PEDAGOGY OF BIOLOGICAL SICENCE PART – 2

(PONDICHERRY UNIVERSITY)

STUDY MATERIAL

UNIT -3

Dr. THANDAVAMOORTHY. M,

ASSISTANT PROFESSOR,

VASAVI COLLEGE OF EDUCATION,

MADAGADIPET, PUDUCHERRY,

CONTACT: 9489391166.

UNIT – 3

Teaching resources

Syllabus: ***Machine operated aids:*** *Overhead projector, digital projector, smart interactive board.*

Non– Machine operated aids: *Graphical aids: flash cards, charts, flip chart, graphs, pictures, poster, and cut–outs and its effective uses. Display Board: chalkboard, bulletin, flannel, magnetic, peg board and its effective uses. 3D aids: objects, specimens, models.*

Our senses are gateways to acquire knowledge. These receptive mechanisms vary in their functions as much as the individuals themselves. The receptive mechanisms feed us the necessary data, the sensory impressions. The natural way of learning by children is principally through the employment of senses.

Sensory experience forms the foundation for intellectual activity and learning. For long, the common practice to communicate knowledge has been by means of written and oral language. But language has many limitations that may contribute to learning difficulty. The modern educators recognize such basic values as concreteness, enrichment, clarity and dynamic interest in audio-visual materials.

The number of aids for teaching has become so numerous that even the most abstract can now be presented to the pupils in a concrete way by means of more than one aid. All the teaching aids that come under audio-visual aids can be broadly categorized under two heads namely machine operated and non-projected aids. They are further classified ad follows.

I - Machine Operated aids

When a projected aid is used an enlarged image of the material is projected on a screen kept at a distance from the projector. The room is either totally or partially darkened. A machine operated aid is bound to be more effective than non machine operated aids and since a darkened room reduces distraction and the bright image on the screen secures the attention of the audience easily. Colour will make the aid more attractive; motion will make the aid and more dynamic; and motion associated with sound will be more effective and attention-compelling than the non machine operated aids.

A machine operated aid is suitable for large groups as well as small groups. The projected image could be made large and bright to enable everyone in the large group perceive details. The

following are some of the machine operated aids which can be used in teaching any subject especially biology.

1. **Over head projector (OHP)**

In OHP the projected images is behind and over the head of the speaker or teacher. In overhead projection, a transparent visual is placed on horizontal stage on top of light source. The light passes through this transparency and then is reflected at an angle on to the screen at the back of the speaker or teacher. OHP is not a new one and it was used in World War II for teaching the recruits in armed services.

Advantages:

- It gives large image. The teacher can always face the students. This can be used even in lighted room.
- Its weight is less and it can be used with flexibility and versatility. It can be used for personalized presentation.
- Transparencies or OHP sheets are prepared form tri-acetate films rolls of minimum thickness.
- Matter can be permanently written on acetate sheets using quill or ruling pen or rapid mat pen with special Indian ink or acrylic markers with special inks,
- Acetate sheets may be cleaned with sponge dipped in detergent or soap solution.

OHP can be used for the presentation of material in step-by-step fashion and sectional fashion using overlays. Small live aquatic animals may be kept in a flat glass dish and get projected. Leaf profiles, flower petals and details can be projected. Even dynamic demonstrations can also be shown.

2. Projector

The teacher can show the students slides, filmstrips and film and make the teacning interesting with the help of the projector.

Types:

Slide projector

Slides are projected by an instrument equipped with a powerful light source in a lamp house and carriers for holding slides of suitable sizes. It is a simple mechanism and the essential elements in it are the same as in filmstrip projector. Usually a double slide carrier is fitted in the projector so that when one slide is being projected on the screen, a second slide, the first slide can be removed and another inserted in its place. There is a thumb mark or guide marker on the upper right hand corner of each slide.

Film projector

Film as an aid to teaching is inferior to direct experience. But in some cases film will be able to provide the expected learning outcome better than even direct experience. The bright image on the screen with the associated sound is more realistic if it is in colour. It provides a vivid, dynamic visual presentation.

Advantages: It is easy to convenient to use. It takes up little space and can be stored easily in a container. It is expensive. It can be used at any desired place while teaching. It can be used effectively even in semi-darkened room.

Micro projector

It is specialized projection equipment designed to project microscope slides to a class of pupils at the same time, during the teaching learning process.

Advantages: It is minimize the need for expensive microscopes for each student. It present greatly enlarged picture of the project on the slide. It assures the teacher that his pupils are seeing precisely what he wants to see.

