CHAPTER-V DEVELOPING ADVANCE ORGANIZER MODEL LEARNING PACKAGE

• David P Ausubel and background of his theory

• Use of Advance Organizers in different fields of Knowledge

• Advance Organizer Model Learning Package on the topic “The Living World”
David P Ausubel (October 25,1918 - July 9, 2008)

“The learner’s acquisition of a clear, stable, and organized body of knowledge...is the most significant independent variable influencing the learner’s capacity for acquiring more new knowledge in the same field.”

David P. Ausubel

David Paul Ausubel was born on October 25, 1918 in Brooklyn, New York. David P. Ausubel entered the field of educational psychology from the field of medicine. He was an assistant surgeon and psychiatric resident with the U.S. Public Health Service and worked in Germany in the medical treatment of displaced persons immediately after World War II. After completing his training in psychiatry, Ausubel entered Columbia University and earned a Ph.D. in developmental psychology.

In 1950 Ausubel accepted a position with the Bureau of Educational Research at the University of Illinois. He remained with the Bureau for the next sixteen years. While David P. Ausubel was at the University of Illinois, he published extensively on cognitive psychology. David P. Ausubel left the University of Illinois in 1966 in order to accept a position with the Department of Applied Psychology,
Ontario Institute of Studies in Education. He was in Toronto for two years, (1966-68). He moved to become Professor and Head of the Department of Educational Psychology, Graduate School and University of New York, where he served until his retirement in 1975. When David P. Ausubel retired from university teaching, he returned to the practice of psychiatry at the Rockland Children’s Psychiatric Centre.

David P. Ausubel's theory is concerned with how individuals learn large amounts of meaningful material from verbal/textual presentations in a school setting (in contrast to theories developed in the context of laboratory experiments). According to David P. Ausubel, learning is based upon the kinds of superordinate, representational, and combinatorial processes that occur during the reception of information. A primary process in learning is subsumption in which new material is related to relevant ideas in the existing cognitive structure on a substantive, non-verbatim basis. Cognitive structures represent the residue of all learning experiences; forgetting occurs because certain details get integrated and lose their individual identity. A major instructional mechanism proposed by David P. Ausubel is the use of advance organizers." These organizers are introduced in advance of learning itself, and are also presented at a higher level of abstraction, generality, and inclusiveness; and since the substantive content of a given organizer or series of organizers is selected on the basis of its suitability for explaining, integrating, and interrelating the material they precede, this strategy simultaneously satisfies the substantive as well as the programming criteria for enhancing the organization strength of cognitive structure."

David P. Ausubel emphasizes that advance organizers are different from overviews and summaries which simply emphasize key ideas and are presented at the same level of abstraction and
generality as the rest of the material. Organizers act as a subsuming bridge between new learning material and existing related ideas.

Advance Organizers

The "advanced organizer" approach to teaching is a cognitive instructional strategy used to promote the learning and retention of new information proposed by David P. Ausubel in 1960. In the development of this approach, Ausubel (1960) promoted meaningful learning upholding that the most important thing a child could bring to learning situation was what she/he already knows. Therefore, meaningful learning results when that child consciously and explicitly ties new knowledge to relevant concepts within his/her schema. When this occurs it produces a series of changes within our entire cognitive structure. Existing concepts are modified and new linkages between concepts are formed.

David P. Ausubel (1960) believed that meaningful learning is idiosyncratic and involves personal recognition of the links between concepts. The most important element of meaningful learning is not so much how information (rote vs. discovery) is presented but how new information is integrated into an existing knowledge base.

In order to enhance meaningful learning, Ausubel believed that it was important to have students preview information to be learned. Teachers could do this by providing a brief introduction about the way that information that is going to be presented is structured. An example of this might be opening a lesson with a statement that provides an overview of what will be taught. In presenting outlines of information, teachers can help students see the big picture to be learned. This approach encourages students to build upon prior knowledge and mentally organize their thoughts before being introduced to the details of new concepts. By making new material
more familiar and meaningful to students, it should be easier to retrieve. (Gagne, 1988)

Use of Advance Organizers in different fields of Knowledge

Illustration-1 - Humanities- History

Concept to teach - Culture and Art

A guide, beginning a tour of an art museum with a group of high school students says,

“I want to give you an idea that will help you understand the paintings and sculpture we are about to see. The idea is simply that art, although it is a personal expression; reflect in many ways the culture and times in which it was produced. This may seem obvious to you at first when you look at the differences between oriented and western art. However, it is also true that, within each culture, as The culture changes, so the art will change- and that is why we can speak of periods of art. The changes are often reflected in the artist’s techniques, subject matter, colours and style. Major changes are often reflected in the forms of arts that are produced.”

The Art teacher is using an advance organizer in this case, a powerful concept used by art historians. This organizer contains many subordinate ideas that can be linked to the particular characteristics of the art objects being viewed.

In this scenario, the teacher has thus provided students with what David Ausubel calls an intellectual scaffolding” to structure the ideas and facts they encounter during their lesson.
Illustration-2 - Humanities - English

Concept to teach Difference between the literal and figurative meanings of words or the differences between denotative and connotative language. Teacher begins by presenting an organizer, Organizer This is simply to point out that words both represent things, actions, and states of beings and so on, while doing so often suggests things. E.g. the word puppy refers to a young dog, but it also suggests playfulness and cuddliness because we think of puppies as playful and cuddly.

Illustration-3 - Science - Chemistry

Concept to teach- Elements, atomic weight and chemical bond. Organizer - PERIODIC TABLE (The concept and knowledge of the table itself serve as the conceptual structure of the course or Organizer)

Illustration-4 - Science-Bio- Chemistry (For medical students)

Concept to teach DNA- Replication, Recombination and Repair. Organizer- The Hereditary molecule, DNA speaks.

“1 replicate and recombine,
To permit the cells to proliferate,
Environmental insults try to damage me,
But I protect myself with adequate repairs.”
Concept to teach Transcription and Translation.
Organizer The genetic code speaks.

“Triplet base sequence of messenger RNA,  
1 am: universal, specific, non-overlapping,  
Degenerate, in character; faithfully work under the dictates of DNA; to execute my masters orders for protein synthesis”

Concept to teach Regulation of Gene Expression.
Organizer The genes speaks.

“Functional units of DNA, we are;  
Ultimate for all cellular activities;  
Tailored to express as per tissue demands;  
* Mystery of our molecular action await unfolding”

Concept to teach Recombinant DNA and Bio-Technology.
Organizer The Recombinant DNA speaks

“I am the hybridized DNA molecule;  
Created by cutting sealing;  
When introduced into host cells;  
I multiply and code for desired proteins”

Illustration-5 - Education - Educational Psychology

Concept to teach Learning
Organizer “Seekhana OOS thermometer ke saman hai jiske pare ka star mausam ke anusar parivartit hota hai”

This Advance Organizer was presented before a detailed description of the meaning and definition of learning.
Illustration-6  News paper articles

The title given to articles in News papers act as advance organisers which emphasizes key ideas and details of the articles

PROPERTY TAXES AND THE CVS CONTROVERSY

Is it the devil or the deep sea for the public who seem to be bombarded with one critical tax after another? Enter Capital Value Scheme (CVS) and the 'Aam Aadmi' would be lost in the maze of permutations and combinations of the tax systems that would tax any prodigy in algebra. Feels Mathew Thomas

CRUSHING
VERY
SHOCKINGLY

BBMP

HOME SWEET HOME
Hair will grow, but Forest?
CONSERVE OUR FORESTS
TO EXIST

World Forestry Day: Time to think of the future of the planet.

As the Forestry sector is struggling to meet the objective of the National Forest Policy to establish a green cover over 33 per cent of India’s geographical area. In practical terms this entails the need to raise forests from the present 44 million hectares to 109 million hectares. Obviously, the country needs to create another 65 million hectares of man-made forests in the coming years. In order to achieve this target, the Ministry of Environment and Forests has evolved the National Forestry Action Programme. This envisions afforestation, plantation and regeneration of 80 million hectares in the next 20 years with an annual target of 3 million hectares each year. Numerous foreign-funded forestry projects are being implemented by 19 states to restore forests degraded over time.

Will our country succeed in attaining this target? How is implementation? What are the major challenges to reforesting India’s forest cover? The country has followed the plantation model to establish tree cover in barren land. The colonial policy of conversion of natural forests into monoculture plantations has been abated. However, the forest department continues to implement afforestation programmes by implementing the ‘plantation’ model.

The plantation model of forestry is almost at fast growing monocultures, especially exotic species like azaleas and eucalyptus. They are easy to plant—the planting period for harvesting timber is less compared to that of Indigenous tree species. It is also a highly aerobic system which feeds and nourishes the forest dwellers who depend on the use of man-made forest products collected from diverse natural forests. Sundar Banapura, the environmental activist, said: “Plantations are not forests, they just have a timber mine”. As an alternative to this capital-intensive plantation model, the people in the forest regions in the country have successfully created forests through the regeneration model.

