectual, tentative solution for a problem.

11. Interpreting data

Information becomes more meaningful when they throw light on new knowledge.

Skill of interpreting data is important to be developed among learners of science.

Process Skills

12. Controlling Variables

lwhen we plan an experiment, variables are to be controlled.

13 Experimenting

Experimenting is the integrated form of process skill, which includes

Skills like observing,measuring,controlling variables,interpreting data etc.

2 Mark Questions & Answer key words

1. Which are the five domains coming under McCormack and Yager classifications
2. List down process skills in science

4 Mark Short Essays & Value Points

1. Explain the Revised Blooms Taxonomy?

Unit 2
Pedagogic Analysis

Group members

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3. Aysha Nihala

Steps of pedagogic analysis

1. Major and minor concepts :

- First process of pedagogic analysis of a unit is the analysis of it into major concepts and component minor concepts.
- The number of major concepts included in a unit determines the depth of the unit.
- Eg: Unit - excretion in animals and man.

MAJOR CONCEPTS	MINOR CONCEPTS
● Excretion	● Excretion is an important life process. ● Excretory products in organism. ● Excretory organs.
● Excretion in lower animals	● Excretion in amoeba ● Excretion in earthworm ● Excretion in insects
● Excretion in man	● Kidney parts and functions. ● Formation of urea ● Nephrons ● Formation of urine
● Disorders of the kidney	● Stone formation ● Uremia ● Dialysis ● Kidney transplantation

2. Analysis of concept into attributes

- The teacher examined the analysed minor concepts one by one and analysed into its essential attributes.
- Eg: Concept--Respiration

● Respiration	● Takes in oxygen ● Release of energy from food materials. ● Give out carbon dioxide.

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

- Teacher lists the new terms in the unit and more important effort is to explain them.
- Eg. Tricuspid valve- valve with three lobes.

4. Identificayion of principles in the unit and analysis of these principles into component concepts and their relationships

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

Eg: Process : Urea formation in man.

Hierarchical steps -

- Unwanted amino acids brought to liver.
- Breaking amino acids into ammonia and carbohydrate.
- Ammonia combines with carbon dioxide to form urea.
- Urea taken by blood.

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

- Eg:

New learning material	Prerequisites
● Tubular reabsorption ● Portal circulation	● Active absorption ● Vein, villus, liver

7. Preparations of pre- diagnostic test items

- Analyses pre-requisites and to prepare pre-diagnostic test items.

8. Division of unit into hierarchical lessons

- Based on the logical, psychological relationships between the analysed material, sequence of lesson is determined.

9. Formation of stage appropriate behavioural objectives for the whole unit

- Eg: Name of the unit--life process

  Objectives - acquires knowledge of anabolism and catabolism

Realises the role of photosynthesis.
Compares nutrition in plants and animals.
Identifies the relationship between different life process.
Develops attitude towards blood donation.
Appreciates the role of plants in animals nutrition.
Develops attitude towards conservation of natural resources.

10. Preparation for the introductions for all the lessons of the unit

Eg: Name of the lesson--blood groups

Previous knowledge - blood of one person can be given to another person

Device of introduction - teacher narrates a road accident in which many people were seriously injured. All of them were taken to the medical college and admitted in casualty.

11 . Formulating stage appropriate learning experiences

Eg. Name of the unit : health and hygiene

Subject: Biology

- Discussion on unhygienic practices
- Discussion on hygienic food habits
- Collection/ preparation of picture/ charts showing ill effects of alcoholism,drug addiction and smoking
- Preparing immunization charts showing time schedule for children
- Discussion on different systems of medicine
- Preparing a list of commonly occuring diseases and classifying them under hereditory , communicable and non communicable
- Collectiing details of genetic engineering.

12. Developing improvisation/ aids/ charts for teaching the analysed units

Eg.

Working models of teach	Still models to teach
● Mechanism of respiration in man	● Structure of cell ● Bohr atom model ● Nuclear fission ● Binary fission ● Dicot steam
● Synaptic transmission ● Motor ● Pinhole camera ● Periscope	

13. Identifying environmental inputs that could enrich the learning of new materials

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

Eg. Topic

- Eye disorders in biology can be correlated with the topic lenses in physics
- Digestion in biology with catalyst , hydrolysis, chemical changes and physical changes in chemistry
- Fuels in chemistry with fossils in biology
- Nervous transmission in biology with chemical effect of electricity in physics.

15. Identifying historical anecdotes/ events and current events that could enrich the learning materials.

- Eg: Biographies of scientist(Archemedes, Mandel) contributions of scientist to mankind.
- Major historical events which influenced the new learning material (eg: Discovery of penicillin by Alaxander Flemming and First World War).
- Current event which struck the news headline(eg: Bhopal tragedy, Halley's comet, etc.) can be used for teaching certain concepts in science.

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

Eg:

- Osmosis- misconcept that one solution diffused into another.
- Dark reaction of photosynthesis- error that dark reaction takes place at night.

17. Listing situations of practicals/projects.

- The teacher selects the situation suitable for practicals and projects.
- For the selected practical instruction cards are to be prepared.

Eg :

Practicals	Projects
● Bell Jar experiment to show transpiration ● Expt. on detecting adulteration	● Harmful effects of smoking ● Waste disposal in a locality

18. Listing situations for outdoor activities

Eg: visiting a swimming pool to observe the apparent and actual depth.

Visiting to nursery to study vegetative techniques, etc.

19. Listing items of home assignments

- Different types of assignments are to be stalked out by the teacher.
- Eg:
- collection of clipping from newspapers, magazines related to health and hygiene.
- Attending to media programmes on means and methods of improving crops.

20. Preparation of unit plans and lesson plans

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 tests for skills

22. Preparation of pre-diagnostic test and post-diagnostic test

PADAGOGIC ANALYSIS OF UNIT

Name of the unit : Excretion in animals and man

Standard : 9

1. Analysis of the unit in to major concepts and minor concepts

Major concepts	Minor concepts
. Excretion an important life process	Exception - why? Excretory products Organisms produce different excretory products Excretory products are eliminated in different ways

2. Exertion and excretory system in lower animals	Excretion in amoeba Excretion in earthworm Excretion in insects
3. Excretion and excretory system in man	Excretory products in man Formation of urea Excretory organs of man
4. Kidney the developed excretory organ	Structure and associated parts Internal structure Ultra structure- nephron Urine formation Osmoregulation by kidney Role of hormone in osmoregulation
5. Disorders connected with kidney and treatment	Stone formation Nephritis,uremia Treatment of dialysis Treatment of kidney transplantation

Skin as an excretory organ	Structure of skin Excretion through skin Temperature regulation Skin care Disorders- moles,warts, pimples

2 . Analysis of concepts in to attributes

Excretion	Cell metabolism Metabolic toxic wastes Removal of toxic wastes
Excretory products	Nitrogen compounds Ammonia,urea,uric acid, creatinine Carbon dioxide and water
Need of excretion	Excess water- bye products of metabolism Excess carbon dioxide- increases acidity, fluctuations in acid base balance; disrupt metabolism Ammonia highly toxic to cell

Excretory organs	Organ structurally suited for expeltion of nitrogen waste. Different types has contractile vacuole, nephridia, malpigian tubule, kidney and skin.
Excretion in amoeba	Excretory product is ammonia. Contractile vacuole as excretory organ.
Excretion in earthworm	Excretory products in body cavity. Nephridia is the excretory organ. Remove through external openings.
Excretion in insects	Uric acid is the excretory product. Malphigian tubule is the excretory organ. Tubules open into alimentary canal

Formation of urea	Amino acid broken in to ammonia and carbo-hydrate in the liver Ammonia combines with carbon dioxide and forms urea
Kidney	Position- a pair on either side of vertebral column Dark brown,bean shaped Ureter from kidney opens in the urinary bladder Renal artery provide blood Renal vein carries blood from kidney
Internal structure of kidney	Outer - cortex (dark brown) Inner- medulla (pale red) Pyramid- conical lobes directed inwards Ureter- continuation of pelvis
Nephron	Structural functional unit of kidney A long coiled tube Bowman's capsule at one end Other end open s into collecting tubules Afferents and efferent vessels

Filtration or urine from blood	High pressure in glomerulus causes filtration of fluid Filtered into capsular space - glomerular filtrate Water, urea, glucose, amino acids are major components.
Osmoregulation	Water balance Influences dfference in osmotic pressure, amount of water lost, etc.
Role of hormones in water reabsorption	Pituitary hormone ADH. Control the permeability of Nephrons. Hormonal deficiency - greater water loss. Diabetes incipidus results.
Kidney stone	Deposition of calcium, uric acid. Lodged in pelvis, ureter, urinary bladder RBC in urine.
Failure of kidney	Serious condition - both kidneys stop functioning. Nitrogenous waste accumulates in body. Drowsiness, loss of appetite, vomiting.

Nephritis	Inflammation of the kidney Infections of throat,skin during childhood
Dialysis	Artificial kidney outside the body. Used as life saving technique during kidney failur Complicated and expensive
Renal transplantation	Transplantation of healthy kidney when kidney damaged Tissue compatibility Kidney of identical twins ideal
Skin- an excretory organ	Sweat glands open through sweat pore Sweat glands surrounded by a network of capillaries Sweat- 99 / water and the rest salts and nitrogenous materials
Role of skin in thermoregulation	Human body temperature constant Fat under skin insulator

Moles	Large hairy and raised Small flat and smooth Harmless and painless
Warts	Causative factor- virus Harmful when snatched Treatment
Pimples	Sex hormones, sebaceous glands Sebum,waste products and dust lead to infection Danger in squeezing Frequent face wash

3. identication of process in the unit

Excretion in amoeba Steps:	Difference in osmotic pressure in the cell Water enters in to the cytoplasm Water concentration in the cytoplasm high Contractile vacuole filled with excess water Nitrogenous waste dissolve Contractile vacuole move to the surface of the cell
Formation of urea Steps:	Excess amino acids brought to the liver Amino acids deaminated in to ammonia and carbohydrates Ammonia combines with carbon dioxide of the blood Urea is formed
Filtration of urine from blood Steps:	Blood reaches the glomerulous Glomerular pressure increases A fluid filtered from the blood It oozes in to the capsular space It passed through the tubular of nephron Essential component reabsorbed Remaining liquid from urine

Dialysis Steps:	Dialysis equipment connect with the patient Blood from artery pumped in to kidney chamber Blood passes through semipermeable membrane immersed in a constantly moving solution The waste products of the blood are filtered.