Movie projector

Sound motion picture enables to recreate in the class room, events, actins or processes occurring anywhere in the world. May real experiences may be shared. The special techniques such as slow motion, animation, close-ups, microscopic and telescopic photography employed makes it more realistic and concrete.

Advantages: it combines light and sound, compels attention through to use of motion and direction sight. It helps to recreate the past provides common experiences, provides a continuity of action, overcomes may physical limitations and may be used for testing.

3. Smart interactive board

An interactive smart board, also known as an electronic whiteboard, is a classroom tool that allows images from a computer screen to be displayed onto a classroom board using a digital projector. The teacher or a student can "interact" with the images directly on the screen using a tool or even a finger.

With the computer connected to the internet or a local network, teachers can access information around the world. They can do a quick search and find a lesson they used previously. Suddenly, a wealth of resources is at the teacher's fingertips.

For teachers and students, the interactive white board is a powerful benefit to the classroom. It opens up the students to collaboration and closer interaction to the lessons. Multimedia content can be shared and used in lectures, keeping students engaged.

According to a recent article from Yale University, interactive lessons presented on a smart board or white board increased student engagement. The technology encourages active learning in students. Students asked more questions and took more notes, enabling more effective group activities like brainstorming and problem-solving.

More and more teachers are using smart board technology in the classroom. Here are five ways teachers are engaging with students using this technology:

a) Presenting Additional Content on the Whiteboard

The whiteboard shouldn't replace teaching or lecture time in the classroom. Instead, it should enhance the lesson and provide opportunities for students to better engage with the information. The teacher has to prepare additional materials that can be used with the smart technology before class starts – such as short videos, info graphics, or problems the students can work on using the whiteboard.

b) Highlight Important Information from the Lesson

Smart technology can be used to highlight essential information as you work through a lesson. Before the lesson begins, you can outline the sections to be covered in class. As each section begins, you can break down the key topics, definitions, and critical data for students on the whiteboard. This can also include graphics and videos in addition to text. This will help students not only with note taking, but also to review future topics you will be covering.

c) Engage Students in Group Problem Solving

Center the class on problem solving. Present the class with a problem, and then pass over the interactive whiteboard to the students to let them solve it. With the smart board technology as the center of the lesson, students can better collaborate in the classroom. The digital technology unlocks the internet as they work, allowing students to connect the lesson to technology they use every day.

d) Answer Student Questions

Engage the students using the interactive whiteboard and questions from the class. Look up additional information or data using the smart technology. Write the question on the whiteboard and then work through the answer with the students. Let them see how you answer the question or pull in additional or data. When you are finished, you can save the results of the question and send it to the student in an email for later reference.

Smart board Technology in the Classroom

For schools struggling to connect students to classroom lessons, or keep students engaged, smart technology like interactive whiteboards is an ideal solution. An interactive whiteboard in the classroom provides students with the technology they know and understand. It enhances collaboration and invites interaction with the lesson. Afterwards, students can see how the technology they use connects to the lessons they learn in school.

II - Non Machine Operated aids

These aids are the form of visuals that cannot be projected using an equipment. They convey meaning mainly through relatively conventionalized symbols that are nearer to reality, perceptually than verbal symbols. The following are some of the non machine operated aids that could be used in the teaching of biology.

1. Graphic Aids:

The primary function of a graphic as a teaching-learning aid is to serve as a more concrete referent to the object being discussed in the class. When the object being discussed is not at hand, then the best referent is a visual representation of it. Even when it is at hand, visuals of its various aspects and its structure are useful referents. For example, when telescope or compound microscope is being discussed, visuals of its structure are extremely useful aids. Similarly, during the teaching learning of human eye, Van-De-Graff generator, nuclear reactor, electric generator and motor, etc., visuals of its appearance from various angles and its internal structure are very effective for learning. Obviously, for most effective communication, one must use the most realistic visuals available.

Visuals are used very often as iconic representations of objects. Railway stations, roads, bus terminals and airports cater to people of all strata, from totally illiterate to highly literate people, and people of all nationalities. Universal icons representing various objects have been developed, so that no language is necessary to explain them. Similarly in science, we use various symbols of different electric and electronic devices and symbols for various elements in chemistry.

(a) Flash cards

The flash cards are compact visual aids. Teaching can be made more meaningful and interesting with the help of flash cards. The flash cards are approximately 10x12 inches in size which are flashed before the students to get their attention and to emphasis important points in the lessons. They should contain brief and stimulating messages. The message should contain brief and stimulating messages. The message should be presented in step by step manner for its easy understanding. The number of cards should be restricted to ten or twelve in a period.