The regeneration model is based on community participation. The entire village, especially women’s groups, decide to regenerate forests on barren degraded forests, where root stock is intact. Community forestry has been practised in the Chipko villages in the Himalayas to the Kudupall in Mudhol taluk of Belagavi district in Karnataka to the Rambur in Mayurhat district of Gis, 90 villages have regenerated 25,000 acres of Sal forests. Community-led efforts have enhanced biodiversity and led to the enrichment of soil, and increased the water percolation. This method is less capital intensive than the plantation model. It also meets the objective of social equity. The success of the regeneration model in different ecosystems of the country shows the practical alternative to the high cost plantation model to establish greenery. But these ‘models’ are neither supported nor taken seriosly.

End of the hour is the shift in the focus of forestry from the plantation model to the regeneration model.
ADVANCE ORGANIZER MODELS

ON THE TOPIC

“THE LIVING WORLD”

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Advance Organizer Model Learning Package on the topic “The Living World”

Description of Advance Organizer Models

The investigator developed eleven Advance Organizer models on the topic “The Living World” for secondary level. The details regarding the various phases of development Advance Organizer Models are given below.

Syntax

Phase I: Presentation of Advance Organizer

Clarify aim of the lesson
Present organizer
Relate organizer to student’s knowledge
Identify defining attributes
Give examples
Provide multicontext
Prompt awareness of relevant knowledge

Phase II: Presentation of Learning Task

Make the organization of the new material explicitly.
Make logical order of learning material
Present material and engage students in meaningful learning activities.

Phase III: Strengthening Cognitive Organization

Relate new information to advance organizer
Promote active receptive learning
Module-1

Classification of Organisms
Module -1

Sub-unit 1: Classification of Organisms

Lesson Plan: 1

Syntax
Phase One: Presentation of Advance Organizer

(a) Clarify Aim of the Lesson
Teacher: You have already learnt about the characteristics of living organisms in your earlier classes. There are about 1.7 million species of organisms identified and classified in a scientific manner. Today let us study the classification of organisms at the cellular level.

(b) Present Organiser
Type of Advance Organizer - Comparative
Form of Advance Organizer - Verbal and Visual

Advance Organizer

Figure 5.1

“Cells are for the organisms as people are for the Nation
Cells build and govern the organism as people build and govern the Nation”.

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(c) Relate Organizer to Students Knowledge

(i) **Identify defining attributes**

Teacher helps the students to identify defining attributes in the organizer by asking the following question.

a) What are your observations regarding the statement presented?
b) Why are we comparing organisms to nation and cell to people?
(ii) Give Examples

We cannot think of a Nation without people and organisms without cell. Only geographical region cannot become a Nation. It is the people who make the Nation. In the same way it is the cells which make an organism.

People govern the Nation; they look after the Nation by discharging their duties and responsibilities. Similarly cells govern the organisms and they perform different functions which are essential for the survival of the organisms.

(iii) Provide Multicontext

1. If we compare an undeveloped area with a developed area we can analyse the importance of people in the development of the country.

2. People form the government out of a single party or multiple parties. Can you give an example where a state is governed by a single part and state governed by multiple parties

(iv) Prompt Awareness of Relevant Knowledge

We can classify the states in our Nation by type of government. Similarly we can classify the organisms based on the cells (Organisation at the cellular level). Let us try to know the classification of organisms by comparing it with the classification of the Nation based on the type of government.

Phase Two; Presentation of Learning Task

(a) Make the Organization of the new material explicit

1. Meaning and Characteristics of living Organisms

2. Structure and Importance of Cell (Animal Cell)

3. Meaning of unicellular and Multi-cellular Organisms

(b) Make logical order of Learning Material

1. Slide of an animal cell and a chart showing structure of the cell.
2. Pictures of vertebrates and invertebrates

(c) Present material and engage students in meaningful learning activities

<table>
<thead>
<tr>
<th>Teacher Activity (Learning Experience)</th>
<th>Pupil Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>You are all familiar with living organisms. Mention some of them All these living organisms possess certain common characteristics</td>
<td>Lists out some living organisms</td>
</tr>
<tr>
<td>Mention ‘ the important characteristics of living organisms ’</td>
<td>Lists out the important characteristics of living organisms</td>
</tr>
<tr>
<td>You have studied in your lower classes that cells are the fundamental building blocks of an organism There is a -slide of an Animal cell. Observe and tell the important components of a cell <em>Picture 5.2</em> Teacher elicits important functions of each component of an Animal cell</td>
<td>Observes and identifies important components of a cell.</td>
</tr>
</tbody>
</table>
Teacher fixes the placards of organisms and cells in the flannel Board,
All living organisms are made up of cells.

<table>
<thead>
<tr>
<th>Observe and note down the points.</th>
</tr>
</thead>
<tbody>
<tr>
<td>But there are organisms which are made up of only one cell</td>
</tr>
<tr>
<td>Name such organisms which are made of a single cell</td>
</tr>
<tr>
<td>What do we call such organisms as?</td>
</tr>
<tr>
<td>Answers Euglena, Paramecium, amoeba etc.</td>
</tr>
<tr>
<td>Answers unicellular (Unicellular means one / single)</td>
</tr>
<tr>
<td>Organisms which are made up of a single cell are termed as unicellular organisms.</td>
</tr>
<tr>
<td>Teacher develops the flow chart by fixing the placards single cell and unicellular organisms.</td>
</tr>
<tr>
<td>Now, what do we call organisms which are made up of many cells?</td>
</tr>
<tr>
<td>Cite a few examples for multicellular organisms</td>
</tr>
<tr>
<td>Multicellular organisms</td>
</tr>
<tr>
<td>Teacher shows pictures of multicellular organisms</td>
</tr>
<tr>
<td><em>Picture 5.3</em></td>
</tr>
<tr>
<td>Teacher develops the flow chart by fixing the placards many cells and multicellular</td>
</tr>
<tr>
<td>organisms</td>
</tr>
<tr>
<td>---------------</td>
</tr>
<tr>
<td>Define unicellular and multicellular organisms</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Why is it compared to single party and multiple party governments? (Relating to subsumer of the Advance Organizer)</th>
<th>When we observe the diversity of organisms, we find 75% of the total population of living organisms comprises of multicellular organisms. Are they all similar?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reasons out as to how a single cell perform all the functions whereas different cells share the different functions in an organism.</td>
<td>Answers as they differ in habitat shape, size, etc.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Do you find any difference in their movement? (Locomotion) (E.g. Snake, Man, Elephant, Crab etc.) What is the reason for such variation? Animals which crawl and brittle in nature do not have backbone or support and their internal skeleton is not made up of bone. Any they are called invertebrates Define Invertebrates</th>
<th>Some crawl and some are erect.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Some crawl and some are erect.</td>
<td>Defines Invertebrates</td>
</tr>
</tbody>
</table>
What do we call animals which possess backbone? Why do we compare them to collaborate and independent parties? (Relating to subsumer of the Advance Organizer)

<table>
<thead>
<tr>
<th>Teacher completes the flow chart of classification of organisms by fixing the placards of vertebrates and invertebrates</th>
<th>Observes and note down</th>
</tr>
</thead>
<tbody>
<tr>
<td>This is how organisms are classified at the cellular level; there are other types of classification of organisms based on different criteria, which you will study in your higher classes.</td>
<td></td>
</tr>
</tbody>
</table>

Phase Three: Strengthening Cognitive Organisation

**(a) Relate** new information to Advance Organizer

<table>
<thead>
<tr>
<th>Teacher: Explain the classification of organisms at the cellular level</th>
<th>Student: Summarises the major attributes of the new material</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher: Discuss among yourself why people of a nation are compared to a cell?</td>
<td>Student: Discuss and relate new information to advance organizer</td>
</tr>
</tbody>
</table>

**(b) Promote active receptive learning**

Teacher asks review questions on the topic taught
Module-2

Multicellular Organisms
Picture 5.4 (A)

Advance Organizer
Sub-unit 2; Multicellular Organisms

Lesson Plan: 2

Syntax

Phase One: Presentation of Advance Organizer

(a) Clarify aim of the lesson

Teacher: In your previous class you have learnt the classification of organisms based on cells or at cellular level. It is classified as unicellular and multicellular organisms. Multicellular organisms are made up of many cells which are specialized to perform specific functions which make multicellular organisms unique and possess certain unique characteristics. Today let us study the characteristic feature of multicellular organisms.

(b) Present the organizer

Type of Advance Organizer - Comparative
Form of Advance Organizer - Verbal and Visual

Picture 5.4 (A, B & C)

Advance Organizer

“A Systematic arrangement of bricks (Cells) give rise to a wall (Tissue) A systematic arrangement of walls (Tissues) give rise to a mom (Organ) A systematic arrangement of rooms (Organs) give rise to a house (Organ System) A systematic arrangement (Vertical) of houses (Organ Systems) give rise to an apartment (Multicellular)”
Picture 5.4(B)

Advance Organizer

CELL

- TISSUE
- ORGAN
- ORGAN SYSTEM
Picture 5.4(C)

Advance Organizer

CELLS

TISSUES

ORGANS

SYSTEMS
(c) Relate Organizer to student’s knowledge

(i) Identify defining attributes

Teacher helps the students to identify defining attributes by asking the following questions.

- What are your observations regarding the statement presented?
- Why are we comparing an organism (multi cellular) to an apartment?

(ii) Give Examples

- You have all seen an Apartment, it is a group of houses built one above the other (vertical arrangement)
- A house is built with systematic arrangement of bricks

(iii) Provide **multi context**

How is a wall built?