4- identifation of terms and explanation of meaning imbedded in them

Contractile vacuole	Vacuole that can contract and expand
Malphigian tubule	Named after the discoverer (malphigian)
Ureter	A duct that carries urine
Urinary bladder	Bladder that collect urine
Renal artery	Artery carrying blood to kidney
Renal vein	Vien carrying blood away from kidney
Pyramid s	Having the shape of pyramid
Bowman's capsule	Named after the scientist bowman
Capsular space	Space or cavity in the capsule
Collecting tubules	Tubule collecting urine from nephrons
Glomerular filtrate	The fluid formed of filtration by glomerulus
Renal colic	Pain connected with kidney
Nephritis	Inflammation of kidney

5 identification of pre- requisites needed for assimilating the new analysed concepts

Concepts	Pre- requisites
Excretion	Cell, metabolism
Excretory products	Organic compounds, nitrogenous compounds,acids,bases
Excretion in amoeba	Unicellular organism , hypertonic, vacuoles
Excretion in earthworm	Body cavity, vertebral column, artery, vein,aorta, inferior venacava
Nephron	Cell, blood vessels, capillaries
Glomerular filtration	Filtration, permeability, reabsorption active absorption

Osmoregulation	Osmotic pressure, hormone, pituitary gland, dehydration
Kidney stone	Uric acid, calcium salts, crystallization
Failure of kidney	Snake venom
Dialysis	Artery,vein, semipermeable membrane, osmosis
Renal transplantation	Donor , recipient,blood group s compatibility, tissue
Skin	Glands ,body temperature, evaporation

6 - preparation of pre-diagnostic test items

The structural and functional units of Livings things are called cell
What are the simple unit of organs?
Name the parts of a cell
Define metabolism
Distinguish between anabolism and catabolism
Give some eg for metabolic activities
What are organic compounds? Give eg
What are nitrogenous compounds? Name the nitrogenous nutrients

7- division of unit in to hierarchical lessons

Lessons

- Excretion- introduction
- Excretion in lower forms
- Kidney- structure
- Structure of nephron
- Excretory products in man
- Urine formation and osmoregulation
- Disorders of the kidney
- Treatment of kidney disorders
- Skin- an excretory organ
- Disorders of skin and skin care

8- formulation of stage appropriate behavioural objectives for the whole units

- Assimilate the concepts of the unit
- Compare the excretory system of lower and higher animals
- Identify the parts of excretory system
- Explain the structure and function of excretory organs
- Analyse the processes in the unit in to sequential steps
- Discriminate between closely related concepts in the unit
- Develop skills in observation, dissection and drawing diagrams
- Establish relationship between structure and function
- Suggest remedies for disorders of kidney and skin
- Develop interest in knowing more about dialysis and kidney transplantation

9- preparation of introduction for all the lessons of the unit

Name of the lesson: structure of kidney

Previous knowledge: kidney are the excretory organs of man

Device: teacher gives lecture on the working of a factory and focusses on the Products .the waste products of the factory are eliminated.using this analog.teacher.focuses on the Human body and it's metabolic waste products.

Teacher : why does the Human body eliminate these wastes?

Pupil: they are toxic

Teacher: how they are eliminated?

Pupil : through the excretory organs

Teacher: what are the Human excretory organs?

Pupil: kidney

Teacher: have you ever thought of the structure of kidney?

Teacher states the aim of the lesson

Today let us start “ structure of kidney”

10- formation of stage appropriate learning experiences

- Activities and experiments to show diffusion and osmosis
- Listing the metabolic waste of human or animal body.
- Study of urea formation through chart.
- Use of charts or models of anatomical aspects of excretory organs of lower organism.
- Discussing on excretion and excretory organs.
- Observing chart showing kidney and associated parts.
- Translating equations of urea formation.
- Examining the kidney of sheep.
- Observing model of Nephrons.
- Comparing excretion in insects and earthworm.
- Discussing the effect of hormone in water reabsorption.

- Study of urine formation through working models.
- Discussing on the role of skin in temperature regulation.
- Listing disorders of kidney, skin, etc.
- Discussing treatment of disorders of kidney.

11. Developing improvisation /aids/charts, etc. for teaching the analysed units

Working models - showing	Urine formation Osmoregulation in amoeba Dialysis
Still model showing	Kidney and associated parts Section of the kidney Nephrons Bowman’s capsules and glomerulus

Charts showing	Excretion in amoeba Nephridia in earthworm Malphigian tubule insects Kidney and associated parts Orithene cycle Section of the kidney Nephron and network of capillaries Dialysis unit

12- identifying environmental inputs that could enrich the learning of new materials

- Blood bank,blood transfusion
- Artificial limbs, plastic surgery
- Medical colleges and hospitals- dialysis unit
- Urinals
- Urea- chemical fertilizers
- FACT alwaye
- Decaying animal matter
- Transpiration in plants
- Diabetic patients
- Nephrologists and dermatologist
- T.F.M of toilet soap

13- identifying portions/topics/items from the curricular itself with which the learning materials could be linked or correlated

- Formulation of urea linked with chemical changes, Dr animation, organic compounds, factors influencing chemical reactions, catalyst etc.
- Kidney transplantation with blood compatibility and tissue compatibility
- Dialysis with hydrolysis, osmosis, diffusion, filtration, pumps,etc and acidity, alkalinity and neutralisation

14- identifying historical anecdotes/ events and current events that could enrich the learning of new materials

- Synthesis of urea from ammonium cyanate in 1828 by friesrich wholer
- Hippocrates (460-370 BC) remarked
- 1540- barber guild and guild of surgeons in England
- 1800- royal college of surgery in England
- 1960- pace maker in plant, artificial heart value
- 1967- south African Dr. Christian bernad made first heat transplantation

15- Listing most probable errors/difficulties/ misconceptions expected

Misconcept

- Artificial kidney/ dialysis unit structurally similar to kidney
- Diabetics mellitus and insipidus similar
- About the size and length of nephron
- Hypotonic and hypertonic solution
- Diffusion and osmosis
- Body surface and contractile vacuole of ameoba
- Coelom of earthworm and insects
- Glomerular filtration, glomerular pressure
- Active absorption and passive absorption

16- Listing suitation of practicals and projects

Practicals

- On osmosis using egg membrane and straw
- Effect of sea water on fresh water plants
- Dissect and display kidney of frog
- Dissect and display excretory organs of insects
- Dissect and display excretory organs of earthworm
- To show diffusion using water and kmno4

Projects

- A project on skin care and skin diseases among family members
- Collection of clippings from news papers,health magazines, health department pamphlets etc and preparation of album to show
- Disorders of the kidney
- Disorders of the skin

17- Listing suitations for outdoor activities

- Visiting a medical exhibition
- Visiting to a hospital having dialysis unit and observe how dialysis is done
- Visit to hospitals and collecting information about disorders of the kidney and renal transplantation
- Conduct a conscientisation programme on care of the skin

18- Listing items of home assignments

- Prepare a model of kidney and accessory organ's
- Draw the diagram of kidney, section of kidney and nephron
- Collect pamphlets from health department on care of the skin
- Collect information about the needs for kidney transplantation
- Prepare a report on the present controversy on kidney transplantation

19- preparation of different types of test items

(a) Multiple choice test items.

1 . excretory organ of grasshopper are

(Contractile vacuoles; malphigian tubules; nephridia)

2. Urea is formed in the ……

(Kidney; sweat gland; liver; lung)

3. During deamination in the liver…….formed

(Urea is; ammonia and co2 are; ammonia and amino Acids are; ammonia and carbohydrates)

(b) completion type test items

1. The osmoregulation structure in ameoba is called …….
2. The net work of capillaries of the nephron is called…….
3. The hormone…… regulate tubular reabsorption of water
4. One of the reason for dehydration is the malfunctioning of…… gland of the endocrine system
5. The segmental excretory organslllll of earthworm are called…….

(C) matching type test items

A	B
Nephron	Insects
Nephritis	Artificial kidney
Nephridia	Structural unit of kidney
Malphigian tubules	Earthworm
Dialysis	Ameoba
	Inflammation of kidney

(d) short answer type items

1 . How is urea formed in human body?

2. What is the functional significance of bowman's capsule?

3. What is ADH? What is it's function?

4. How do kidneys act as osmoregulators?

5. What is uremia? What are its symptoms?

ANALYSIS OF LEARNING OBJECTIVES/LEARNING OUTCOMES

Learning objecitives

- Alearning objectives should describe what student should know or able to do at the end of the course.
- Learning objective define learning outcomes and focus teaching .
- They help to clarify,organise and prioritise learning.

Major instructional objectives and specification

- Education is a process of bringing desirable behavioural changes in the individuals. It helps the individuals to identify their capabilities and potential.

- Classroom instructions and activities are the gate way of this process. Hence a teacher who deals with any subject should clearly plan his objectives of a particular instruction.

- Pre determined learning outcome of an instruction can be called as **instructional objectives. Or**
- Instructional objectives are the specific or immediate goal which is obtainable as a result of instruction or through classroom interaction.

- This is considered as the target of a teacher for a specific lesson or a topic

- Learning/ teaching outcomes of a classroom is designed by the instructional objectives.

- Without formulating instructional objectives instruction become aimless or target less as well as wastage of time and effort of both teachers and students.

- Instructional objectives should be planned to develop different domains of the learner

- NCERT has worked and adapted the blooms' taxonomy with some modification to suit with Indian situation. It clearly mentioned the cognitive, affective and psychomotor domain with their instructional objectives as well as specification.

- **Specifications** are the observable and measurable changes in the behavior of the learner. It tells us what the pupil will do or how they behave if they realize an objective

- Hence it is the behavioural changes showed by the students which can be observable and measurable by the teacher is called as behavioural objectives.

NCERT taxonomy of educational objective

Cognitive Domain	*Psychomotor Domain*	*Affective Domain*
Knowledge Comprehension Application	Skill	Appreciation Interest Attitude

- Every educational activity should be planned to develop all this domain of the learner .Hence these three domains are mutually interrelated and interdependent also.

- In **cognitive domain** NCERT listed the Knowledge, Comprehension and application. But it merged the analysis, synthesis and evaluation in to application objectives

- . Development of **psychomotor domain** intended by the development of skills related to the concerned subject. It may be drawing, locating, observing, experimentation, drama, and so on.

- **Affective domain** indicate the student appreciation of personalities, events, culture, tradition and good deeds of individuals etc. it also indicates the development of interest among the student to learn more related to subject by further reading, conducting interviews, preparation of album, bulletin boards, projects etc.

- Each domain has its own objective and each objective has its own specific objectives. Specific objectives are written generally in the form of action verb. To understand the writing of instructional objectives and specific objectives see the following example.

Instructional objectives and specific objectives

Domain	*Instructional objectives*	*Specific objectives*
Cognitive	Knowledge	Recalls, Recognize
	Comprehension	Translation, citing examples, identifies relationships, compares, interprets, detect errors, classifies, explains, discriminate etc
	Application	Applies, analyses, reasons, predict, suggest methods, formulate and test hypothesis, establish relationship, generalize, synthesis, justify, verifies, infers etc
Psychomotor	Skill	Prepare model, tools, project, album etc. Draw cartoon, map, chart, diagram etc Handle instruments appropriately Recording observation Conduct survey and interviews Present data in symbolic form Improvise model Conduct role play Acting in drill and drama Participation in literary and arts work
Affective	Appreciation	Express appreciation on valuable work, rich heritage, social activism etc. Show like and dislike of good and bad deeds prevailing in the society Participate in desirable social welfare programms
	Interest	Show attention, curiosity, motivation, desires etc Engage in further reading voluntarily Participate in social discussions Visit places of social, historical, political and geographically important. Collect coins, stamps, pictures etc Write articles, poems etc
	Attitude	Develop positive attitude towards values, personalities, organizations; work for social, environmental and human welfare etc. Develop negative attitude towards war, crimes, antisocial activities, extremism, communalism etc

Criteria for writing major instructional objectives

- The statement of objective should contain a non-action verb.
- The statement should indicate a worth while objective .
- The statement should be in the form of students achievement and not in the form of teachers intention.
- The objective should be written in the form of the achievment of every single learner and not in the form of achievement of a group learners.
- The statement of objective should contain only one ability to developed or achieved or modified.

