Biology Teaching Aids

TEACHING AIDS IN BIOLOGY

The enterprising teacher will develop many teaching aids from the local environment which will be more or less adapted to his particular teaching situation. Teaching aids must be considered in the light of their adaptability to local teaching needs, the learning needs of the pupils, the financial ability of the school system to purchase these aids, and the local resources, such as electricity, gas, suitable rooms and funds for the operation of such equipment. The so-called "visual aids," like the microscope, stereopticon, opaque projector, micro-projector, stereoscope, films, graphs, charts, and general equipment of the laboratory, are necessary adjuncts in order to help for better learning situations and for better teaching.

Teaching aids help to stimulate the interests of the pupils, help the students form correct concepts, develop their powers of observation, extend their powers of vision, economize their time and energy in learning, stimulate and cultivate the imagination and above all, develop an appreciation of the culture of the past by inculcating a different perspective of the things they observe through the scientific method.

Teaching aids can be listed as follows:

1. Visual Aids:

a. Micro-projector
b. Stereograph
c. Stereoscope
d. Stereopticon
e. Opaque projector
f. Field Trips
g. Models
h. Biology Clubs
i. Projects
j. Graphs
k. Pictures
l. Charts
m. Lantern Slides
n. Bulletins
o. Pamphlets
p. Aquaria
q. Terraria
r. Museums
s. Microscopes
t. Microphotographs
u. Motion Picture Films
v. Experiments
w. Demonstrations
x. Text Books
y. Class Newspaper
z. Library
aa. Book Reports
bb. Book Reviews

2. Pedagogical Aids:

a. Scientific Method
b. Problem Method
c. Project Method
d. Dalton "Contract" Plan
e. Lecture Method
f. Demonstration Method
g. Inductive-Deductive Method
h. Socialized Recitation

All teachers should learn how to use their aids so as to benefit their pupils to the fullest extent. All teachers should therefore learn how to modify their present equipment to meet their needs and those of the pupils they teach.

This column has been projected as a clearing house for teachers to send articles, telling others what they are doing to simplify, revive and renovate these teaching aids, "visual aids," techniques and demonstrations for their own use in their respective localities.

Please send all contributions, questions and answers to

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THE VIVARIUM

Vivaria are a necessary adjunct to every biology laboratory. For the past

year one in particular in my laboratory has created an unusual amount of interest among my students and several of the faculty members have passed favorable comments on it. These plants do attract attention for many individuals have never seen them for they do not go to conservatories or supply houses where such plants are grown.

For a very small sum a vivarium can be purchased or an old aquarium might be substituted. Two inches of humus is placed in the bottom, built up slightly in back; in this the small plants are planted. In our vivarium we have woodland ferns, table ferns, creeping snow berry, moss, club mosses, liverworts, and sedum. The very prolific growth of these plants give the appearance of the floor of the woods with their denseness and greenness.

The care of this type of equipment is appreciably negligible. This year our vivarium has been watered just twice. No fungus has appeared thus far. One is warned to watch for fungus growth and remove it as soon as it appears.

Such equipment can be most helpful in biology. In the study of the life histories of ferns and mosses the leafy fern sporophyte, the leafy moss gametophyte, and the leafless moss sporophyte with the sporangium can be pointed out and observed. The real plant makes this work much clearer to the student than by just using charts to explain these structures. Then, too, the various types can be understood and remembered much easier when a student has seen them as well as studied about them. Transpiration of plants is no longer doubted for the sides of the vivarium give evidence of it daily.

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CULTURING INVERTEBRATES

AQUATIC SNAILS (*Gastropoda*)

Aquatic snails may be found in most streams, permanent ponds, and lakes. They are usually found on either living or decaying plants.

Small jars (glass) are best for keeping snails. Three to five in a bottle. The water must be changed daily.

Lettuce or bits of decaying leaves may be used as food. Care should be taken to not allow the food to become sour.

Some aquatic snails will do very well in a balanced aquarium.

CENTIPEDS (*Chilopoda*)—SOW BUGS (*Cylisticus convexus*) LAND SNAILS (*Gastropoda*)—SLUGS (*Gastropoda*)

These animals are usually found in cool, moist places, especially under dead leaves, boards, stones, etc.

While bringing the animals into the laboratory, much care should be taken to keep them moist, since drying will kill them quickly.

It has been found that a shallow glass dish $2\frac{1}{2}''$ deep is most satisfactory for keeping the animals. Place the animals in dishes half filled with moist soil, or preferably moist peat, and cover with plate glass. Peat is better than soil, since it does not sour as quickly as the latter.

Decayed leaves, bits of apple or bananas, or lettuce proved to be satisfactory food materials.