Bricks are the building blocks of a house. A systematic arrangement of bricks gives rise to a Wall, wall to Room, rooms to House, houses to Apartment (group of houses).

(Sv) Prompt awareness of relevant knowledge

The house is built of bricks, the body of a multi cellular organism is built up of cells.

Just like the arrangement of bricks make a house similar arrangement of cells make the body of a multi cellular organism. Today let us study how a cell builds an organism.
Phase Two: Presentation of Learning Task

(a) Organization of the new material

- Multicellular organisms are those which are made up of many cells

- Cells are the structural and functional unit of the body

- Cells are specialized to perform specific functions based on this they are classified into difficult types for eg. Human blood cells, cartilage cells, connective cells, nerve cells etc.

- Tissue is a group of similar cells to perform a specific function. The cells in a tissue are usually held together by a cementing material.

- Several tissues together contributing to some specific function inside the body constitute an organ.

- Organ system - Many organs act together to perform a specific life processes this constitute an organ system.

(b) Logical Order of Learning Material

1) Structure of a cell (chart)
2) Classification of cells based on size, shape and function (chart)
3) Different types of tissues (chart)
4) Different organs (chart)
5) Organ system (chart)
6) Picture of different organisms
Picture 5.5
Structure of Unicellular and Multicellular Organisms

Picture 5.6
Different Types of Cells

Bone Cell

White blood cell
Platelet
Red blood cell
As discussed earlier, organisms are classified as unicellular and multicellular organisms based on the number of cells. Observe these pictures showing the structure of a unicellular organism and multicellular organisms. Picture 5.5

Multi-cellular organisms are made up of many cells and each cell is specialized to perform specific functions. Teacher explains different types of cells classified based on shape, size and functions. Picture 5.6

Let us consider muscle cells. Arrangement of similar types of muscle cells in a systematic manner to form a structure and this structure is called as Tissue. Define the Tissue?

<table>
<thead>
<tr>
<th>Teacher Activity (Learning Experience)</th>
<th>Pupil Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>As discussed earlier, organisms are classified as unicellular and multicellular organisms based on the number of cells. Observe these pictures showing the structure of a unicellular organism and multicellular organisms. Picture 5.5</td>
<td>Compares and list out the differences</td>
</tr>
<tr>
<td>Multi-cellular organisms are made up of many cells and each cell is specialized to perform specific functions. Teacher explains different types of cells classified based on shape, size and functions. Picture 5.6</td>
<td>Identify different types of cells and their respective functions</td>
</tr>
<tr>
<td>Let us consider muscle cells. Arrangement of similar types of muscle cells in a systematic manner to form a structure and this structure is called as Tissue. Define the Tissue?</td>
<td>Defines a tissue</td>
</tr>
</tbody>
</table>
Four types of tissue

Connective tissue
Epithelial tissue
Muscle tissue
Nervous tissue
This group of similar type of cells performing a specific function are called a tissue, the cells in a tissue are usually held together by a cementing material [shows the structure of a muscle tissue]

*Picture 5.7*

Teacher explains the different types of tissues with their function. *Picture 5.7*

<table>
<thead>
<tr>
<th>Why are tissues compared to the walls of a house? (Relating to subsumer of Advance Organizer) We cannot imagine a room with only one wall, it is a systematic arrangement of walls Similarly let us consider our hands what are the functions of a hand?</th>
<th>Analyses the reason List out the functions of hand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Can our hands perform all the above said functions with only muscle tissue which are the other tissues which helps in the functioning of our hand</td>
<td>List out the types of tissues</td>
</tr>
<tr>
<td>So, a group of different tissues constitute the part of a body and this part is called an Organ Define an organ</td>
<td>Defines an organ</td>
</tr>
<tr>
<td>Teacher explains about different organs of a human body (pictures and chart) <em>Picture 5.8</em></td>
<td>Identify different organs in a human body</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Why are organs compared to a room of a house? (Relating to subsumer of Advance Organizer)</td>
<td>Compares and reason out</td>
</tr>
</tbody>
</table>
| Let us now consider an organ like stomach  
What is the function of stomach?  
Is it only the stomach that digests the food we eat? | Digestion |
| Which are the other organs involved in digestion process?  
So, a group of organs help in effective functioning, of a process/system | Lists out the organs involved in process of digestion of food |
| What do we call such a system of organs as?  
Define an organ system | Organ system  
Defines an organ system |
| Let us now consider a multicellular organism for e.g. Human being  
The human body is made up of a number of organ systems.  
Mention some of them  
Tr shows picture of different organ systems ) *Picture 5.9* | Lists out different organ systems in a human body |
The body of a multi cellular organism is made up of different organ system which in turn is made up of organs and organs by different tissues and tissue with different cells.
Organ systems build the body/structure of a multi cellular organism
Why is the body of multi cellular organism compared to an Apartment?
(Relating to subsumer of the Advance Organizer)
These are the important features of a multicellular organisms

Phase Three; Strengthening Cognitive Organisation
fa) Relate new information to advance organizer
Teacher: Explain the characteristic features of multi cellular organisms
Student: Summarises the major attributes of multicellular organisms

Teacher: Discuss among yourselves why an Apartment is compared to multi cellular organism? What happens if one house in the middle of the Apartment collapses?
Student: Discuss and relate new information to advance organizer

(b) Promote active receptive learning
Teacher asks review questions on the topic taught.
Module-3

Invertebrates

Don't worry, it's not broken: I'm an invertebrate...
Module - 3

Sub-unit 3; Invertebrates Meaning & Classification
Lesson Plan: 3
Syntax
Phase One: Presentation of Advance Organizer

(a) Clarify aim of the lesson
Teacher; In your previous class you have learnt the characteristic features of multi cellular organisms. Out of the million and more multi cellular animal species in the world, more than 98% have a distinct feature apart from the general characteristics of multi cellular organisms i.e. they don’t have an internal skeleton made of bone and they are called as invertebrates. The characteristics and classification of this unique group of multi cellular organisms, Invertebrates will be discussed in this class.

(b) Present the Advance Organizer

Type of Organizer - Comparative
Form of Organizer - Visual (cartoon)

(Advance Organizer follows in the next page)
We have back bone but still see our number.

We don't have backbone but see our number.
(c) Relate Organizer to student’s knowledge

(i) Identify defining attributes

Teacher helps the students to identify the defining attributes in the Advance Organiser.

What are your observations regarding the cartoon?

(ii) Give examples

We come across many animals in our surrounding. Some common animals that we observe are Dog, Sheep, Goat, Snake; some animals like earthworm are seen dwelling under the ground. But we see many differences among these animals, like the internal skeleton (Endo skeleton) of few animals like earthworm, crab, and cockroach are not made up of bones, they also do not stand erect since they do not have a backbone.

(iii) Provide Multi context

If we dissect some organisms like crab or earthworm it will be filled with a fluid, crab and other marine species have a hard outer shell.

(iv) Prompt awareness of relevant knowledge

The organisms that we quoted above come under a distinct group of multicellular organisms called invertebrates with many special characteristics and varieties of species.

Today let us know the uniqueness of invertebrates by studying its meaning and classification.

Phase Two: Presentation of Learning Task

(a) Make the Organization of the new material explicit

- Animals which do not possess backbone are called as invertebrates.
- Characteristic features of invertebrates in terms of habitat, structure of the body, types of exoskeleton, reproduction etc...
Invertebrates

Animals without backbones

Protozoa
Annelids
Mollusks
Echinoderms
Crustaceans
Arachnids
Insects
Invertebrates are mainly classified into eight phyla they are Porifera, Coelenterate, Platyhelminthes, Aschelminthes, Annelida, Arthropod, Mollusca and Echinodermata.

(b) Make logical order of learning material

- Pictures and specimens showing different invertebrates.
- Pictures and diagrams showing the distinct characteristics of invertebrates (habitat structure of the body, exo-skeleton, reproduction etc.)
- Flow chart for the classification of invertebrates (power point presentation)