Criteria for writing specification

- The statement of specification should contain an action verb.
- The statement of specification should contain two part.A modification part and content part.
- The other criteria which are applicable to statement of major instructional objectives are applicable here also,they are;
    - The statement of specification should indicate a worthwhile specification
    - The statement of specification should be in the form of learners achievement

- Statement of specification should be written in the form of the achievement of every single learner

- Specification should contain only one behaviour to be developed or modified

- Specification should reflect the general charateristics warranted,namely specificity,observability and measurability

Learning outcomes

- As per the rules of the RTE Act, the idea of learning outcomes was introduced in the Kerala School Curriculum 2013.
- Knowledge of learning outcomes is essential to plan the teaching learning process and evaluation,
- Learning outcomes are the aims to be achieved by the learner during the various stages of school education.
- Learning outcomes are the concepts/ideas and skillsvto be acquired by a learner during the various stages of school education.
- Learning outcomes are the result for a learner following a learning activity

Characteristics of learning outcomes

- The learning outcomes should contain concepts,processes,skills,values and attitudes
- Reflect broad conceptual knowledge and adaptive vocational and generic skills
- Reflect essential knowledge skills or attitudes
- Focus on results of the learning experiences
- The learning outcomes should be simple ,lucid , precise and logical.
- Learning outcomes should be connected to class room activities and the assessment approach.
- Learning outcomes should be ensured in all learner.
- This is essential for quality education.

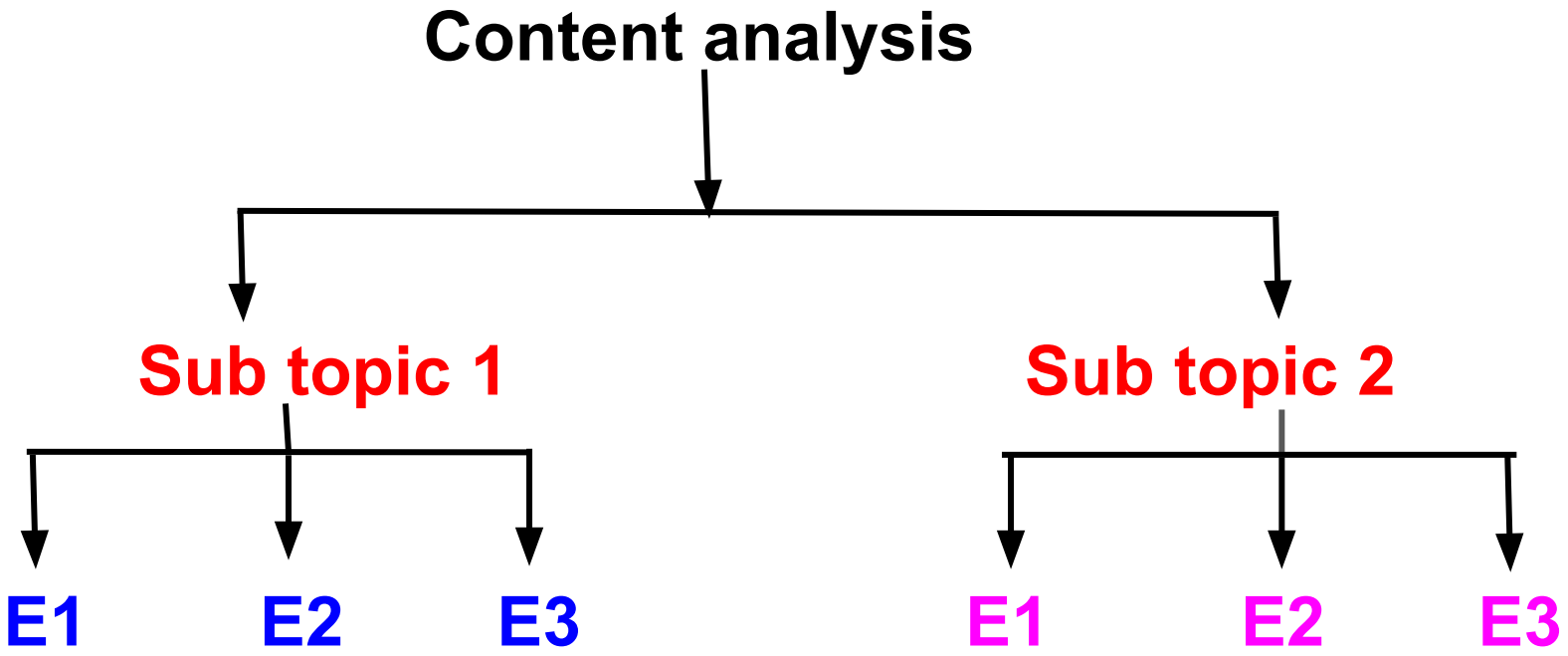
Content Analysis

Content analysis is breaking of content into its constituent parts. It help teacher to prepare himself to comprehend the general outline of contents. It helps in refining and limiting the content according to the needs and interest of pupil.It helps to understand important terms, concepts and ideas of lesson.

Steps of content analysis

a) Teacher has to delimit the content to be taught according to educational and learning needs of pupil.

b) Arrangement of analysed elements into some type of natural sequences.



Basic components of content analysis

Term:

It is a new word with scientific meaning.

Fact:

It is true simple statement which acts as a basis for formation of a new concept/ law/ principle.

It is unaltered statement of an object, events , phenomenon etc.

Concept:

Concept are abstract ideas that are generalised from facts specific relevant experiences.

According to Bruner a concept is mental imagery of a

category of objects or phenomena.

Eg ; parasite, acceleration etc

A concept has certain specific characteristics which describes the common features of the class . These characteristics are called **attributes.**

Certain attributes are prime and essential and they are called essential attributes. It convey the idea behind the concept and verbally put together can acquire form of a definition for the concept.

Principle:

It is a statement that establishes the relationship between two or more concepts

They are more complex ideas based on several concepts.

Processes:

They are series of task with a sequential order of occurrence.

Definition:

It is a statement of the meaning to be attached to a word of expression, operation or symbol.

Theory and law:

Broadly related principles that provide explanation for phenomena are known as theories.

They are used to explain, predict and relate various facts and phenomena.

Theories confirmed by various scientific experimentation by scientist over a period of time becomes laws

Unit 3
Planning of instruction

GROUP MEMBERS

1. Aysha Nihala
2. Aysha Nidhi
3. Anusha T. K
4. Ayana Sudheer

Objective Based Instruction

- An instructional objective is specific and immediate goal attainable as a result of instruction.
- It serves as a guide for both teaching and evaluation.
- The instruction which is aimed to attain the ore-determined objectives is known as objective Based Instruction.
- Taxonomy of instructional objectives are mainly classified under 3 domains: **Cognitive, Affective** and **Pyschomotor** domain.

Cognitive domain includes those objectives which deal with development of intellectual abilities related to aquisition, processing and mastery of knowledge.

Affective domain include those objectives which are concerned with desirable modifications in emotional patterns related to appreciation, ineterst, attitudes etc.

Pyschomotor domain includes development of manipulate or motor skills.

Description of major categories in cognitive domain

1. **Knowledge:** It is defined as remembering of previous learned material. It involve recal of wide range of material.It is lowest level of learning outcome in cognitive domain.
2. **Comprehension:** It is the ability to grasp meaning of material. This may be shown by translating material from one form to another.
3. **Application:** Ability to use learned material in new

concrete situations.

4. Analysis: Ability to break down material into its component parts.

5. Synthesis: Ability to out parts together to form a new whole.

6. Evaluation: Ability to judge the value of material for a given purpose

Description of major categories in affective domain

1. **Recieving**:It refers to students willingness to particular phenomena or stimuli (classroom activities, textbook etc) from a teaching stand point. It is concerned with getting, holding and directing the students attention.
2. **Responding:** It refers to active participation on part of students.
3. **Valuing:** It is concerned with worth or value a student attaches a particular object, phenomenon or behaviour.

4. Organisation: It is concerned with bringing together different values, resolving conflicts between them, and bringing the building of an internally consistent value system.

5. Characterisation by a value or value complex: The individual has a value for a sufficiently long time to be described as characteristics life stylem.

Description of the major categories in the pyschomotor domain

1. **Perception:** Concerned with use of sense organs to obtain cues that guide motor activity.
2. **Set:** Refers to readiness to take a particular type of action. Include mental set and emotional set.

3. Guided response: Concerned with early stages in learning a complex skill. Include imitation , trail and error.

4. Mechanism: Concerned with performance acts where the learned responses have become habitual and movements can be performed with some confidence and proficiency.

5. Complex Overt Response: Concerned with skillfull performance of motor acts that involve complex movement patterns.

6. Adaptation: Concerned with skill that are so well developed that the individual can modify movement patterns to fit special requirements or to meet a problem.

7. Origination: Creating new movement patterns to fit a particular situation.

Specific Objectives or Specification

An objective is a level of mental growth which the learner attains as a result of action and reaction related to kearining, which results in some changes in behaviour of learner, which is obesravable and measurable. This obesravable and measurable behavioural changes as a result of realising an objective is termed as **specific Objectives** or **specification.**

Advantages of Objectives based instructions.

1. Gives direction to teachers and helps them to take wise decision.

2. Helps curriculum planners to decide in advance the matter to be included in curriulum and scope to be envisaged regarding its transactions.
3. Objective aid in evaluation which in turn helps in refining objectives.
4.Effort if teacher is made more specific and concrete.
5. Make instruction - output oriented and hence helps to maximize the output of learning.

PLANNING OF INSTRUCTION

The success of any work depends on how thoroughly and systematically it is planned in advance.Careful planning is the key to effective instruction also.The success of a teacher for bringing about desirable changes in pupil depends on the systematic planning made by the teacher.

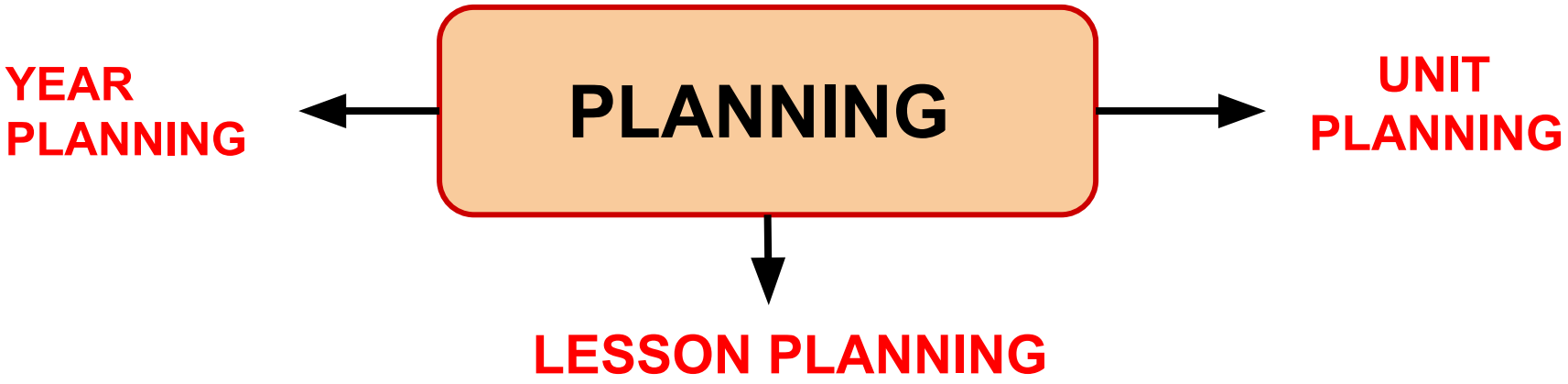
We should plan our teaching in order to….

- Obtain adequate coverage of subject.
- Impart quality instruction.
- Present the learning material in logical,systematic and effective way.
- Develop self confidence and pride in our work.
- Achieve economy in time,material and effort.

- Get opportunities to experiment with our own ideas.
- Attain orderliness and system in the instructional process.
- Achieve instructional objectives within the time limit.

TYPES OF PLANNING

Planning of instruction has to be done at various levels and for a variety of purposes.Certain types of planning to be made by teachers are:



1. YEAR PLANNING

- ★ Is a **long term planning** of the instructional process.
- ★ At the beginning of the academic year, all teachers make a plan for organizing the year's work,that provide the teachers with a design of the work to be executed during the year as a whole.
- ★ In this the total course material is divided into units and units into daily lessons.
- ★ Year plan should indicate the course purpose and objectives, course units,number of lessons,time schedule for dealing each unit,suggested methods of teaching,details of equipments and aids,their sources,etc…..