The flash cards may be prepared by just writing the contents on a card or thick plain paper. A large piece of cardboard can be purchased and cards of 10 x12 inches or 4x4 inches shall be cut from it. The lettering on these cards may be written simply and legibly. Nowadays alphabet stencils of different sizes are available in the market which can be used to write letters on these cards. Attractive figures, diagrams, illustrations, cutout pictures and cuttings from magazines can be made use of it the preparation of flash cards.

(b) Charts

Charts of different types can be prepared by the learners with a little help from teacher depending on the teaching-learning objectives to be achieved and the need of the subject matter. Charts help in effective representation of the subject matter which is in the form of data, diagram, etc. Those charts which cannot be prepared locally may be procured from various educational centers.

Charts depicting pictures of great scientists, instruments, equipment used in industry, industrial processes, etc. could be used as teaching aids. But the pictures used should be of reasonable size, so that it is visible to the whole class. They should not be overloaded with information to avoid distraction of the learners to unnecessary parts. Pictures or portraits of great scientists displayed in science laboratories not only give proper scientific atmosphere to laboratory, but also inspire learners.

The chart should be large; every detail depicted should be visible to every student in the class wherever he is sitting. The chart should not contain too minute details or too much written matter making it necessary for any observer to come near and see. Flip chart and flow charts are two types of charts used for different purposes for them.

Flip chart: a set of charts related to specific topic have been tagged together and hang on a supporting stand. The individual charts will carry a series of related materials or messages in sequence. The silent points of specific topic will be presented.

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

(C) **Graphs**

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

Types:

Pie graph:

These are called as circle diagram. The data are presented thorough the sections of portions of a circle.

- In determining the circumference of a circle we have to take in to consideration a quantity known as pie.
- The surface area of a circle is to cover 360 degree.
- The total frequencies or value us equated to 360 degree and then the angles corresponding to component parts are calculated.
- After determining their angle, the required sectors in the circle are drawn.

Bar graph:

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

Line graph:

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

Pictorial graph:

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

(d) Pictures

These may be hand drawn or photographic reproductions which are self explanatory. Good picture should have good quality, good composition, good contrast and sharpness, effective colour and should communicate the idea clearly, they are complete by themselves and do not require any lengthy explanations. These are a still opaque representation of a scene or object or plant or animal. Such pictures costless are readily available and can easily be made and used; but often they are of small size, lack depth and motion. Worthwhile pictures can be

preserved for future use by suitably mounting them on a backing surface. The usual way of fixing a picture is to make use of gum or rubber cement on the baking surface and placing the picture on it and pressing it uniformly. Dry mounting is another method of permanent mounting.

(e) Posters and cutouts

Printed posters on various science concepts and life history of scientists are available from science publishers. These can be used as a resource in teaching scientific concepts covered in the school syllabus. If a desired poster is not available, teacher should endeavour to make one for her with the help of students. For example, a good large-size poster of Periodic Table and Electromagnetic Spectrum will be of good help in teaching-learning of science.

Advantages of poster

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

Cutouts

Cutout animation is a form of stop-motion animation using flat characters, props and backgrounds cut from materials such as paper, card, stiff fabric or even photographs. The props would be cut out and used as puppets for stop motion.

Uses

Farm Friends **cut-outs** are perfect for **use** in a variety of classroom displays and themes, including science, plants, animals, and life on the farm. They also make perfect decorations for a child's party.

2. Display boards

(a) Chalk board

The chalk board is also called black board. The teacher can vitalize teaching through good, clear, well proportioned illustrations developed in the presence of students, making good

use of coloured chalk to emphasize or differentiate specific points, aspects or details. The modern chalk board is not black but made in different colours, mostly in pleasing green.

Chalk board provides a very convenient surface where the teacher can develop subject matter visually in a manner and at a pace to suit the subject and the students.

Ground glass board is the ideal board for the modern classroom. The construction is easy and very little effort is necessary to write on the same. It can be made in a variety of colours.

The chalk board should be so positioned that the surface is well lighted and the entire surface will be in full view of any student seated in the last row and any teacher of average height will be able to reach any portion of the board easily.

The chalk board can be used to write assignments, spelling lists, definitions, outlines and summaries. Facts ideas and processes can often be illustrated with the help of drawings, sketches and other visual symbols.

(b) Bulletin board

These are commonly called as notice boards. The modern term for these is display boards. In well designed modern school buildings, there are extensive bulletin board spaces in classrooms, display cases located at vantage points, teaching walls made up of folded sliding panels which can be extended to form a partition between one classroom and another and it the same time provide a lot of display space, etc.