(c) Present material and engage students in meaningful learning activities

<table>
<thead>
<tr>
<th>Teacher Activity (Learning Experiences)</th>
<th>Pupil Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>As we all know, organisms are classified into unicellular and multicellular organisms based on number of cells Teacher shows different pictures and specimens of multicellular organisms (Invertebrates) Picture 5.11 E.g. Cockroach, Leech, Earthworm, Crab, Sponges, Sea anemone, Butterflies, etc. and instructs to observe the internal skeleton (nature) and find out the presence or absence of backbone</td>
<td>Observe and notices the differences</td>
</tr>
<tr>
<td>Question</td>
<td>Answer</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
</tr>
<tr>
<td>What is the common feature you observe in these organisms?</td>
<td>List out the features (absence of backbone)</td>
</tr>
<tr>
<td>Such a kind of organisms are called as invertebrates</td>
<td></td>
</tr>
<tr>
<td>Mention few examples of invertebrates</td>
<td>Cites examples</td>
</tr>
<tr>
<td>Why did the organisms invertebrates in the cartoon said see our number?</td>
<td>Answers they are large in number</td>
</tr>
<tr>
<td>(Relating to subsumer of the advance organizer)</td>
<td></td>
</tr>
<tr>
<td>Of the total number of multicellular species more than 98% are invertebrates, they do not have backbone, but apart from this they have certain general distinct and unique characteristics. Let us learn it one by one. The places where organisms live are scientifically termed as habitat, and we find different kinds of habitat in the environment. Which are the different habitats that we find in the environment?</td>
<td>Answers as aquatic, aerial and terrestrial.</td>
</tr>
<tr>
<td>Question</td>
<td>Answer</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Where do you usually find invertebrates? (Teacher helps the students to answer)</td>
<td>Water, air and on land</td>
</tr>
<tr>
<td>What do you conclude from this?</td>
<td>Conclude the general habitat of invertebrates</td>
</tr>
<tr>
<td>Teacher shows pictures of invertebrates seen in different habitats <strong>Picture 5.12</strong></td>
<td>Let us now try to know the nature of internal skeleton of invertebrates which makes them unique from other multicellular organisms. Teacher helps to observe and feel the nature of internal skeleton in invertebrates</td>
</tr>
<tr>
<td></td>
<td>a) Hydrostatic</td>
</tr>
<tr>
<td></td>
<td>b) Cartilage and</td>
</tr>
<tr>
<td></td>
<td>c) Fluid filled by giving different examples</td>
</tr>
<tr>
<td>What are your observations regarding the internal skeleton of invertebrates?</td>
<td>'Listen to the explanation identify and describes the nature of internal skeleton of various invertebrates</td>
</tr>
</tbody>
</table>
Picture 5.13
Reproduction in Invertebrates

ASEXUAL REPRODUCTION

STROBILA → EPHYRA

SCHIZOGYNE

MEDUSA

SEXUAL REPRODUCTION

ZYGOTES

POLYP → PLANULA
You have studied in lower classes that the reproduction process in plants and animals are broadly classified as asexual and sexual reproduction.

What is sexual and asexual reproduction?

Recalls the definition/meaning.

Teacher explains the different modes of reproduction by giving examples (chart)  
*Picture 5.13*

The different modes of reproduction - seen in invertebrates are Vegetative," Sexual, Asexual, and Regeneration.

Identify the different reproductive process seen in invertebrates.

The next important characteristic of invertebrates is the mode of nutrition. In our lower classes we have studied that plants prepare their own food and animals depend on plants and other animals for food. What do we call those living things which prepare their own food and those which depend on others for food?

Recalls the meaning of autotrops and heterotrops.
Picture 5.14
Locomotion in Invertebrates

Cilia

Flagellum

Tentacles
Invertebrates are heterotrops i.e. they depend on plants and others smaller organisms for food.

<table>
<thead>
<tr>
<th>Identify the mode of nutrition in invertebrates</th>
</tr>
</thead>
</table>

**Locomotion / movement from one place to another is one of the distinct characteristics of animals. And the organs/part of body used for locomotion is termed as locomotory organs.**

Mention the locomotory organs of fish, bird, and deer.

<table>
<thead>
<tr>
<th>Respond as fins, wings and limbs/legs</th>
</tr>
</thead>
</table>

Invertebrates are not highly evolved organisms as the vertebrates. Their body structure is less developed when compared to vertebrates.

<table>
<thead>
<tr>
<th>Listen to the explar.at.o, i</th>
</tr>
</thead>
</table>

Specialized cells present in invertebrates facilitate movement like cilia, flagellum and tentacles, (chart) *Picture 5.14*

<table>
<thead>
<tr>
<th>Identify the locomotory organs present in invertebrates</th>
</tr>
</thead>
</table>
5.15 Classification of Invertebrates

ORGANISMS WITH PORES

PHYLUM: PORIFERA

ORGANISMS WITH A BODY CAVITY

PHYLUM: COELENTERATA
Picture 5.15

Classification of Invertebrates

ORGANISMS WITH A LONG AND FLAT BODY
PHYLUM: PLATYHELMINTHES

ORGANISMS WITH A ROUND AND UNSEGMENTED BODY
PHYLUM: ASCHELMINTHES
In the beginning of this class, we have learnt that about 98% of multi cellular organisms are invertebrates. Invertebrates are broadly classified into eight phyla’s. Let us try to know one by one. Teacher uses power point presentation to show the classification of invertebrates into eight different phyla.

*Picture 5.15*

1. **PORIFERA -** Invertebrates with pores on their body.
2. **COELENTERATA** Animals having an internal cavity or gastro vascular cavity.
3. **PLATYHELINTHIS** Animals having a long and flat body without segmentation.
4. **ASCHELMINTHES** Animals which are round elongated, cylindrical and unsegmented bodies.
5. **ANNELIDA -** Animals which have elongated body with segments/ partitions.
6. **ARTHROPODA -** Animals

Observe the presentation and classify invertebrates
Identify the basis for classification of invertebrates
Observe the specific features to group the animals into different phyla under invertebrates.
Picture 5.15

Classification of Invertebrates

ORGANISMS WITH A ROUND AND SEGMENTED BODY
PHYLUM: ANNELIDA

[Image of an annelid]

© www.osf.uk.com

ORGANISMS WITH JOINTED LEGS
PHYLUM: ARTHROPODA

[Image of a scorpion]

Scleratiomma lineatum, Linnaeus, 1758  Copyright ©1996 Steve Raybould
ORGANISMS WITH A SOFT BODY
PHYLUM: MOLLUSCA

ORGANISMS WITH A SPINY BODY
PHYLUM: ECHINODERMATA
which have jointed legs.

7. **MOLLUSCA** - Animals with a soft body.

6. **ECHINODERMATA** - The skin of the animals covered by numerous spines.

Teacher develops the flow chart on the black board.

---

**Phase Three: Strengthening Cognitive Organization**

**d)** Relate new information to advance organizer

**Teacher:** What are the general characteristics features of invertebrates?  
**Student:** Summarises the major characteristics features of attributes of invertebrates

**b)** Teacher asks Promote active receptive learning

Teacher asks review questions on the topic taught.
Module-4

Phylum; Porifera
Sub-unit 4 : PHYLUM - PORIFERA
Lesson Plan: 4

Syntax
Phase One: Presentation of Advance Organizer

(a) Clarify aim of the lesson
Teacher: In your previous class we have learnt the classification of invertebrates they are classified into eight phyla each phylum is unique from other in terms of habitat, reproduction, shape and size and their economic importance. In today’s class let us study the unique characteristics of the first phyla PORIFERA.

(b) Present the Organizer
Type of Advance Organizer - Comparative
Form of Advance Organizer - Verbal and Visual

Picture 5.16
Advance Organizer
“We are Sponges not the Lufa (Brush) in your Showers”
(c) Relate Organizer to student’s knowledge

(i) Identify **defining attributes**

Teacher helps the students to identify defining attributes by asking the following question,

What are your observation regarding the statement presented?

(ii) Give Examples

We all know that to keep ourselves healthy and clean we have to take bath daily.

- How do you clean the dirt on your body?
- What type of material you use to clean the body?

(Student response is recorded on the Board)

Even today we believe in using natural products to maintain a healthy and clean body, like in villages we find people using neem stick to brush their teeth, Shikakai nuts to shampoo their hair but you may be surprised to hear that the exoskeleton of an invertebrate is used as brush (lufa).

(iii) Provide multi **content**

We have seen people using plastic brush, brush made of nylon, fibers of coconut to clean dirt on their body.

But it is strange to see people using the exoskeleton of an animal as brush.

(iv) Prompt awareness of relevant knowledge

This group of animals (sponges) has a wide application in our day to day life and they have a unique set of characteristics. We should just not see them as lufas (brushes) in our showers.

Today, let us try to find out this under the unit phylum Porifera.
Poriferans

SYCON

EUSPONGIA

EUPLECTELLA

HYALONEMA

CALCAREOUS SPONGE
Phase Two: Presentation of Learning Task

fa) Organization of the new material

- Origin of Poriferans
- Habitat
- Shape and structure of the body
- Nutrition and respiration
- Reproduction
- Economic importance

(b) Make logical order of learning material

- Specimens of phylum Porifera (sponges)
- Pictures to show varied habitats where poriferans live.
- Shape and structure of the body (specimen/pictures)
- Specimens and pictures to show the economic importance of Poriferans.

Phase Three: Present material and engage students in meaningful learning activities

<table>
<thead>
<tr>
<th>Teacher activity (learning experiences)</th>
<th>Pupil activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>We have already learnt while classifying invertebrates, that the organisms with pores belong to phylum Porifera. Teacher shows a few specimen of organism belonging to the phylum Porifera Picture 5,17</td>
<td>Observe the picture</td>
</tr>
</tbody>
</table>
Picture 5.18

Poriferans Habitat
Teacher asks to observe the surface of the body in these animals, they are perforated by pores called ostia and hence they are called as Porifera and the members of these phyla are commonly called sponges.

<table>
<thead>
<tr>
<th>Identify the reason for origin of the name Porifera</th>
</tr>
</thead>
</table>

Let us now try to find out the habitat of this group of animals. Mention the different kinds of habitats you are aware of.

<table>
<thead>
<tr>
<th>Recall the different habitats like River, Sea, land, air..</th>
</tr>
</thead>
</table>

Depending on the places of dwelling, habitats are classified as Aquatic, Terrestrial and Arboreal/Area. What do you mean by Aquatic habitat?