Why Year Planning?

- It makes evaluation easier as teachers are clear about the weightage given to objectives as well as content.
- It indicates the total weightage to be given for various instructional objectives and content'
- It points out the way of achieving the objectives,the methods and approaches to be adopted for each topic.
- It promotes professional co-operation and mutual exchange of ideas as the teachers of a school plan for the year jointly.
- It makes evaluation objective based.
- It gives suggestion to make teaching interesting,economic and effective.

FORMAT OF A YEAR PLAN

School: Standard:

Subject: Year:

Sl No	Units	Time required in periods	Month when planned to teach	Special methods if any	Preparations and aids necessary	Percentages of objectives to be achieved(%)						
						K	U	A	S	I	A	A

K- Knowledge U - Understanding A - Application S - Skill I- Interest

A- Attitude A- Appreciation

2. UNIT PLANNING

- ★ Unit planning is a middle stage between Year planning and Lesson planning.
- ★ A Unit is a large segment of subject matter having a common fabric of knowledge.
- ★ " The unit is an organised body of information and experience designed to effect significant outcomes for the learner." - **Wisley**
- ★ A well planned unit integrates a well knit set of related learning materials and learning activities to be taken for their effective transaction.
- ★ A unit infact is a 'compound' of lessons and not a 'mixture of lessons.
- ★ Unit planning improves structuralization of the course content and gives well planned direction for teaching-learning process,thereby making teaching more meaningful and goal oriented.

Characteristics of good Unit Plan

- It should be flexible so as to allow the above average pupils to go beyond the limits of the unit.
- The length of the unit should be such as to maintain the interest of the students upto the last.
- It should take into account the previous experiences and background of the pupils.
- Provides for field trips, projects,experiments, demonstration,etc…
- Provision for evaluation and follow up activities.
- The content should have close relationship that makes the unit a compact whole.
- Provides correlation to life and other subjects.
- Should satisfy some of the future needs of the pupils.

Steps in Unit Planning

1. **Content Analysis /Content Overview (the What of the unit):**
   The course content is analysed into terms, facts, concepts, principles, process, laws, generalisation, etc..This helps the teacher himself in achieving subject competency and in increasing his self confidence.
2. **Objectives and specification (the Why of the unit):**
   By going through the analysed content,the teacher should identify general and specific objectives of the unit.
3. **Learning activities (the How of the unit):**
   The teacher decides suitable activities that may be provided for students,

for providing objective-based learning experiences.Keeping in mind individual differences,the psychology of learning,the content and objectives suitable learning activities can be planned.This also include the specific teaching strategies and aids.

4. Testing Procedures (the How far and How good of the unit):

This involves the choice of suitable evaluation tools and the techniques through which the teacher can evaluate pupil achievement in terms of realisation of objectives.

FORMAT OF A UNIT PLAN

Subject: Class:

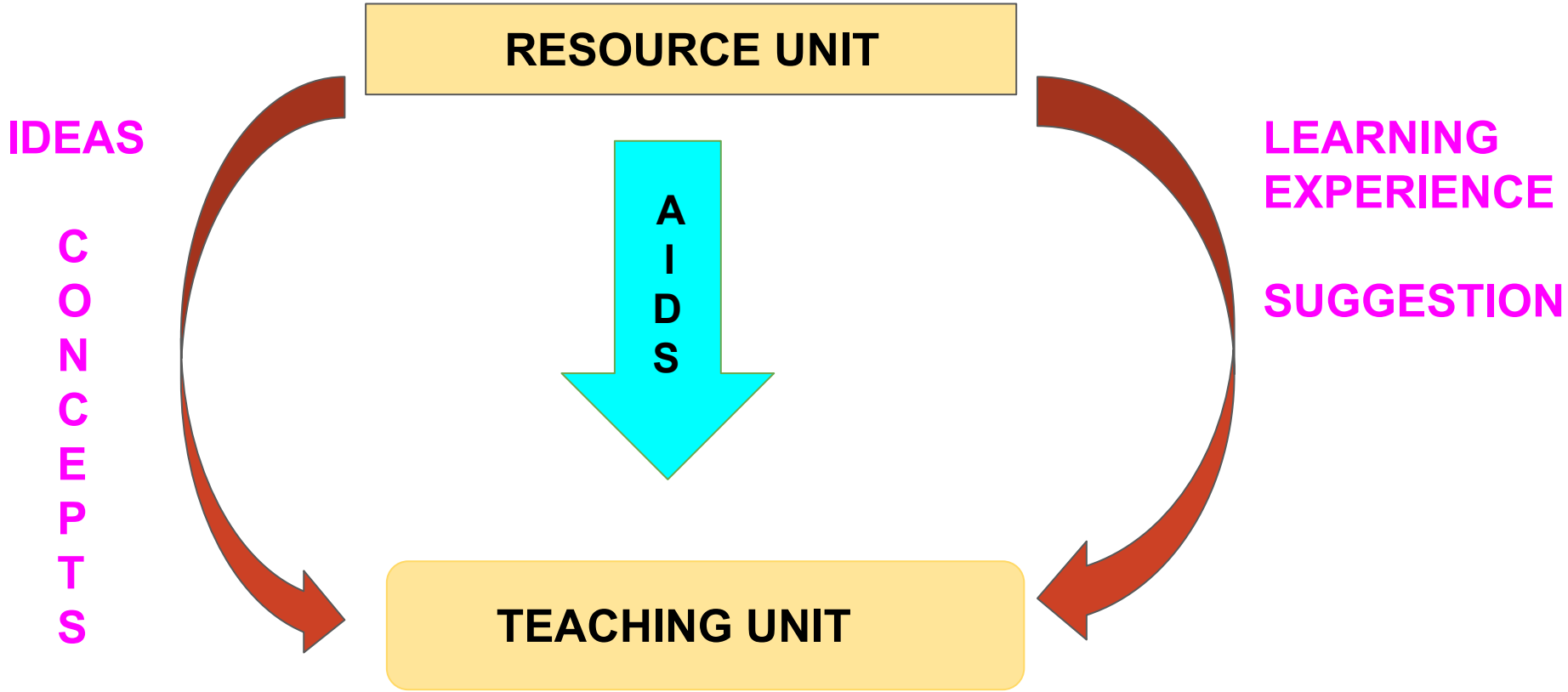
Name of Unit:

Major objectives of the Unit:

Sl.No	Concepts	Number of lessons required	Learning material	Methods to be used	Aids to be used	Evaluation

RESOURCE UNIT

- Collection of suggested teaching and learning activities organised upon a given unit.
- It is prepared by a group of teachers.
- It provides sources of materials from which teachers can select according to their needs.
- It is more comprehensive and differs from teaching units in purpose,scope and organisation.
- It acts as an excellent reference with respect to concepts,learning experience,objectives,outdoor activities,etc…….
- It is a broad reservoir of teaching content,activities and materials.


RESOURCE UNIT
IDEAS
CONCEPTS
AIDS
LEARNING EXPERIENCE
SUGGESTION
TEACHING UNIT

STEPS IN THE PREPARATION OF RESOURCE UNIT

1. **Title**
2. **Introduction**: Briefly indicate the social,scientific and pedagogical significance of the unit.
3. **General Objectives**: Briefly indicate the learning outcome by learning the curricular materials in the unit.Objectives are stated in terms of behavioral dimension.
4. **Content Analysis**: Most important step where content is analysed in depth and presented in the form of paragraphs.
5. **Activities**: General and specific methods of teaching,various activities meant for teachers and pupils are decided.Activities like project,group work field trips,collection, etc..are described.
6. **Teaching material and sources**: Materials for teacher's use and pupils

use are mentioned and listed.Audio visual materials for teaching,their sources and preparation are described,suggestions regarding reading materials for teachers and pupils are to be made.

7. Evaluation Procedures:The evaluation procedures suitable for the unit is described.This include classroom evaluation techniques,sample tests methods of evaluating pupils work.viz experiments, discussion,projects,etc....

8. Editing

3. LESSON PLANNING

LESSON: It is defined as a blueprint/ plan of action for transacting a compact portion of the curriculum,within the duration of a period.

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)**

★ It is the teacher's mental and emotional visualisation of classroom activities.

★ Good lesson planning is the key to successful teaching.

★ Lesson plan reflects the teacher's subject competency,theories of learning and resourcefulness in formulating learning activities.

Characteristics of a good Lesson Plan

- Content well analysed.
- Selection of appropriate teaching aids.
- Specific objectives need to be stated.
- Effective and sufficient blackboard work.
- Well thought out items for evaluating learning.
- Broad frame of methods of teaching.
- Suggestive list of activities for learners.
- Relevant motivational devices selected.
- Summarisation techniques.

Needs of Planning a Lesson

- Gives self-reliance and confidence to the teacher.
- It keeps the teacher to be systematic and orderly in the treatment of the subject matter.
- Ensures a proper connection of the new lesson with the previous lesson.
- Develops the reasoning,decision making and imagination of teacher.
- It ensures appropriate use of aids at the appropriate time.
- It ensures proper assignment according to the mental level of students.
- It prevents wastage of time,as every step has been planned.
- It ensures definite aim for each day's work in terms of learning materials as well as learning objectives.
- Helpful in developing specific teaching skills.
- Lesson is correlated with the social and physical environments of the

students and their interest is maintained throughout the lesson.

- Lesson Planning provides for an adequate checking of the outcomes of instruction.

HERBARTIAN APPROACH OF LESSON PLANNING

J.F. Herbart (1776-1841) and other educators after him have emphasised the following **six formal steps.**

1. **Preparation/ Introduction**
2. **Presentation**
3. **Comparison/Association**
4. **Generalisation/Systematisation**
5. **Application**
6. **Recapitulation**

1. PREPARATION

The teacher must prepare the students to receive new knowledge.This knowledge is to be linked with previous knowledge of the students.Teacher's skill lies in leading the pupils to see that their knowledge is incomplete and that new field to conquer lies before them.This can be done:

(i) By testing the previous knowledge of pupils, and introducing the lesson with explanation.

(ii) By asking questions that may reveal their ignorance, arouse interest and curiosity to learn the new matter.

(iii) Through the use of charts, maps,or pictures.

(iv) Through skillful conversation.

2. PRESENTATION

- ★ In this step,the pupils must get some new ideas and knowledge.
- ★ Both the teacher and pupils should be the active participants in the teaching-learning process.
- ★ The teacher should try to introduce everything from the students.
- ★ A sort of heuristic attitude should prevail the whole teaching.
- ★ Questioning is an important device of this step,other aids should also be used to make the lesson more interesting and comprehensive.
- ★ Blackboard summary should also be developed.

3. COMPARISON/ASSOCIATION

- ★ Learning becomes permanent when the new knowledge is associated with already known facts, concepts and experiences.

- ★ Some examples are given to the students and they are asked to observe carefully and compare them with other set of the examples and facts.
- ★ This step is important where some definition or some generalisations is to be induced from the students.
- ★ Comparison initiate reflective thinking which may result in inductive and analogical reasoning.
- ★ Probing questions help in process of comparison and association,which leads to classification and generalisation.

4. GENERALISATION/SYSTEMATISATION

- ★ With this step,the aim of the lesson is achieved.
- ★ This step involves reflective thinking because the whole knowledge learnt is to be systematised which leads to generalisation,formulae,rules etc….
- ★ This step completes the enquiry by providing the answer to the problems

with which it began.Thus, the students get a new knowledge which is ready for use.