Bark or small bits of wood placed on the top of the soil or peat will serve as hiding places.

Crayfish (*Decapoda*)

Crayfish from ponds or lakes thrive best in the laboratory. They may be kept well in shallow jars which contain one or one-and-one-half inches of water.

They will eat chopped beef, bits of apple, and lettuce, but seem to prefer apple seeds, which they eat very readily.

Grasshopper (*Insecta—Ortheoptera*)

Collect in open fields in late summer or fall before the frost comes. Do not place in containers with crickets as the latter will soon kill and devour them.

In the laboratory place in a box container which has screening on the sides and a bottom suitable for holding soil. The soil will also aid to keep the container dry. The container should be placed in a position where a little sunshine will strike it.

Grass, seedlings or lettuce are good food materials. A dish of water is also necessary.

Mating occurs very often and may be observed.

Leeches (*Hirudineae*)

Leeches of many species may be collected and kept in the laboratory for a considerable time. They may be used as food for fish or for experimental laboratory animals.

Leeches are found between leaves of water plants such as cattails, often at the water line, sometimes at the base under stones. Many times they are found on leaves which have sunk to the bottom. Turtles provide a very good host for these forms. Occasionally frogs are found which have leeches attached to them.

Fresh, bloody meat may be used as bait for catching leeches. Attach a string or wire to the meat and leave in the marshy area of a stream, lake, or permanent pond for a few hours or over night.

Four of five leeches placed in a pint food jar, three-fourths filled with water, will live for a considerable length of time. A *small* amount of grass may be added to the water. Most leeches will thrive well on Tubifex, and also earthworms, which have been chopped fine.

Fresh-water Mussels (*Sphaerium*)

Prepare a bowl for these animals by putting in a small amount of sand and filling it half-full of water. If water which is known to contain Protozoa can be obtained, it should be used, since the food of these animals consists of protozoans and bacteria. However, if such water cannot be obtained, a protozoan culture should be started and used to feed the Sphaerium.

These animals may be placed in an aquarium where they can be observed half buried in the sand.

Water Scorpion (*Nepidae*)
Back Swimmer (*Notonectidae*)

Many of these insects are found in the plants along the sides and the bottom of slow moving streams and ponds.

Place the insects in half-pint food jars, half filled with pond water, containing a small amount of growing plants—Elodea or Netella. Cover the jars with a fine mesh screen.

The water should be changed once a

week and fresh pond or aquarium water added.

Tubifex or small earthworms chopped fine should be fed daily. Small minnows or insects can be used as food also.

Earthworm (*Annelida*)

Earthworms may be found in moist humus.

These may be kept for long periods of time, if kept in suitable containers such as one-gallon tin cans which may be obtained from most any restaurant. Holes should be punched in the bottom of the cans with *tacks,* not nails, since the worms will escape if the holes are too large.

The soil in the bottom of the can should be kept moist, but not wet since the soil will quickly sour. The holes in the bottom will aid in taking care of excess moisture.

Place dead leaves or coffee grounds on the top of the soil occasionally.

Glass jars will not work well.

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turned onto a glass plate covered with glycerine. Cross walls must be built into the cells illustrating late anaphase and telophase. After drying for several days the set can be turned over and the faces completed.

A filler does not have to be used in making the cells but it makes the finished product much lighter than solid clay or pure asbestos. A filler is particularly desirable when large cells, such as are seen in the Amphioxus set (illustration), are modeled.

Fine wire, the kind that is used in making paper flowers, can be inserted on the face in spindle-form as spindle fibers. Spireme threads and forming chromosomes are made of cord or fine beads strung on wire. These can be prepared while the backs of the cells are hardening, and will be ready to insert when the faces are designed.

Many common objects can be used as modeling material. Small spongy rubber balls (2 for $0.05) form the base for most of the models, representing the early embryological development of the frog (illustration). They were mounted on wires, covered with clay, grooved, and painted. A small hollow rubber ball was halved and used as a base for the blastula.

Undulating membranes for trypanosomes can be cut from celluloid and the stuffed enameled fingers of a soft rubber glove form excellent pseudopodia for an arcella, the shell of which is modeled in a small deep saucer.

There are many tricks to the trade, it seems, but when all is said and done, modeling is easy. The resourceful and persevering student, besides learning much that is already known, will make discoveries. He will find new methods, new materials, new modes of expression well worth recording. He will develop a fruitful interest in science.

These few suggestions may serve as a stimulus to the beginner. Instructors might advise students to start modeling something in which they are interested and which they can make. After a modeling project is undertaken, the teacher should not permit the student to stop until the model has been completed, for it is the mounting and the enameling and the last clever finishing stroke that bring satisfaction and success.