<table>
<thead>
<tr>
<th>Answers as River, sea, lake (water bodies) are termed as aquatic.</th>
</tr>
</thead>
</table>

Teacher exhibits computer slides showing the habitat of species belonging to phylum Porifera. *Picture 5.18*

<table>
<thead>
<tr>
<th>Observe the species in Computer slides.</th>
</tr>
</thead>
</table>

What can we conclude from this, which are the kinds of habitat where Poriferans are seen?

<table>
<thead>
<tr>
<th>Respond as they are aquatic, most being marine, some live in fresh water, attached to rocks, weeds, shells and other objects in water.</th>
</tr>
</thead>
</table>
PORIFERANS---MORPHOLOGY

Osculum
Spicules
Choanocyte
Spicules
Pore


osculum
body wall
atrium
spicules
spicules
oscular tube
bud
stolon
substratum
This group of animals differ in their shape and size. Teacher exhibits computer slides of different sponges. *Picture 5.17(a)*

What are your observations, how do they look like?

<table>
<thead>
<tr>
<th>Observe and answer as flat, branched and globular.</th>
</tr>
</thead>
</table>

Whatever may be the shape and size they have a common morphology / structure of the body. Let us now try to know the morphology of a sponge (Phylum: Porifera) with the help of a chart, teacher explains the general morphology of a sponge. *Picture 5.19*

<table>
<thead>
<tr>
<th>Listens and notes down the important points</th>
</tr>
</thead>
</table>

Teacher draws the diagramatic representation of the structure and assists the students to draw the diagram, and labels it.

<table>
<thead>
<tr>
<th>Students draw and label the diagram</th>
</tr>
</thead>
</table>

Teacher shows the sponge used as the brush to clean the dirt on the body. Most of you did not recognize this sponge as an animal which is used as a brush.
TYPES OF CELLS SEEN IN PORIFERANS

EPITHELIAL CELLS

FLAGELLATED COLLAR CELLS

MESENCHYME CELLS

AMEBOID CELLS
What may be the reason for this? When we observe a dead body we can identify it because of its structure. Our body has organal level of organization. Since it is made up of organs and organ system.

But when we observe the body of a sponge, they don’t have any specific organ or structure. Sponges are made up of different cells each independent of one another.

**Picture 5.20**

Now answer what may be the reason for describing sponges as having cellular level of organization?

Answer it was like a brush / stone.

Listen to the teachers explanation

Answer the question by analyzing the reason that since they are made up of different cells they are termed as cellular level of organization.
Teacher helps the students to observe and identify the types of cells present in a sponge i.e. Mesenchyma, epithelial, flagellated color cells and amoeboid cells (chart).

**Picture 5.20**

Food/Nutrition, Oxygen are very important for an organism to exist our next aspect is to learn how sponges breathe and eat.

We all breathe oxygen which is present in the atmosphere.

How do animals living inside the water breathe?

Answer as the dissolved oxygen in water

We have just now understood that sponges have cellular level organization i.e., they don’t have distinct structure/organ for respiration and mode of nutrition.

Teacher shows the general morphology of a sponge and explains how oxygen and food enters the body **Picture 5.19**

Students identify the process of respiration and digestion in sponges.
INTERNAL SKELETON OF SPONGES

A. CALARIOUS SPICULES

B. SILICEOUS SPICULES

C. SPONGIN FIBERS
REPRODUCTION IN SPONGES

GEMMULES

Asexual → Sexual

exchange + fusion

meiosis
Sponges being an invertebrate we should not forget to know its important feature i.e., the internal skeleton. Teacher displays a picture showing the internal skeleton present in sponges. *Picture 5.21*

Observe the picture and identifies the shape and size of internal skeleton.

Sponges possess an internal skeleton in the form of crystalline structure called ‘Spicules’ which protect and support the body (Calcium Carbonate / Silica/ Spongin fibres)

Now, let us try to know the mode of reproduction in sponges. Teacher explains the different kinds of reproduction seen in sponges. *Picture 5.22*

Identify the type of reproduction seen in sponges.

Today we started our class by knowing that a sponge is used as a brush to clean the dirt on the body like this sponge have a wide economic importance in day to day life. Teacher explains the economic importance of

Observe and identify the economic importance of
PICTURE 5.23

PORIFERANS---ECONOMIC IMPORTANCE
Phase Three; Strengthening Cognitive Organization

fa) Relate new information to advance organizer

Tr: What are the general characteristics St: Summarizes major features of phylum Porifera attributes of the new material

Tr: Discuss among yourselves that St: Relates new sponges are not just brush. but information to something different and unique advance organizer.

(b) Promote active reception learning

Teacher asks review questions on the topic taught
Module-5

Phylum: Coelenterata
Sub-unit 5: Phylum - Coelenterate

Lesson Plan: 5

Syntax

Phase One: Presentation of Advance Organizer

(a) Clarify aim of the lesson

In our previous class we have learnt the characteristics of Phylum Porifera. In today’s class let us study the unique characteristics of another interesting phylum coelenterate.

(a) Present the Organizer

Type of Advance Organizer - **Comparative**

Form of Advance Organizer - **Verbal**

Picture 5.24

Advance Organizer

“As coastal region make the land more attractive and colorful, coastal jewel (corals) make jewellery more attractive and colorful”.

![Coastal Region and Jewelry Images]
(c) Relate Organizer to student’s knowledge

(i) Identify defining attributes

Teacher helps the students to identify defining attributes by asking the following questions.
- What are your observations regarding the statement presented?
- What are coastal jewel?

(ii) Give examples

All of us wear jewels made of gold or any other metal.
There are two varieties of gold jewellery one made of pure gold and others with combination of gold and precious stones, pearl or coral.

(iii) Provide multicontext

Our state Karnataka is a geographically diversified state with almost all types of land forms in it i.e., plains, ghats, coastal region, hill station; depending on the region each region is rich in its respective natural resources.

We are all familiar with richness of our coastal region (Mangalore, Udupi, Karwar...) how beautiful it is! It makes our land beautiful, resourceful and colorful. Depending on the natural resources available in coastal region the life style of people is also different, like their food habits, costumes and jewellery they wear.

(iv) Prompt awareness of relevant knowledge

Teacher shows a few jewellery pieces where corals are used which is famous in coastal region.
Tr: Students observe and identify the red material used in this Jewellery
St: Answers as corals
Tr: Are these materials available in the earth crust like gold or diamond?
St: answer the question
Tr: It is the secretion, secreted by a group of invertebrates called coelenterates. It is very interesting to find out the unique characteristics of organisms belonging to Phylum Coelenterate which is a ‘costly merchant for goldsmiths’.

In today’s class let us try to know the characteristics of the *Rich Merchant - Corals.*

Phase Two: Presentation of learning Task

fa) Organization of the new material

- Origin
- Habitat
- Morphology
- Life processes
- Economic importance

(b) Make logical order of learning material

- Pictures, specimens of corals (origin)
- Computer slides/pictures (habitat)
- Chart and computer slides (morphology)
- Computer slides and specimens (economic importance)
fc) Presentation of material and engage students in meaningful learning activities.

<table>
<thead>
<tr>
<th>Teacher Activity (Learning Experiences)</th>
<th>Pupil Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>We shall now start our class to list out the unique characteristics of phylum coelenterate. Our first question is why these animals belonging to this phylum are called coelenterates. Observe these pictures and specimens which show the internal structure of these animals. <em>(Picture 5.25)</em> How is it? Teacher gives the Latin meaning of the word coelenterate Coel-cavity.</td>
<td>Observe and answer the question as it has empty cavity</td>
</tr>
<tr>
<td>These animals have an internal cavity called 'coelenteron’ or gastrovascular cavity which helps in digestion. Hence the name coelenterate</td>
<td>Identify the origin of the name coelenterate</td>
</tr>
<tr>
<td>In the beginning of our class we regarded coelenterates as coastal jewel. What may be their habitat? <em>(Place of living)</em></td>
<td>Answer as sea</td>
</tr>
</tbody>
</table>
COELENTERATES - HABITAT
Yes, coelenterates are aquatic animals. Most of them are marine, some are found in fresh water.

Teacher exhibits computer slides to show the habitat of coelenterates. Picture 5.26

Teacher shows one specimen belonging to the family coelenterates.

Observe this specimen. It is tube like with a mouth at the tip surrounded by a circlet of tentacles.

Listen to this statement I say, "Tentacles are to the coelenterates as sticky tongue to the frog"

We have all seen frogs and their activities. What are the functions of tongue in a frog?

Answers as captures the food

What may be the function of tentacles to the coelenterates?

Answers as capturing the food

Good! A special type of cell called 'Nematocysts' or 'stinging cells' - are found on the tentacles.
<table>
<thead>
<tr>
<th>Activity</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Which help in paralyzing and capturing prey and in defense against enemies.</td>
<td>Identify the function of stinging cells</td>
</tr>
<tr>
<td>Let us now know the general morphology of coelenterates Teacher explains it with help of a chart. <em>Picture 5.27</em></td>
<td>Listens to the explanation Observe the chart</td>
</tr>
<tr>
<td>With this general morphology coelenterates perform different life processes like responding to stimuli (Nervous system), respiration, digestion,&quot; * excretion and reproduction. Teacher explains the&quot; life processes.</td>
<td>Students listen and identify the modes of life processes in coelenterates.</td>
</tr>
</tbody>
</table>
Picture 5.28

COELENTERATES - ECONOMIC IMPORTANCE
Now, at last we shall discuss the very important objective of our today’s class i.e., why corals are regarded as coastal jewel? It is because of its economic importance. Observe and appreciate the formation of red coral.