5. APPLICATION

- ★ At this stage, the students make use of the acquired knowledge in familiar and unfamiliar situations.
- ★ It tests the validity of the generalisation arrived at by the pupils.
- ★ In this way, the new knowledge gained by the pupils will become permanent in the minds of the students.
- ★ This stage gives the learner an idea about the worth of the knowledge and makes the learning more clear and meaningful.

6. RECAPITULATION

- ★ In recapitulation,the knowledge,understanding,application and skill involved in the content area are tested/reviewed using appropriate test items.
- ★ This will help both the teacher and the student in evaluating the effectiveness of teaching and learning.

It should be noted that these Herbartian steps need not be followed strictly in teaching all types of lessons.In some cases one step of the Herbartian scheme may be stressed than other while in other cases some steps may be deleted completely.

FORMAT OF A LESSON PLAN

Name of teacher: Division:
Class: Duration:
Subject: Date:
Unit:
Topic:
1. Concepts:
2. Specific Objectives:
3. Teaching Aids:
4. Previous Knowledge:

5. Introduction:
6. Statement of Aim:
7. Presentation:

Content/Steps	Specifications	Learning Experiences	Evaluation
8. Recapitulation:			
9. Blackboard Summary: 10. Home Assignments:			

COMPARISON OF LESSON PLAN AND UNIT PLAN

LESSON PLAN	UNIT PLAN
• A daily action plan	• Extend over 8 to 12 periods depending on the subject matter.
• Content in logical,psychological order.	• Content grouped in terms of major and minor concepts.
• Part of the whole.	• Made up of several lesson plans.
• Actual test items given.	• Evaluation tools and techniques mentioned.
• Learning activities in detail.	• Learning activities just mentioned.

LESSON PLAN ON CONSTRUCTIVIST FORMAT

Constructivism

- Learner centered approach.
- Individual construct knowledge through individual and social activity.
- Learner contribute meaning to experiences.
- Knowledge is constructed by the learner.
- Constructivism in the classroom generally emphasizes active student participation in the learning process through experiment,problem solving and discussion.

Tips for structuring a constructivist lesson plan

- Designing a constructivist lesson plan is an intellectual challenge for the teachers as it involves many dimensions.It should be activity centered,learner centered and should cater to multiple intelligence and open ended thinking.
- Begin with a puzzling activity which create interests in the topic.
- Avoid prolonged activities that create chaos and confusion in the classroom.

- Avoid stereotyped and monotonous activities.
- A mix of groups and individual activities is desirable.
- Consolidate each activity with appropriate teacher intervention.
- Provide opportunities for creativity like poster design,sketching diagrams,roleplay etc.

Format of a constructivist lesson plan

Name of the teacher:	Class :
Name of the school :	Division:
Name of the subject:	Duration:
Name of the unit :	Strength:
Name of the topic :	Date :

- Learning outcomes
- Facts/concepts/understandings
- Process skills
- Values and attitudes
- Learning resources

- Previous knowledge
- Expected product
-

Learning activities	Evaluation/response
1. Introductory activity 2. Developmental activity 1 Consolidation 3. Developmental activity 2 Consolidation 4. Developmental activity 3 Consolidation 5. Concluding activity	

- Follow up activity
- Blackboard summary

Advantages

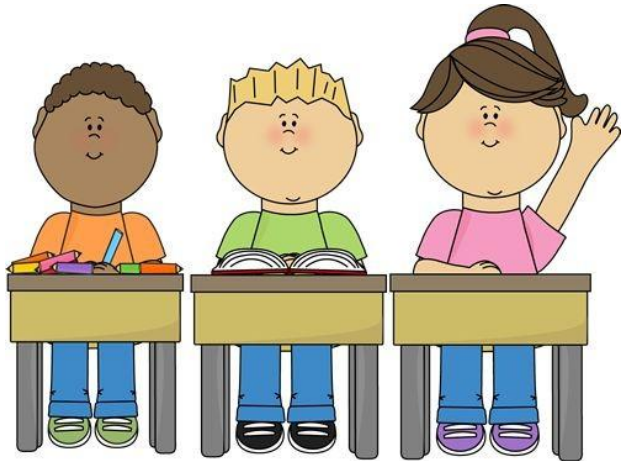
- Each person builds their own knowledge
- Focuses on student centered learning
- Teacher guides student in building their own understanding and knowledge
- Student actively engaged in their learning process

Disadvantages

- Lack of teacher preparation for constructivist classroom
- Difficult to break the cycle of those who have been taught in a classroom where they were expected to solely absorb information.

Lesson Plan in **Behaviourist Format**

- According to the tenets of behaviorism, learning occurs as the result of **environmental stimuli** that cause an obvious **change in behavior.**
- Behaviorists support the use of lesson plans for teaching purposes, as the best method for accomplishing learning objectives.



Preparing Students for learning..

- This is the first step.
- Stating an **objective** for the lesson is vital.
- **Motivate** students by explaining the relevance of the material
- State the **expected outcome** of the lesson.
- **Handouts** or other **visual aids** to prepare the student
- Using a "**hook**" to capture the imagination and interest of a student

Evaluating students…

- Key to the behaviorists' approach to learning is the idea of obvious proof that a student has learned the material presented
- **Evaluating progress** made by students is an essential part of any lesson plan.
- Through **classroom practice**, or a **question and answer session**, a teacher assesses how well the students have learned the material presented.
- By **checking student progress**, the teacher can back up and review material if needed, or move forward when certain elements of the subject matter are mastered by the majority of the students.

Final steps..

- Teacher finishes discussion about that subject matter to prepare for the next lesson.
- The **test or homework exercise** is graded and discussed.
- The lesson is reviewed as a **final wrap-up.**
- Last-minute questions are answered.
- Then the teacher introduces what will be covered next in class.

Merits	Demerits
● Provides strong arguments for the nurture side of the nature ● Approach has provided a number of practical applications and techniques to shape behaviour, Example : ***the use of rewards*** in education	● Ignores the mental processes that are involved in learning ● According to the behaviourist approach, people can only learn as a result of their experiences ● It rejects the possible role of biological factors in human behaviour, unlike the biological approach which considers nature and important factor. ● Students remain as passive learners, unlike humanistic psychologists who view humans as active agents - able to control and determine their own development.

2 Mark Questions & Answer key words

1. Describe the need for lesson planning?
2. Differentiate between Unit Plan and Year Plan.
3. Define objective Based evaluation.
4. Distinguishe objective and specifications.
5. What is objective Based Instruction?

4 Mark Short Essays & Value Points

1. Explain the steps of preparing a Resource Unit.
2. List out different types of resources for teaching Biological Science.
3. Explain a Resource Unit.
4. Distinguish between a Unit Plan and an Year Plan.
5. Explain the need and significance of planning in teaching.
6. Explain the tripolar relation between experiences and evaluation?

10 Mark Essays & Value Points

1. What is the role of planning in teaching?Briefly explain any one plan of instruction with its format.

Unit 4
Resources in Teaching Science

Group members

- Rohith
- Shfla
- Shahrbanu
- Shifa
- Smitha
- Sukrutha
- Thabshi
- Vaheeda

RESOURCE MATERIALS IN TEACHING SCIENCE

Definition: Learning resource materials are materials that are used for teaching a course.

Case study: A narrative resource describing a complex interaction of real life factors to help illustrate the impact and/or interactions of concepts and factors in depth.

1 .Workbook

- Workbook is a suppliment to the science text book.
- Usually the workbook for a particular standard is organized in the same order or sequence of that of the science text book.
- Fuctions of workbook : it includes
    - proforma or forms for reporting data
    - diagrams to be labelled
    - blank spaces to draw diagrams
    - suggestions for supplementary works
    -study guides for reading, assignments and self testing devices.

Advantages

1. It provides for systematic practice of skills.
2. Helps for the revision of topics included in the text book.
3. Makes learning more structured.

Limitations

1. It is highly organized and inflexible, hence gives no role for pupil to plan the study in his own way.
2. Workbook demands uniform outcomes of the students.
3. It doesn't cater to individual differences.

2.Teacher's handbook or guide book for teachers

It is a ready reference material for the teachers to supplement class room teaching.It contains :

- Summaries of chapters in the textbook.
- Conceptual development of the topic.
- Statement of instrumental objectives.
- Explanation of significant terms,facts,and principles.
- Additional learning experiences to be provided.
- Precautions to be taken while demonstrations and experiments.

- Guidelines to evaluation and experiments.
- Suggested reading materials for teachers and pupils.

Advantages

- It equips the teacher with sufficient theoretical knowledge about what is to be taught.
- The teacher can choose appropriate learning experiences from different alternatives.
- It helps the teacher to construct test items.
- It makes the work of the teacher more easy.

3.Supplementary reader

It is a pamphlet,brochure, journal or an illustrated text book meant for light reading.

It introduces the student to new materials and meet their varied needs and their interests.

It also helps to understand science in a broader perspective.

It helps to utilise the leisure time of the learner in an enterprising way.

It provides insight into social significance to scientific issues.

4.Audio visual aids

These aresensory objects or images which initiate or stimulate and reinforce learning.It helps the teacher in providing suitable learning experiences to the learners in the form of audio and video perceptions.

Importance of audio visual aids

- Improves motivation for learning.
- Provides freshness and variety.
- Caters to students of various abilities.
- Widen the range of experience.

- Improve the effectiveness of classroom teaching.
- Saves energy and time of the teacher and students.

Classification of audio visual aids

1. Projected aids **:**

Films, film strips, slides, opaque projections, smart board,etc.

2. Graphic aids **:**

Photographs, pictures, flash cards, posters, charts,graphs,etc.

3. Non projected aids :

Display boards : black board, flannel board, magnetic board, Peg board,flannel board.

3D aids : models,objects,specimens,mock ups,diorama,puppets

Audio aids : radio, audio clips, podcasts.

***4. Activity aids* :**

experiments, field trips, demonstrations, teaching machines, drama, teaching machines, programmed instructions,computer assisted instructions.

5. Improvised aids

Improvised aids or improvised instructional materials are those teaching and learning materials produced using locally available resources with the help of experts.

Innovation in education is the act of producing new things that are important and that will enhance teaching and learning effectively.

Merits of improvised aids

- It is economical.
- Upholds the dignity of labour.
- Develops skills.
- Develops clear understanding of underlying principles.
- Ensures neuromuscular coordination.
- Promotes self sufficiency.

5.Science Laboratory

In science classes, laboratory work supplements the classroom activities.Experiments and lab works clarifies the theoretical sessions dealt in classrooms.

Practical works develop curiosity, power of observation, measurement skills, inferencing skills, etc.

Features of a good science laboratory

- Location of the laboratory should be preferably on the ground floor.
- There should be proper ventilation and lighting.
- There should be provision for sufficient water, gas and electruc points.
- There should be enough storage facilities.
- Demonstration table and black board.
- Working tables and shelves for students.

TEACHING AIDS IN SCIENCE

- The teacher uses various media in order to supplement the different teaching methods.Such medias are collectively known as **Audio Visual Aids.**
- Audio visual aids are classified into,
  1-Projected Aids
  2-Non-projected Aids
  3-Activity Aids

PROJECTED AIDS

- Items to be perceived as projected on screen using mechanical devices.

  Eg: Film projected on a wide screen using a film projector.

  Projected Aids:

  1- Overhead projector (OHP)
  2- Slide projector
  3- Film strip projector
  4- LCD projector

1-Overhead Projector (OHP)

- OHP is a widely used medium of instruction.
- Machine designed to project an image, text, and drawing onto small screen or whiteboard.
- Projected image is behind and over the head of the speaker (OHP).
- It is usually faced in front of the classroom, therefor the teacher can still face his/her students.
- Transparencies can be prepared through a variety of simple, inexpensive methods.