The bulletin board should be near the laboratory or science room. A side from providing vitalized material, which supplement other sources of information, and as an effective motivational device, it provides opportunity for developing creativity, responsibility and other abilities in the students.

Any information to the students can be put up in the bulletin board. Maximum educational value is derived if the students are made in charge of it and the teacher acts as a guide.

(C) Flannel Board

In the modern age flannel boards have special importance. These are prepared by mounting a flannel cloth very tightly on 18”x24” or 36” x48” piece of plywood or hard board.

Then, on it, various pictures, maps, sketches and graphs etc. related to different subjects are displayed. In order to display on the flannel board, sand papers are pasted in the back of the pictures maps etc. This makes these pieces sticking to the flannel board.

After using them these can be removed easily or retained for future use. These flannel boards can be used vary conveniently for teaching language especially foreign language and mathematics to the lower classes and history, geography, civics, economics, maths and science to the higher classes. Hence every teacher should use this instrument as the need arises.

(d) Magnetic Board

A magnetic board will be useful to show the relative movements between elements of visuals. A magnetic chalk board becomes more versatile due to the additional facility of visuals that could be made using chalk. A sheet of iron that attracts pieces of magnet can be used for magnetic board. Steel backed chalk boards specially provide the added utility of a surface that can be used either for chalk board or magnetic board or both in combination can be installed. Small ceramic magnets can be fixed to the back of the display cutouts by fevicol.

Pockets of thin sheets may be pasted at suitable locations on the back of the display, proper size ceramic magnets could be inserted in pockets, when display is to be used. This will enable use of several displays without purchasing large number of magnets.

(e) Peg Board

A board having a regular pattern of small holes for pegs, used chiefly for games or the display of information.

One main use of a pegboard is to improve fine motor skills. For toddlers, this task does not come so easy. To grasp the peg and successfully place it in a small hole is a big accomplishment for most toddlers. Practicing and learning how to do this task improves hand-eye coordination and fine motor skills.

Another use of a pegboard is to teach early math skills. Math doesn't need to be taught by writing numbers down on a piece of paper, it can be learned by other means. With a pegboard, toddlers learn basic math skills such as matching and sorting by making patterns and placing pegs in a sequence. Toddlers will also learn other basic math functions such as counting how

many pegs are on the board. This builds a foundation for future math skills that will be learned later in life.

Pegboards can also generate a lot of concentration. Manipulating pegs on a board can prove a challenge for most toddlers. A lot of focus is needed to make the connection and it can be very rewarding to manipulate the pegs right. Therefore, using a pegboard can increase concentration and independent play.

3. 3 Dimensional aids

(a) Objects

The objects represents the concrete, direct, first hand experiences. Objects in the classroom instruction by educators to improve students' understanding of other cultures and real-life situations. Any concrete object shown to students will enable them to have a correct concept of the object.

Uses

As an addition to other forms of classroom materials, teaching with objects offers a direct, tactile experience for students. Teaching with objects is also a powerful way to facilitate concept learning, the skill of classification which helps children develop high levels of reasoning and assessment abilities.

(b) Specimen

Specimens are objects that are representative of a class or group of similar objects. An individual animal, plant, piece of a mineral, etc. used as an example of its species or type for scientific study or display.

Uses

They provide the means for establishing correct initial concepts in the minds of the pupils. A specimen is a sample or a part of an object-for example, a piece of coal, a piece of marble, the skin of a bird, a leaf, or a piece of mineral.

(c) Model

In the absence of direct experiences teachers use models and mockups. Such teaching aids provide contrived experiences. A contrived experience is a simplified experience through a model.

The use of models for teaching purpose should be definitely being highly effective. Models are concrete objects, some considerably larger than the real object, some small replicas of objects which are too large to be seen as a whole, mostly three dimensional or sectional to explain clearly the structure or functions of the original. In many cases working scale model of the original are used where the specific action of the original is duplicated and could be explained easily. Models offer a kind of short cut or substitute for the real things and sometimes models can be more effective than reality. An object is a real thing but a model is just a recognizable three dimensional representation of it.

It is possible to easily explain the structure, function and working of the original using the model.

Models may be static or working. Static models are the models which the teacher or the students can use but they cannot move by themselves. Working model is one which functions and enables the students to learn by its working. A working model will secure immediate attention and will serve as motivation. Interest stimulated could be utilized to fullest advantage.

<><><><><>