Teacher explains the process of coral formation by a group of coelenterates called corals with the help of computer slides Picture 5.28

Phase Three: Strengthening Cognitive Organization

(a) Relate new information to advance organizer

Teacher: What are the characteristics features major attributes of phylum coelenterates?

Student: Summarizes the major attributes of the new material

(c) Promote active Receptive Learning

Teacher asks review questions on the topic taught.
Module-6

Phylum: Platyhelminthes
Module- 6

Sub-unit 6: Phylum - Platyhelminthes

Lesson Plan: 6

Syntax

Phase One: Presentation of Advance Organizer

a) Clarify aim of the lesson

In our previous class we have learnt the characteristics of phylum Coelenterate which was a highly economical species for human beings. Today we shall study the characteristics of one more group of Invertebrates Phylum Platyhelminthes.

b) Present the Organizer

Type of Advance Organizer - Comparative

Form of Advance Organizer - Verbal

“As Traitors are to the Nation, Flatworms are to the Human being

Picture5.29

Advance Organizer

Worms

Worms are a diverse group of invertebrates, found in virtually every habitat. Some of the worms are parasites of man. Three major phyla of worms are Platyhelminthes, the flat worms; Nematoda, the roundworms; and Annelida, the segmented worms.
(c) Relate Organizer to student’s knowledge

(i) Identify defining attributes

Tr helps the students to identify defining attributes by asking the following questions

- What are your observations regarding the statement presented?
- Why are we comparing Flatworms to traitors?
- Who are traitors?

(ii) Give examples

We are all living on this beautiful planet Earth forming our own territories (country) we say we live in harmony, yet we have enemies around, each country is an enemy to another. We may have enemies outside the country or sometimes even inside the country; our own people cause trouble to the country.

(ii) Provide multicontext

We can recall our struggle for Independence against the Britishers. How could they rule us? One important reason was we had many enemies within the country and they are called Traitors. They live in our country; take all the benefits from the country but cause problem to the country which has given them shelter.

(iii) Prompt awareness of relevant knowledge

If we recall our childhood days, when we would complain of stomachache, we remember mother or doctor recommending some medicine to kill the worms inside our stomach. These worms are the flatworms belonging to phylum Platyhelminthes. Today, let us try to know the unique features of traitors who live in us and cause harm to us.
Picture 5.30

FLAT WORMS

PLANARIA

TAPEWORM

LIVERFLUKE
Phase Two: Presentation of learning Task

(a) Organization of the new material
- Origin
- Habitat
- Morphology
- Life processes
- Diseases caused by Flatworms

(b) Make logical order of learning material
- Specimens of flatworms (origin)
- Chart/ computer slides (habitat)
- Chart/ computer slides (Morphology)
- Computer slides (Diseases caused by flatworms)

(c) Presentation of material and engage students in meaningful learning activities.

<table>
<thead>
<tr>
<th>Teacher Activity (Learning Experiences)</th>
<th>Pupil Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Since Flatworms are parasites, they possess certain special features in order to live in their host (vertebrates). Tr shows a few specimens (persevered) of flatworms to identify their external features. What are your observations? What may be the reason to call this group of animals as flatworms? (Picture 5.30)</td>
<td>Observe and identify the external appearance of flatworms (long, flat, absence of segmentation) Identify the reason and answer the question</td>
</tr>
</tbody>
</table>
Not all the species which belong to this phylum are parasites a few species are free living and many are parasites.

Tr shows pictures and computer slides showing the different habitats of organisms belonging to phylum Platyhelminthes.

**Picture 5.31**

Irrespective of their habitat, shape and size of their body they have a general morphology.

Tr explains the general morphology with the help of a chart giving special reference to triplio blastic and acoelomate nature of Platyhelminthes.

**Picture 5.32**

<table>
<thead>
<tr>
<th>Identify the different Habitats of phylum Platyhelminthes</th>
<th>Listen to the Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Recognize the general morphology</td>
</tr>
</tbody>
</table>
DISEASES CAUSED BY FLAT WORMS
When we were discussing about the habitat of phyla Platyhelminthes we found that the species under this phyla are parasites. What are parasites? Since these organisms are parasitic their digestive system is said to be incomplete. What may be the reason? Tr explains the digestive system and other important life processes seen in Platyhelminthes.

In the beginning of our class we regarded flatworms as traitors. What may be the reason? (Relating to subsumer of the advance organizer) Let us try to know the different diseases caused by these organisms belonging to phylum Platyhelminthes. Tr explains the different diseases caused by flatworms by showing pictures/computer slides. *Picture 5.33*

Listen to the discussion of the teacher

Recalls the meaning

Reasons out as they get ready food (digested) from host.

Listens and appreciates the uniqueness in their life processes.

Analyses the reason and answer as they may cause problem

Observe and identify the diseases caused by flatworms.
Phase Three: Strengthening Cognitive Organization

a) Relate new information to advance organizer

| Teacher: list out the characteristics of phyla Piatyhelminthes | Student: Summarizes the major attributes of phylum Piatyhelminthes. |
| Teacher: Discuss among yourselves Why are flatworms regarded as Traitors to human body? | Student: Discuss and relate new information to advance organizer |

b) Promote active Receptive Learning

Teacher asks review questions on the topic taught.
Module-7

Phylum: Aschelminthes
Sub-unit 7: Phylum - Aschelminthes

Lesson Plan: 7

Syntax

Phase One; Presentation of Advance Organizer

a) Clarify aim of the lesson

In our previous class we have studied the characteristics of phylum Platyhelminthes. Today we shall study the characteristics of another important phylum Aschelminthes.

b) Present the Organizer

Type of Advance Organizer - **Comparative**
Form of Advance Organizer - **Verbal**

*Picture 5.35*

Advance Organizer

“As Friendship of Plasmodium and Anopheles cause Malaria. Friendship of Filaria (Elephantiasis) and Culex cause Elephantiasis”
(c) Relate Organizer to student’s knowledge

(i) Identify defining attributes

Tr helps the students to identify defining attributes in the statement by asking the following questions

- What are your observations regarding the statement presented?
- What is Malaria and Elephantiasis?

(ii) Give examples

We all know that micro-organisms like bacteria and viruses cause many diseases like malaria, typhoid, and diaherea....

Mention some examples of such diseases

(iv) Provide multicontext

Do you know how are these diseases caused?

It is very interesting to know how is malaria caused. Tr narrates how a parasite called *Plasmodium* which is responsible for malaria enters the human body through the bite of a female mosquito *Anopheles*.

(v) Prompt awareness of relevant knowledge

Like Malaria, a parasite belonging to the phylum Aschelminthes enters the human body through the bite of a mosquito called culex and cause a peculiar disease. We shall know what is that? Other diseases they cause and the special characteristics of the phylum they belong in today’s class.

Phase Two; Presentation of learning Task

(a) Organization of the new material

- Origin
- Habitat
- Morphology
- Life processes
- Diseases caused by Round worms
ROUNDWORMS

ASCARIS (ROUNDWORM)  HOOK WORM

FILARIA WORM

Picture 5.36

ASCHELMINTHES- HABITAT
(b) Make logical order of learning material

- Specimens (origin)
- Chart/ computer slides (habitat)
- Chart/ computer slides (Morphology)
- Computer slides (Diseases)

(c) Presentation of material and engage **students** in meaningful learning activities.

<table>
<thead>
<tr>
<th>Teacher Activity (Learning Experiences)</th>
<th>Pupil Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>We shall start our class to know the reason for calling this group of organisms as Aschelminthes. Tr explains the meaning by showing different specimens of roundworm, Hookworm, and Filariaworm. <em>Picture 5.35</em></td>
<td>Identify the meaning Aschel- means round Minthes- means worms</td>
</tr>
<tr>
<td>Most of the species under this phylum are parasites, let us know the general habitat of this organisms Tr shows the computer slides on habitat of Aschelminthes <em>Picture 5.36</em></td>
<td>Identify the general habitat of phylum Annelida.</td>
</tr>
</tbody>
</table>
Not all the species which belong to this phylum are parasites a few species are free living and many are parasites.

Tr shows pictures and computer slides showing the different habitats of organisms belonging to phylum Aschelminthes.

*Picture 5.36*

Irrespective of their habitat, shape and size of the body they have a general morphology

Tr explains the general Morphology with the help of a chart giving special reference to Triploblastic, cuticle, and pseudocoel nature of Aschelminthes.

*Picture 5.37*

- Identify the different Habitats of Phylum Aschelminthes.
- Listen to the explanation
- Recognize the general morphology
DISEASES CAUSED BY ROUNDWORMS
As we discussed in our previous class that parasites do not have a well developed organ systems since they depend on their hosts similarly in the species belonging to this phylum have simple organ systems. Tr explains the digestive, respiratory, circulatory, nervous, excretory, and reproductory system

Listens and appreciates the uniqueness in their life processes.