2- Slide projector

- An instrument equipped with a powerful light source & carrier for holding slides of suitable size.
- Most slide projectors use drums or catridges in which many slides can be loaded in proper sequence in advance.
- It is a time saving aid.
- Teacher can prepare slides and can be used during the class time.
- Any picture or diagram can be developed as a slide.

3- Film strip projector

- A film strip is a piece of non-inflammable safety film, 35mm wide.
- One strip may contain 10 to 50 picture frames.
- The pictures may be in colour or in black and white.
- The film strips are projected by a film strip projector

4- LCD projector

- LCD (Liquid Crystal Display Projector).
- Most advanced and sophisticated projecting aid.

- It is used to present a topic in the classroom or in front of a large audience.
- Can demonstrate the real world situations and simulations in the classroom in a theatre like atmosphere.
- We can present a topic or subject matter by using computer made slides, graphics, pictures, video clips and movies.
- We can replace all other projected and non projected aid with only a single LCD projector and computer system.

NON-PROJECTED AIDS

- Non-Muslims projected aids are classified into 4 types

1) **Graphic aids**
2) **Display boards**
3) **Three-dimensional aids**
4) **Audio aids**

1- Graphic Aids

1] Graphs 2] Diagrams (Drawings) 3] Charts

1] Graphs

a) Line graphs
b) Bar graphs
c) Circle or pie graphs
d) Pictorial graphs

2] Diagrams (drawings)

a) Outline drawings
b) Mass drawings
c) Analytical drawings
d) Generalised drawings
e) Graphical drawings

3] Charts

a) outline and tabular charts
b) Flow, organisation or process charts
c) Tree charts

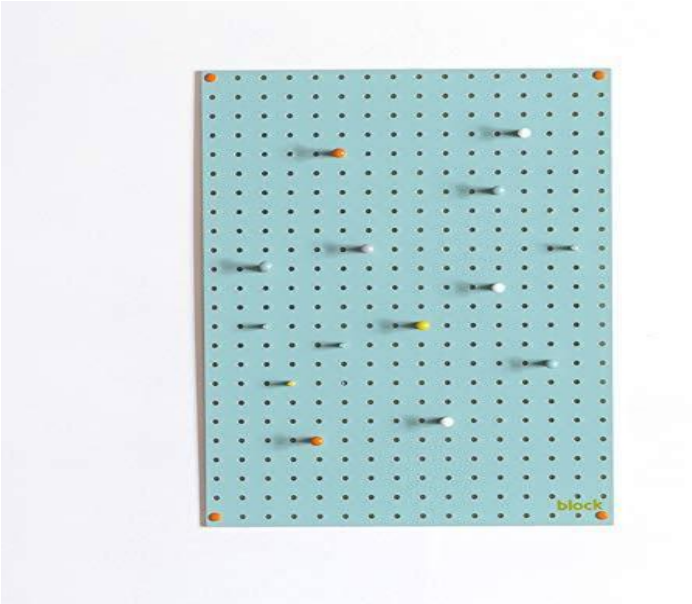
2- Display boards

a) **Black board**
b) **Roll-up chalk board :**which can be conveniently rolled up.
Usually made of thick rexin cloth.
The charts and pictures can be drawn on it well in advance.

C) Bulletin board : Suitable place for the display of all kinds of creative work of pupils such as paintings, articles, cartoons, cut outs etc.

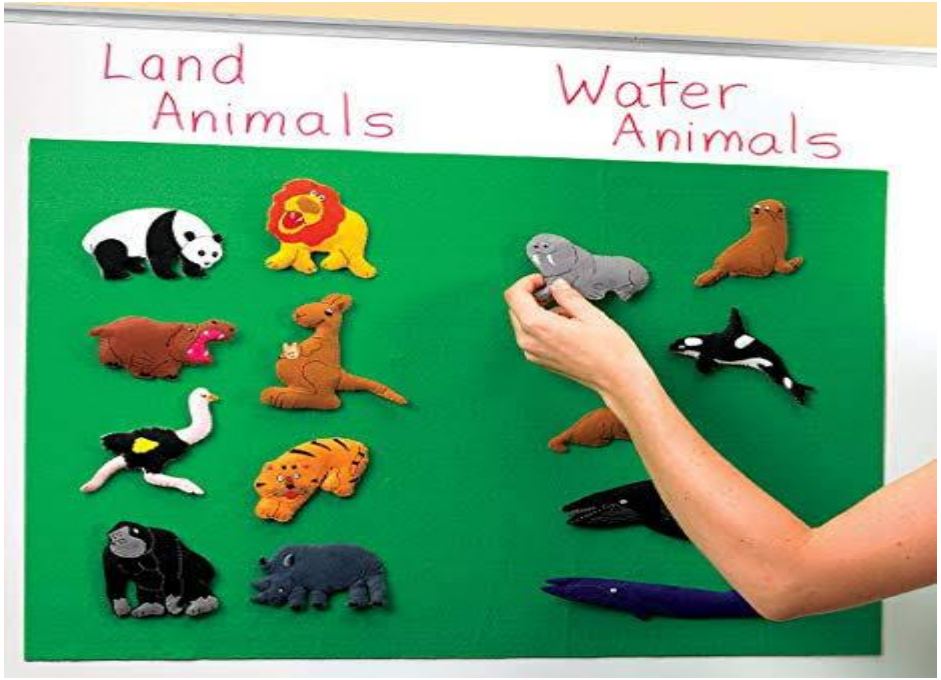
Also a suitable place for posting announcement and assignments.

d) Peg board :



e) Hook and loop board: To suspend heavy 3D objects or flat materials.

f) Flannel board: Only flat and light weight teaching materials can be used on flannel board.



g) Magnetic board : Useful to show the relative movement of elements of a visual.

h) Plastigragh board: Any smooth polished surface like a glass plate or rigid plastic sheet may serve as a plastigraph board.

I) Marker board: Large sheet of white plastic board with a surface texture suitable for writing or drawing with markers or crayons.

3- Three- Dimensional aids

1] Models: Models are concrete representation of objects.

Models can be classified as,

a) **Scale models:** In the teaching of physiology, physics etc. exact scale models of organs/equipments are used.
b) **Simplified models**
c) **Cross sectional models**
d) **Working models**

2] Objects

3] Specimen

4] Moke-ups: Is an imitation of the real process.

5] Diorama: A diorama is a three-dimensional scene in depth, incorporating a group of modelled objects and figures in a natural setting.

6] Puppets: Most commonly used puppets are hand puppets, glove, finger puppets, rod puppets, string puppets and shadow puppets.

4-Audio aids

1] Radio : Powerful medium for mass communication.

2] Tape Recorder :

- Very effective aid for classroom instruction.
- The recorded tapes consisting of lessons handled by eminent teachers on any subject can be played in the classroom.

ACTIVITY AIDS

1) **Field Trips and Excursions**
2) **Exhibition**
3) **Demonstration**
4) **Dramatization**
5) **Museum**
6) **Planetarium**
7) **Live Corner:**

a) **Aquarium -** Represent an aquatic environment.
b) **Terrarium -** Represents a complete land environment.
c) **Vivarium -** Raising plants or small animals usually for research and observations.

8) Science kits:

- Science kits are mini mobile laboratories.
- They are small portable boxes containing some apparatus and chemicals.
- It provides opportunity for practical activities.
- It develops expirimemntal & manipulative skills.
- It develops skills related to the scientific method.

9) Nature study garden:

- It helps children to develop skill in observation.
- To study living and non-living components of an ecosystem.

10) Computer CD's:

- Computer CD's are document storage devices used in computer information system.
- It can store all types of data such as text, graphics, voice (audio) images, and movies (video).

11) Interactive CD Rooms :

- CD Rooms (Computer disc read only memory) are the storage media used to record, retrieve, read and replay the digitally formated content of programmes and packages.
- The content or topic to be taught are programmed and stored in the CD's with multimedia features and effect.

12) Power point presentation :

- Presentation softwares are used to present an idea,topic,message, lecture, information etc. on a subject, in front of an audience using computer system and LCD projector.
- The basic components provided by PowerPoint to develop slides are,

a) Text data
b) Pictures
c) Audio files
d) Moving images
e) Graphics and special effects
f) Film movies

IMPROVISATION

- Improvisation is the designing and production of ordinary laboratory apparatus and other instructional material from simple articles found in our surroundings.

Values of Improvisation :

a) Save money
b) Develops useful habits and dignity of labour
c) Develops skills
d) Hand-head co-ordination

e) Utilisation of leisure

f) Joy of creation

g) Scientific thinking and independence of thought

h) It makes the school self sufficient

I) Confidence to face problems

Science Laboratory

- It is the central to science instruction.

(a) Laboratory work.

Objectives of laboratory work:-

- Making abstract scientific understanding concrete.
- Development of scientific concepts and principles.
- Development of scientific skills, attitudes, interests and appreciation.
- Training in scientific method.
- Awakening the maintenance of curiosity in the environment.

(b) Administration of Laboratory work

Different aspects of administering laboratory work:-

1. Organizing and conducting practical work.
   - There should be coordination of theoretical and practical work.
   - Experiments should neither be too difficult nor too easy.
   - Pupil’s work should be keenly observed by the teacher.
2. Students should be made to form appropriate groups.
3. Preparation is required for individual and group working.
4. Laboratory rules and discipline should be laid down.
5. Instructions to pupil's are to be specific and clear.
6. Pupil's record and observation book are to be properly maintained.

(c) Features of a good science laboratory.

Characteristics of a good science laboratory:-

- It must be spacious.
- It must be quite conductive for hard work.
- It's plan must provide elements of flexibility for effective teacher demonstration.
- It must provide certain facilities for objectification.
- It must have water, gas and electric points wherever they are needed.
- It must have ample storage facilities for equipment.
- It must have an emergency exit if it is not situated on the ground floor.

(d) Selection of Apparatus and Chemicals.

Following factors should be considered for selection of apparatus and chemicals:-

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

(e) Registers maintained in the laboratory

1: Permanent stock register:-Articles of metals, wood or of permanent nature, which are not liable to be broken are to be entered.

Eg:-wooden stand, test tube rack,magnets,microscope, telescope. etc..

2:Stock register of breakables:-Articles of glassware like flask,beaker,funnel,buret,.

3:- Stock register of consumables:- Chemicals and other fluids which are to be consumed are entered in this register.

4:- Order register:-It includes a record of orders sent for the purchase of apparatus and chemicals.

5:- Requirement register:- here , teacher should note down the requirements which he remembers at times.

(f) Laboratory Rules and Disciplines

Suggestions for maintenance of discipline in the laboratory:-

- No pupil should be allowed to enter the laboratory in the absence of teacher.
- Every student should have a place assigned to him for his experiment.
- Pupils should perform only those experiments assigned by the teacher.
- Any breakage of apparatus must be reported to the teacher.
- Laboratory wastes should be deposited in waste boxes.
- Bottles taken from the shelf should be replaced immediately.
- A scientific atmosphere should be kept up in the laboratory.

Science laboratory and its organization

A library is the storehouse of knowledge.

(a) science library.

- Secondary Education Commission- every school must have subject library under the charge of subject teachers.

(b) Objectives of organizing a Science Library.

- To help teachers and students update scientific knowledge.
- To facilitate self studies and learning by learn.
- To enrich curricular experience.

- To enable pupils participate in discussion band project work meaningfully.
- To create interest in science as a subject of study.
- To develop the habit of reading as a useful leisure time activity.

(c)Important Library Resources for Science.

1.Book resources.

- **Text books.**
- **Booklets**
- **Literary materials**
- **Reference materials.**

2. Non book resources.

- Periodicals
- Pamphlets
- News papers.

(f) Making science library popular.

- Encourage to read popular journals and books.
- Provision for library work in the timetable.
- Encourage pupils to start science magazines.
- Giving assignments and projects.

Co-Curricular activities in science

- Education is not confined to classroom teaching. For the total development of the learner ,we must go beyond our school walls into the community as students and as working participants.
- Here's a look at the different co curricular activities to enhance the learning experiences in science teaching.

➔ Field trip and excursion
➔ Study tour
➔ Science club
➔ Eco / Nature club
➔ Science fair/ exhibition
➔ Science debates
➔ Nature rambling
➔ Nature calendar

1. Field trip and excursion

- The term Field trips and excursion often used interchangebly.
- Field trip is an outdoor lesson in action.
- The chief purpose of field trips is to give students first hand experiences that can’t be had in the classroom.
- Many objects and phenomenon can be best studied in their natural setting.

❑ Values of field trips and excursion

- Gives first hand experience
- Supplement and enriches classroom teaching
- Creates spirit of scientific enquiry
- Stimulate interest in nature and learning
- Correlates school life with outside world
- Gives relief from routine class work

❑ Organising a field trip

Following are the stages involved in the completion of a field trip.

- A felt need: the purpose of the journey should be clear to the students
- Selecting a suitable place and seccuring permission from the resource centre
- Listing out specific objectives
- Planning and preparation
- Conducting the actual field trip or excursion
- Consolidating the result and taking up the followup activities

2. Study tour

- Study tour is an exposure trip to a place of educational or historical imporance.
- It provide the situations to leatn and aquinted with the process of organising and understanding the environment around.
- It provide an opportunity to the students for community living which is indeed a powerful means of education, entertainment and petsonality development.
- Study tour is a trip with more than educational objectives and it requires extensive planning and preparation where as field tripis a short visit to a local area with a specific purpose

❑ Advantges of study tour

- It provide direct and contrived experiences to the learners
- It gives an opportunity to observe real life situation
- It enables the students to retain thelearning longer and to make the topic more interesting.
- It avoids monotony of regular classroom
- An educational tour offers the perfect informal set-up for lively discussions.
- An educational travel empowers them with a new and enhanced perspective to look at things and develops them into considerate personalities, well aware of the world issues at large and in depth
- The experience of travel makes them independent individuals and helps establish lifelong values and priorities.

3. Science club

- Science learning become joyful through the activities of science club
- “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 may be called a **science club**”

❑ Objectives of science club

- To develop general interest in science
- To inculcate scientific attitudes and provide opportunities for training in scientific method
- To develop habits of exploration and creative facultie
- To make the students and public science minded
- To provide challenging opportunities for the gifted
- To keep the students in touch with the advances in sciences

❑ Organisation of science club

- Tobegin with science teachers can explain the importance and benefits of organizing science club
- Tis discusssion may be followed by general meein in which office bearers are chosen
- Every science club have its own constitution
- Theres should be a general body anf an executive body with principal as the patron and science teacher should be the sponsors.
- Executive members such as president, vice president, secretary, treasurer etc are chosen from among the students
- There should be regular meetings, discussion, planning and feedback etc.

Activities of science club

- Organizing lectures, debates,, seminars and symposia etc
- Participating in science fairs
- Arranging visit to places of scientific interest
- Rendering school services in health and sanitation
- Making a first aid squad
- Conducting visual programs of scientific interest
- Celebrating birthdays of eminent scientists
- Planting and growing trees and plants

4. Eco club/ nature club

- An eco club in a school could be visualised as a coordinated and voluntary effect of a group of students woking for the understanding and protection of the environment
- Eco clubs aims to:
- Develop, maintain and enhance pupils interest in environment
- Make environmental studies meaning ful and enjoyable
- supplement knowledge obtained through classroom teachings
- Provide leisure time activities
- Bring out better relationship with environment

5. Science fair and exhibition

- It's purely an educative activity carried out in systematic manner entirely for the advancement of science
- Science fairs provides an opportunity for the display of valuable work done in the science club by the students and sponsors
- In fairs, it may exhibit demonstrations, talks etc made by experts, film shows on scientific topics, debates, sscientific plays etc.
- Scientific fairs provide opportunity for detecting and cultivating scientific talents
- Values like vocational, ethical, aesthetic, cultural, disciplnary are realised in the cconduct of an exhibition in varying degrees

Organization of a science fair

1. The following factors are to ne considered while organizing science fairs and exhibition.

- Planning : during planning the following aspects should be concerned
  Objective of the fair
- Scope of the fair
- Produced
- Financing
- Location, ttime and duration
- Other factors and faculties, nnecessary arrangements, control etc.

- Distribution of work : duties should be assigned to individuals ang groups. Various committees are to be constituted
- Execution :decided programs are systematically put into action
- Judging : the fair should be judged bt an expert team
- 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.

Purpose and values of science fair

- To stimulate and encourage interest un science
- To focus attention in science experiences in the schools
- To provide situation for scientific hobbies
- To recognized and encourage scientific talents
- To make public science minded
- To provide opportunity for display of talents through exhibits
- To stimulate greater interest in scientific investigation over the routine class work
- Science fairs have psychological, intellectual, social and educational values.

6. Science debates

- Science debates are creative and collective process of all related facts about a scientific topics

  Advantages
- It enables the students to enrich their knowledge through healthy dialogues
- The skills of critical thinking, positive interaction etc can be developed
- It avoid stage fear of students
- It enhances substantiating abilities of yhe learner
- Students become creative and also promotes leadership qualities

7. Nature rambling

- Taking students into the nature for observation is very useful techniques in environmental education.
- During nature walk the learner detects his perspective powers towards all elements in nature
- Observation of the natural wonders helps the learners to gain first hand experiences, which leads to deeper insight into various natural phenomena.

8. Nature calendar

- Nature calendar is an yearly record of daily observations made by pupil of nature -plants, animals, natural phenomenon etc.
- It will be more interesting to pupil to observe plants, animals, weather, sky, stars, rivers, landscapes, etc
- Pupil get training in general and empirical observation through nature calender.
- Class room discussion on nature calendar can be conducted after every season.

Unit 5
Evaluation in Science

- **Group members**
  - Rohith
  - Shafla
  - Shaharbanu
  - Shifa
  - Smitha
  - Sukrutha
  - Thabshi
  - Vaheeda

EVALUATION

- **Evaluation is the process of assigning value to something on the basis of specific pre-determined goals**
- **Evaluation based on pre-determined objectives - Objective based evaluation**
- **Educational evaluation is possible only if the instructional objectives are determined earlier**

Functions of Evaluation

- Evaluation enhances the quality of teaching
- Evaluation helps in clarifying the objectives
- Evaluation motivates learner
- Guidance can be given on the basis of evaluation
- Evaluation can help in bringing changes in the curriculum
- To improve student personality
- To test the achievement of pupil

Purpose of Evaluation

- It helps for promotion, classification,selection and certification
- It helps to assign proper marks or grades for placement of students
- It motivate students for better learning
- It diagnose strengths and weaknesses of students
- To locate areas where remedial measures are needed
- It judges effectiveness of instruction
- It 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
- It helps in selecting the students for admission in different subjects and different levels

Types of Evaluation

1. Diagnostic Evaluation

- This type of evaluation is concerned with finding out the reasons for student's persistent or recurring learning difficulties that cannot be resolved by standard corrective measures or formative evaluation
- The aim of diagnostic evaluation is to find out the causes of learning problems band plan to take remedial actions

2. Formative Evaluation

- Evaluates a program during development in order to make early improvement
- Begins during project development and continuous throughout the life of the project
- A quality control method to improve the effectiveness
- Intent to assess ongoing project activities and provide information to monitor and improve project
- Become a major technique for ensuring quality and consistency of improvement process

3. Summative Evaluation

- Conducted after the completion of the program design
- Most objective way to document the strength and weakness
- Involves gathering information on adequacy and using this information to make decisions about utilization
- Gives a general picture of the level of attainment,again in terms of broader instructional objectives anticipated
- Looks at the result
- Annual examination is summative in nature

4. Confirmative Evaluation

- It is the process of collecting, examining and interpreting data and information in order to determine the continuing competence of learners or the continuing effectiveness of instructional materials
- “New paradigm for continues improvement”
- Builds on the findings and recommendations generated during formative and summative Evaluation

LIMITATIONS OF EVALUATION

- **Larger body of smaller studies examiningthe effectiveness of the introduction of new instructional materials.**
- **May be difficult to receive results in atimely manner.**
- **Training is necessary.**

DIFFERENT TYPE OF TEST ITEMS

Test items

- **Assessments play a central role in the evaluation of student learning.**
- **Written tests are the most widely used of all evaluation tools.**
- **Written test is composed of a number of test items.**

- There are two type of test items on the basis of type of responses they demand for.

1) **FIXED RESPONSE TYPE**

- Objective type

2) **FREE RESPONSE TYPE**

a) Short answer type b) Essay type

A. Objective type test items

- These type test items require specific answer.
- An objective question usually has only one potential correct answer.
- Scoring is objective rather than subjective.

- Objective test items can broadly classified into two

1) Selection type

a) True- false test items

b) Multiple choice

c) Matching type

2) Supply type

a) Simple recall

b) Completion type

1. True- False test items

- **Test items which admit only two possible responses of which one is correct.**
- **“ A true- false item consist of a statement or proposition which the examinee must judge and mark as either true or false” - A.J Nikto (1983)**
- **Respondent is asked to read the statement and indicate whether it is true/ false , right/ wrong , correct/ incorrect, agree/ disagree, Yes/ No.**

Suggestions for constructing true-false items

- **Avoid text book language**
- **Avoid double negatives**
- **Avoid linguistic clues (all, everyone, none etc..)**
- **Avoid long statements and conmplex sentence structure.**
- **Each statement should be unequivocally true or false.**

2. Multiple choice test items

- **Test item presenting four or more responses in which one is either correct or definitely better than others.**
- **This test item consist of two parts.**

1) **First part is called STEM , presented in the form of direct question or incomplete statements.**
2) **Second part is called options/ Alternatives / responses (usually 4 or 5 in number).**

- **Among options one is keyed resposse and others are distractors / misleads.**

Suggestions for construction

- **Avoid copied sentences from the text book in the stem or alternatives.**
- **Avoid ‘patterns’ of correct answer.**
- **Be sure that only one correct/ best answer.**
- **Avoid confusing the respondent with double negatives.**
- **Don’t repeat in each option words or phrases which can be included in stem.**
- **Response or options should not overlap or be synonymous with on another.**

Eg. Cell was discovered by _____ STEM

Options : a) Robert Hooke -------- keyed response

b) Robert Brown

c) M.J. Schleiden Distractors or

d) Rudolf Virshow Misleads

3. Matching Type Test Items

- **Modified form of multiple choice test items.**
- **It consist of two parallel columns**
- **Each phrase, word or number or symbol in one column being matched to a word , phrase or sentence in the other column.**
- **Items in the column for which a match is sought are called Premises or STEM**
- **Items in the column from which selection is made is called Responses or Options.**
- **Respondent is required to make some sort of association between each premise and each responses in the two columns.**

Suggestions for construction

- **Give instruction for ‘ how to mach’ very clearly.**
- **Should contain small premises and responses.**
- **Should contain homogenous premises and responses.**
- **Should not give same number of item in premises and options.**

4. Simple recall type

- **This test requires the respondent to recall a response to direct question.**
- **The typical response should be short preferably a word, a number or a small phrase.**
- **Eliminate chance of guessing.**
- **Eg; which is the structural - functional unit of nervous system?**

5. Completion Type Test Item

- **Series of sentences in which certain words are omitted and replaced by blank**
- **Respondent are expected to fill in the blanks with a word/ a number/ a phrase**
- **Probability of guess work is completely eliminated.**

Suggestions for construction

- **Avoid borrowing statements from the text book.**
- **It is preferable not to begin with blank**
- **There should be one correct response for each blank.**
- **Avoid ambigous statement.**
- **Omit key words or phrases rather than trivial details.**
- **Do not omit too much words.**

Advantages of objective type test items

- It can be scored objectively and easily.
- It covers all aspects of the content.
- Rapid scoring is possible.
- Evaluation time will be less.
- Students can answer quick.
- Objective evaluation.