In the beginning of our class 1 said a disease called Elephantiasis is caused by a species belonging to this phyla (Relating to subsumer of the advance organizer) Let us try to know that, and also other diseases caused by these organisms belonging to phylum Aschelminthes

Tr explains the different diseases caused by roundworms by showing pictures/computer slides.

*Picture 5,33*
Phase Three; Strengthening Cognitive Organization

a) Relate **new information to advance organizer**

| Teacher | list out the characteristics of phyla Aschelminthes | Student | Summarizes the major attributes of phylum Aschelminthes |

b) Promote active Receptive Learning

Teacher asks review questions based on the topic taught.
Module-8

Phylum; Annelida
Module-8
Sub-unit 8: Phylum - Annelida
Lesson Plan; 8

Syntax
Phase One: Presentation of Advance Organizer

a) Clarify aim of the lesson

In our previous class we have studied the group of organisms which cause diseases to human body. But there are organisms (Invertebrates) which are helpful to humans and they belong to the phylum Annelida. Today we shall study the characteristics of organisms belonging to phylum Annelida.

b) Present the Organizer

Type of Advance Organizer - Comparative
Form of Advance Organizer - Verbal

Picture 5.39

Advance Organizer

“As Dogs are faithful to their Masters Earthworms are friends to Farmers”
(c) Relate Organizer to student's knowledge

(i) Identify **defining attributes**

Teacher helps the students to identify defining attributes in the statement by asking the following questions

- What are your observations regarding the statement presented?
- Why are Earthworms regarded as good friends to farmers?

(ii) Give examples

We all have seen Dogs reared by people as pets. Though Dogs are regarded as a pet animals. They help the master by discharging many duties. We see dogs guarding the house, helping the police officials in detecting the crimes. But most important quality of a dog is being faithful.

(iii) Provide multicontext

We have heard many stories where the faithfulness of dogs has saved the lives of many people.

Teacher asks the students to quote a few situations which they have come across.

(vi) Prompt awareness of relevant knowledge

Animals that live with us in the environment help us in one way or the other. A group of organisms which are Invertebrates help the farmers.

To know who are they? How do they help? And what are the special characteristics of the phylum they belong to? We shall discuss and find out answers for the above stated questions.
Phase Two: Presentation of learning Task

(b) Organization of the new material
- Origin
- Habitat
- Morphology
- Life processes
- Economic Importance

(b) Make **logical order** of learning material

- Specimens (origin)
- Chart/computer slides (habitat)
- Chart/computer slides (Morphology)
- Computer slides (economic importance)
ANNELEIDA – HABITAT
(c) Presentation of material and engage students meaningful learning activities.

<table>
<thead>
<tr>
<th><strong>Teacher Activity</strong> (Learning Experiences)</th>
<th><strong>Pupil Activity</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>None of us here are ignorant about the worms regarded as friends of farmers—Earthworms They belong to the phyla Annelida Tr Explains the reason for calling these groups of organisms as Annelida by showing' the external appearance of organisms.</td>
<td>Listen to the statement Identify the reason for origin of the name Annelida.</td>
</tr>
<tr>
<td>The name Earthworm itself indicates as to where these worms live/ dwell. What may be their Habitat? Yes, but a few organisms under this phyla are aquatic.Tr shows the computer slides on habitat of Annelida <em>Picture 5.40</em></td>
<td>Answer as moist soil Identify the general habitat of phylum Annelida.</td>
</tr>
</tbody>
</table>
ANNELEDA - MORPHOLOGY

Picture 51+1

Prostomium

Mouth

Seta

Male pore

Clitellum

Anus
Some of you might have attempted to touch an Earthworm. I have got some collection of Earthworms. Tr instructs students to feel and touch the organisms.

When you touch the outer surface it is very moist and slippery and this layer is called ‘cuticle’.

Tr explains the general morphology with the help of specimen and chart.

Listen to the statement

Get the experience

Recognize the layer covering the body.

Identify the general morphology of organisms belonging to phylum Annelida.

When we see the digestive system of Annelids, they are well developed when compared to the other Invertebrates. Tr dissects the Earthworm and instructs students to observe the various parts of digestive system.

Why is the digestive system in Annelids called as complete digestive system? Tr explains the other life processes (Respiration, Circulation, Nervous System, Excretion and Reproduction) in

Observe the dissection and recognize the digestive system in Earthworm.

Reasons out as they have all the organs involved in digestive system found in higher animals.

Identify the mode of different Life processes in Annelids.
ANNELOID---ECONOMIC IMPORTANCE

Looks like a great job!
Annelids. Finally we shall know how Annelids show their friendship to farmers by analyzing their Economic Importance.

Tr explains the Economic uses of Annelids Importance using pictures and computer slides. *Picture 5.42*

Phase Three: Strengthening Cognitive Organization

a) Relate new information to advance organizer

<table>
<thead>
<tr>
<th>Teacher. Explain the unique characteristics of Annelids</th>
<th>Student. Summarizes the major attributes of Phylum Annelida.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher, Discuss among yourselves why are Earthworms regarded as friends to farmers?</td>
<td>Student. Discuss and relate new information to the Advance Organizer.</td>
</tr>
</tbody>
</table>

b) Promote active Receptive Learning

Teacher asks review questions based on the topic taught.
Module-9

Phylum: Arthropoda
Module - 9

Sub-unit 9: Phylum - Arthropoda
Lesson Plan: 9

Syntax

Phase One: Presentation of Advance Organizer

  a) Clarify aim of the lesson

  In our previous class we have studied the characteristics of an invertebrate namely Annelids. Today we shall study the characteristics of another group of invertebrate,

  b) Present the Organizer

  Type of Advance Organizer - Comparative
  Form of Advance Organizer - Verbal

  Picture 5, 43

  Advance Organizer

  “As the present day world is ruled by computers, planet Earth is ruled by Arthropod’s"
(c) Relate Organizer to student's knowledge

(i) Identify defining attributes

Tr helps the students to identify defining attributes in the statement by asking the following questions

• What are your observations regarding the statement presented?
• Why do we compare the applications of computers to Arthropods?

(ii) Give examples

The present day world is ruled by computers, computers have become part and parcel of today’s life. The application of computers is enormous it ranges from the tip of mountain to deep sea.

Tr: Quote a few places where computers are seen
St: Answers the question.

(iii) Provide multicontext

Computers can be regarded as a man made species multiplying itself through its wider applications. We see computers every where we are living with it like any other species on the earth. Seeing the application of computers in almost all fields of knowledge, they are regarded as rulers of the present world.

(vii) Prompt awareness of relevant knowledge

The living organisms on this beautiful planet earth differ in many ways like shape, color, size, habitat and also the varities. Some are more in number and some are less in number, the most successful animals on the planet, which have conquered land, sea, air and make up over three fourth of all currently known living and fossil organisms are Arthropods.
Phase Two; Presentation of learning Task

a) Organization of the new material
   - Origin
   - Habitat
   - Morphology
   - Life processes
   - Economic Importance

b) Make logical order of learning material
   - Specimens (origin)
   - Chart/ computer slides(habitat)
   - Chart/ computer slides(Morphology)
   - computer slides(economic importance)

c) Presentation of material and engage students in meaningful learning activities

<table>
<thead>
<tr>
<th>Teacher Activity (Learning Experiences)</th>
<th>Pupil Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>To start we shall first know why these groups of organisms are called Arthropods. Tr exhibits specimen of species belonging to phylum Arthropoda, Observe the legs/foot of this organism. The word arthropoda is derived from Greek word arthros- jointed, podos- foot</td>
<td>Observe the joints in legs.</td>
</tr>
<tr>
<td>In the beginning of this class I</td>
<td>Identify the origin of the name artropoda</td>
</tr>
</tbody>
</table>
Picture 5.44
ARTHROPODA - HABITAT
Picture S.44

ARTHROPODA - HABITAT
MORPHOLOGY OF A SPIDER

- pedipalp
- chelicera
- eye
- femur
- patella
- tibia
- metatarsus
- tarsus
- first leg
- nail
- second leg
- abdomen
- third leg
- fourth leg
- spinneret
made a statement Artropoda are the rulers of the planet earth.
(Relating to subsumer of the advance organizer)
What may be the reason for calling arthropods as the rulers of planet earth?
Yes, we find arthropods in all the habitats found on this planet since they adapt to all types of environments.
Tr exhibits computer slides to show different habitats where arthropods live *Pictures.44*

<table>
<thead>
<tr>
<th>Recall the statement presented</th>
<th>Analyze the reason as they are found in almost all the habitat</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Identify the habitat of arthropods</td>
</tr>
</tbody>
</table>

| Arthropods are highly adaptive in nature due to their external and internal morphological structure. | Recognise the general morphology of arthropods |
| Tr explains the morphology using chart and specimens *Picture5.45* | |

| Since arthropods have to live in different habitats their metabolic activity need to be adaptive to the respective habitats. The organ systems in arthropods are well developed to adjust to different habitats. Let us try to know them. | |
ARThROPODA----ECONOMIC IMPORTANCE
<table>
<thead>
<tr>
<th>Teacher. Explain the characteristics of phylum Arthropoda</th>
<th>Student Summarizes the major attributes of phylum Arthropoda</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher. What may be the reason to call Arthropods as the rulers of planet earth?</td>
<td>Student Relate new information to advance organizer.</td>
</tr>
</tbody>
</table>

**Phase Three: Strengthening Cognitive Organization**

**a) Relate new information to advance organizer**

**b) Promote active Reception Learning**

Tr asks review questions based on the topic taught.
Module-10

Phylum: Mollusca
Module -10

Sub-unit 10: Phylum - Mollusca

Lesson Plan; 10

Syntax

Phase One: Presentation of Advance Organizer

a) Clarify aim of the lesson

In our previous class we have learnt the characteristics of a group of Invertebrates which were regarded as the rulers of the planet earth. Today we shall discuss another set of Invertebrates which is very soft and tender.

b) Present the Organizer

Type of Advance Organizer - Comparative
Form of Advance Organizer - Verbal

Picture 5.47
Advance Organizer

“As we build castles to live in,
Molluscans build Shells to live in”

(c) Relate Organizer to student’s knowledge
c) Relate Organizer to student’s knowledge

(i) Identify defining attributes

Tr helps the students to identify defining attributes in the statement by asking the following questions

• What are your observations regarding the statement presented?
• What are castles? How are they built?

(ii) Give examples

We see people building different kinds of houses to live in like huts, tents, house built of mud, stones, or bricks. In olden days kings built palaces and castles to live.

(iii) Provide multicontext

When we were young we were interested to watch movies on fairytales which was telecasted on television.

Tr: Where were the queens or princess staying? In those stories/tales.
St: respond as castle
Tr: Castle were protected by walls and doors where queens and princess would stay safely.

(viii) Prompt awareness of relevant knowledge

We live in houses to protect ourselves from heat and cold. Animals also need houses to live in and protect themselves from changes in the environment and enemies. Organisms which are very soft and tender needs more protection, one such group of organisms (invertebrates) build shells to live in, it is interesting to find out its unique characteristics.
MOLLUSCANS- HABITAT
Phase Two: Presentation of Learning Task

(d) **Organization** of the new material

- Origin
- Habitat
- Morphology
- Life processes
- Economic Importance

(b) Make logical order of learning material

- Specimens (origin)
- Chart/computer slides (habitat)
- Chart/computer slides (Morphology)
  
* computer slides (economic importance)

(e) Presentation of material and engage students

meaningful learning activities.

<table>
<thead>
<tr>
<th><strong>Teacher Activity</strong> <em>(Learning Experiences)</em></th>
<th><strong>Pupil Activity</strong>*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tr exhibits specimen of species belonging to phylum Mollusca, Observe the nature of these organisms. It is soft; hence the name Molluscans is given to them. The word Molluscans has a Latin origin. Molluscans- soft Tr explains the habitat of Molluscans. <em>Picture 5.48</em> Since this group of organisms is soft in nature their morphology (body) is made up</td>
<td>Observe and identify the nature of Molluscans. Trace the origin of the name Mollusca Identify the different habitats of Molluscans</td>
</tr>
</tbody>
</table>
Generalized anatomy of a Mollusc

- Shell
- Mantle
- Digestive gland
- Pericardial (coelomic) cavity
- Open circulatory system
- Buccal region
- Mouth
- Foot
- Nerve cords
- Stomach
- Heart
- Metanephridia
- Anus
- Mantle cavity
- Ctenidium
Tr explains the internal and external structure of Molluscans.

The organ system in Molluscans are well developed with distinct organs to perform life processes.

Tr explains the different metabolic activities.

In the beginning of this class, we discussed people build castles to live but another important reason for building castles was to safeguard the interest of beautiful queens and princess.

Similarly molluscs not only build shells to live but also to protect PEARLS which are very precious.

(Relating to subsumer of the advance organizer)

What are pearls?

Yes, but this pearls are the secretion secreted by a type of Mollusca(PEARL OYSTER).

Like this molluscs have a wide economic application to

| Explain the general morphology of Molluscans. | Recognise the metabolic activities in molluscans |
| Recall as they are used in jewels |  |
MOLLUSCANS - ECONOMIC IMPORTANCE

PEARLS

POULTRY FEED

Jewellery
human beings
Tr list out the economic importance of molluscans with the help of computer slides and specimens Picture5.50

Observe and appreciate the role of molluscans in our daily life.

Phase Three: Strengthening Cognitive Organization
a) Relate new information to advance organizer

<table>
<thead>
<tr>
<th>Teacher. Explain the characteristics of phylum Mollusca</th>
<th>Student Summarizes the major attributes of phylum Mollusca</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher. Why do we compare shells to castles?</td>
<td>Student. Relate new information to advance organizer.</td>
</tr>
</tbody>
</table>

b) Promote active Receptive Learning

Teacher asks review questions based on the topic taught.
Module -11

Sub-unit 11; Phylum - Echinodermata

Lesson Plan; 11

Syntax

Phase One: Presentation of Advance Organizer

a) Clarify aim of the lesson

In our previous class we have learnt the characteristics of phylum Mollusca. In today’s class let us study the unique characteristics of another interesting phylum Echinodermata.

b) Present the Organizer

Type of Advance Organizer - Comparative
Form of Advance Organizer - Verbal

Picture 5.51

Advance Organizer

“As spiny skinned fruit make the salad tasty, spiny skinned invertebrate make the soup tasty”
c) Relate Organizer to student's knowledge

(i) Identify defining attributes

Tr helps the students to identify defining attributes in the statement by asking the following questions

- What are your observations regarding the statement presented?

(ii) Give examples

All of us like food that too if it is special different from our routine menu at home.

Tr: Which are the food items you like the most?

Tr notes down the responses of students on the black board.

(iii) Provide multicontext

We use different ingredients to cook delicious food like plants products, animal products depending on vegetarian or non-vegetarian food we are preparing.

(ix) Prompt awareness of relevant knowledge

We have usually seen people preparing soups using vegetables like Tomato, Com or mixed vegetables and also if we are non-vegetarians we prepare soup out of chicken stock.

But you will be surprised to hear that one of the species under invertebrates are used in soup preparation in China. Let us try to know the characteristics of this phylum to which this organism belong to in today's class.
ECHINODERMATA

STARFISH

BRITTLE STAR

SEA CUCUMBER

SEAurchIN
Phase Two; Presentation of learning Task

(f) Organization of the new material

- Origin
- Habitat
- Morphology
- Life processes
- Economic Importance

(b) Make logical order of learning material

- Specimens (origin)
- Chart/ computer slides (habitat)
- Chart/ computer slides (Morphology)
- computer slides (economic importance)

(g) Presentation of material and engage students meaningful learning activities.

<table>
<thead>
<tr>
<th>Teacher Activity (Learning Experiences)</th>
<th>Pupil Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tr exhibits specimen of species belonging to phylum Echinoderm Observe the nature of these organisms. It is spiny; hence the name Echinoderm is given to them. The word Echinoderm has a Latin origin. Echinoderm - spiny Picture 5,52 (Relating to subsumer of the advance organizer) Tr explains the habitat of</td>
<td>Observe and identify the nature of Echinoderm.</td>
</tr>
<tr>
<td>Tr explains the habitat of</td>
<td>Trace the origin of the name Echinoderm</td>
</tr>
<tr>
<td></td>
<td>Identify the different habitats of Echinoderm</td>
</tr>
</tbody>
</table>
ECHINODERMATA- MORPHOLOGY

- TUBE FEET
- PINNULE
- ARM
- FOOD GROOVE
<table>
<thead>
<tr>
<th><strong>Echinoderm. Pictures.53</strong></th>
<th><strong>Tr explains the general morphology of Echinoderm.</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tr explains the internal and external structure of Echinoderm</strong></td>
<td><strong>Describes the metabolic activities in Echinoderm.</strong></td>
</tr>
<tr>
<td><strong>Pictures. 54</strong></td>
<td></td>
</tr>
<tr>
<td>The organ systems in Echinoderm are well developed with distinct organs to perform life processes.</td>
<td></td>
</tr>
<tr>
<td>Tr explains the different metabolic activities with special reference to water vascular system.</td>
<td></td>
</tr>
<tr>
<td>In beginning of this class we said about soup prepared by spiny skinned invertebrate,</td>
<td></td>
</tr>
<tr>
<td>Similarly Echinoderm are not only used in preparation of food but has many other applications in day today life. (Relating to subsumer of the advance organizer)</td>
<td></td>
</tr>
<tr>
<td>Tr list out the economic importance of Echinoderm with the help of computer slides and specimens</td>
<td></td>
</tr>
<tr>
<td><strong>Picture5.55</strong></td>
<td><strong>Observe and appreciate the role of Echinoderm in our daily life.</strong></td>
</tr>
</tbody>
</table>
ECHINODERMATA- ECONOMIC IMPORTANCE

BIOLOGICAL INVESTIGATION

SEA CUCUMBER SOUP

FERTILIZERS
Phase Three: Strengthening Cognitive Organization

a) Relate new information to advance organizer

Tr, Explain the characteristics of phylum Echinoderm.  
St Summarizes the major attributes of phylum Echinoderm.

b) Promote active Receptive Learning

Teacher asks review questions based on the topic taught.