Disadvantages

- Difficulty in preparing good items.
- Specific abilities like expression and organization are tested.
- Blind guessing is possible
- It takes more time for construction.
- Inefficiency in testing complex skills.
- Problem of cheating

B. Short Answer Type Test Items

- **The length of the answer for this test item should be very short.**
- **Comes between objective and essay type.**
- **Can be answered in few sentences.**

Suggestions for constructing

- **Make questions simple, short and grammatically correct.**
- **Avoid abstract statements deviating from the main context**
- **The item should deal with a single item of information.**
- **Give clear, specific and complete directions.**
- **Give due consideration to time alloted for test**
- **Avoid subjective terms like ‘Discuss’, ‘ what do you know about’ etc..**

  Eg; Explain the meaning of the term ‘Tissue culture’.

Advantages

- Large portion of the content can be covered.
- Easy to construct , because it measures simple learning outcomes.
- It provide little opportunity of guessing
- Useful in evaluating the ability to interpret diagrams, charts, graphs, etc..

Disadvantages

- It is more subjective than objective.
- Leads to rote learning.
- Personal bias of teachers and students are involved.
- It can not test the expression ability of student.
- Writing skill can not be measured properly.

C. Essay Type Test Items

- Free response test item
- It demands long answers covering a number of points and variety of objectives.

Suggestions for construction

- The test item should neither be too general nor too specific.
- The direction and scope of response should be well defined.
- Time factor should give due consideration.
- Instructional objectives should be kept in mind so as to achieve maximum content validity.

Advantages

- Easy to prepare.
- Brings language mastery.
- Useful in measuring many abilities of child

- Reduce chance of spot copying.
- Promote creative thinking.
- Quality evaluation of students achievement.
- Possibility of guess work can be eliminated.

Disadvantages

- It covers only few areas.
- Subjective in nature.
- Do not possess sufficient validity or reliability
- Time consuming type.

Achievement test

- **A test designed to assess the achievement in any subject with regard to a set of predetermined objectives is called an achievement test**
- **Achievement in a subject at a particular stage has to be assessed in terms of his mastery in the curricular provisions anticipated for that stage as well as the realisation of the objectives expected**

CHARACTERISTICS

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

FUNCTION OF AN ACHIEVEMENT TEST

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

CONSTRUCTION OF AN ACHIEVEMENT TEST

Evaluation is an integral part of teaching and learning,for this class room tests are frequently administered.These may be administered after completion of every unit of teaching.This enables the teacher to know the rate of progress of student

Steps involved in the construction of an achievement test

1. **Planning of the test**
2. **Preparation of a design**
3. **Preparation of 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

- A good achievement test should be well planned and systematically developed
- While planning,the paper setter should think about the following aspects
  The first consideration which is of utmost importance is what the paper setter intends to find out through the achievement test.The paper setter should aim at testing the achievement of these objectives
  The next step is to determine the maximum time, maximum marks,nature of the test.

2-prepation of design for the test

- Objectives
- Content
- Forms of questions
- The difficulty level of items
- Scheme of options
- Scheme of sections are the important factors of design

3-preparation of a Blue Print

A Blue print gives the details of the design in concrete terms

Blue print is prepared as a three dimensional chart indicating the distribution of questions as

- **Objective wise**
- **Content wise**
- **Form wise**

The blue print gives the framework for the test and indicates the broad limit within which the test constructor has to work

4- writing of items

- The paper setter start writing items with the precise directive suggested by blue print
- It should also be checked whether all the questions included can be answered within the time allotted
- Construction of test items calls for the mastery of the subject matter and technique of constricting each type of test item
- If a pool of well prepared items in the form of a question bank is available,the constructor can easily choose the number of items for the test

- **After writing the preliminary details such as name of examination, title of paper ,maximum marks,etc the setter has to arrange the question already written**
- **Arrange the question in the order of their difficulty level**

5-preparation of the scoring key and marking scheme

- Scoring should be made strictly in accordance with a predesigned scheme of evaluation
- In the case of objective type where the answers are in the form of some letter or other symbol
- In the case of short answer and essay type,the marking scheme is prepared
- Preparing marking scheme what the examiner has to do is to list out the value point to be credited and then to fix up the mark to be given to each value point
- General instructions also are given at the end of the scheme of valuation in order to avoid subjectivity in scoring

6-preparation of questions wise analysis

- To avoid all loopholes,the setter prepares a table containing all relevant details of all the items of the test
- This is done by making an analysis of each item in terms of content material objective,specification,form of question,difficulty level,marks and estimated time
- This analysis is helpful to check whether all the aspects envisaged in the design

DIAGNOSTIC TEST

- There are tests which have been devised to provide information about the specific nature of pupil's difficulties in given subjects areas

These tests are called *Diagnostic test*

Continued...

- **The word diagnosis is used more or less in the same sense in education**
- In educational diagnosis, **it is the failure of the process of education or learning** that is located and attended **to be remedied**
- **Educational diagnosis is the determination of nature of learning difficulties and deficiencies**

Characteristics of diagnostic test

- **The diagnostic test takes up where the formative test leaves off.**
- **A diagnostic test is a means by which an individual profile is examined and compared against certain norms or criteria.**
- **Diagnostic test focuses on individual's educational weakness or learning deficiency and identify the gaps in pupils.**
- **Diagnostic test is more intensive and act as a tool for analysis of Learning Difficulties.**

- **Diagnostic test is more often limited to low ability students.**
- **Diagnostic test is corrective in nature.**
- **Diagnostic test pinpoint the specific types of error each pupil is making and searches for underlying causes of the problem.**
- **Diagnostic test is much more comprehensive.**
- **Diagnostic test helps us to identify the trouble spots and discovered those areas of students weakness that are unresolved by formative test.**

Functions

- To direct curriculum emphasis
- To provide for educational guidance of pupil
- To simulate the learning activities of pupil
- To direct and motivate administrative and supervisory efforts

Materials used in diagnostic test

1. **Test records** (Standardized and Teacher made).
2. **Pupils' written work** (themes, compositions, home assignments and test papers).
3. **Pupils' oral work** (discussion, speeches and oral reading).
4. **Pupils' work habits** (in class activities, participation, peer relationship, independent work, interest, effort etc.).
5. **Physical and health records** (school and family records about vision, hearing, dental, general).

6. **Guidance and cumulative record data** (family) background, anecdotal references, school activities).
7. **Interview with pupil** (problem or trouble and elimination of misconceptions).
8. **Parent conference** (pupil problems at home, parent interpretation).
9. **Self-guidance** (completing assignments, independent work and seeking teacher help).
10. **Clinic or laboratory aids** (vision tester, audio-meter eye photographs, tape recorder etc.)

Dimensions of Diagnostic Test

- Who can conduct → Teacher/Researcher
- Where → School/Home/Work place
- On whom → Learners
- Purpose → Specific strength and weakness of the learner in a particular area.
- Length of time → Flexible in nature
- Techniques of → Test/observation/interview etc. Assessment
- Sequence → Logical and step by step
- Method of → Negotiable/Therapeutic Remediation
- Support to → Learner/Parents/Teacher

Barriers in Diagnostic Tests:

- **Attitudinal change.**
- **Will Power and patience of the teacher.**
- **Time Scheduling .**
- **Sequencing of Study.**
- **Faulty method of data collection and test.**
- **Maintaining records impartially.**
- **Costs.**

Prognostic test

- One of the important uses of tests is to predict how individuals behave in certain situations
- Prognostic tests are intended for uses in prognosis or prediction of future success in specific subjects of the school curriculum
- They also frequently test some of the aptitude factors that are not directly dependent upon previous training of a specific topic

Steps in the construction of a diagnostic test

1. Identification of the problem areas-purposeful planning
2. Detailed content analysis
3. Analysis of content or teaching units/ ideas /concepts
4. Essentials are listed in terms of learning outcome (LOTS & HOTS)
5. Listing all learning points /ideas /concepts
6. Arranging the learning points/ ideas /concepts in the logical sequence
7. Writing test items (preferably 2 or 3 items of free response type) for each learning point

8. **Clubbing the items around the learning points/ideas /concepts**
9. Presenting each item with clear instructions
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 weaknesses

13. Item wise 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 chart

Remediation

17. **Remedial teaching**

18. Planning and implementing highly individualised remedial programme

19. Evaluating the effectiveness of the programme

Achievement test v/s Diagnostic test

ACHIEVEMENT TEST	DIAGNOSTIC TEST
Measures how much a student has achieved	Measures how much a student has not been able to achieve
Gives due weightage to objectives, contents, form of questions, and difficulty level all in a general level	**Consider each and every one of these aspects in a specialised way - in a critical and analytical way**
Strictly observes the time factor	Not concerned with the time factor, is meant to identify deficiencies and difficulties of the student
Gives weightage to every topic in the content area	**Gives greater emphasis to the problem area**
Marks scored are crucial	Marks scored are not very important
Construction is comparatively easy	**Construction requires more ingenuity and imagination**

CCE

- CCE refers to a system of school based evaluation of students that covers all aspects of student personality. It is a curriculum initiative,attempting to shift emphasis from mere testing to holistic learning.
- ‘Continuous’ means that the evaluation of identified aspects of students growth and development is a continuous process rather than an event. It is built in to the total teaching learning process & spread over the entire academic session.
- ‘Comprehensive’ mean the scheme attempts to cover both the scholastic and co-scholastic aspects of students growth and development.

OBJECTIVES OF CCE

CORE OBJECTIVE: Continuity in evaluation & assessment of broad based learning & behavioural outcomes.

- To help develop skills (cognitive, psychomotor, affective).
- To lay emphasis of thought process & de-emphasize memorization.
- To make evaluation an integral part of teaching learning process.
- To use evaluation for improvement of students achievements.
- To guide teaching learning strategy on the basis of regular diagnosis followed by remedial instructions.
- To make the process of teaching & learning a 'Learner centered Activity'.

MERITS OF CCE

- More valid
  It is more valid than external examinations as it covers all the topics of the syllabus assessment every month or fortnightly.
- Students will become more regular and punctual.
- The problem of discipline will remain subsided.
- It is more reliable than external examinations as it covers all the topics of the syllabus.
- It motivates the pupils to work regularly and thoroughly.
- It enables us to diagnose pupils difficulties in learning.
- Undue strain upon the students is relaxed.

DEMERITS OF CCE

- Time consuming.
- Heavy workload to teachers.
- Incomplete without external examination.
- Subjective assessment by teacher rather than objective assessment.
- Increase in volume of works.
- Lack of adequate ultra structural facilities and teaching-learning materials.

2 Mark Questions & Answer key words

1. What is diagnostic test?
2. Briefly explain objective based evaluation
3. Distinguish between achievement test and diagnostic test
4. What is objective based instruction?
5. Define objective based evaluation

4 Mark Short Essays & Value Points

1. Distinguish between formative and summative Evaluation.
2. Distinguish between achievement test and diagnostic test
3. As a science teacher how will you prepare an achievement test in biology?
4. Discuss the stem and option part in a multiple choice test items. Prepare a good multipl
   choice question with four options.
5. Give a brief outline of the steps in the construction of achievement test in biology