

## LECTURE-DEMONSTRATION-RECITATION- TECHNIQUE IN BIOLOGY TEACHING

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Results of carefully prepared tests have demonstrated that, in so far as fact-getting is concerned, lecture-demonstration methods of biology instruction are superior to laboratory methods. Taking this fact on its face value incurs dangers that need to be pointed out, especially to the young teacher. These dangers emphasize the necessity for a recognition of the definite aims of teaching in biology and of the steps that must be taken by the student in realizing these ends of education. Then should follow the employment of a technique devised to accomplish a specific purpose.

The devotion to the laboratory has, at times, assumed the proportions of a fetich. Faulty pedagogy in connection with insistence upon a certain kind and definite amount of laboratory work has retarded the acceptance of biology in the high school and probably, to some extent, in the college as well. Several misapprehensions of the functions of the laboratory may be pointed out. 1. That the chief facts of a science should be rediscovered in the laboratory. 2. Feeling that the scientific method consists in the observation and recording of facts. 3. Slavish dependence upon outlines and manuals as true laboratory procedure.

The importance of the laboratory in training in science must not be under-estimated. A rational perspective should be set up in order that we may properly evaluate laboratory practice in any given situation. Much time is wasted in the use of the compound microscope in high school classes. The proper use of the projection microscope recommends that instrument highly for the biology work in any grade of school. The laboratory, however, has functions which are clearly and exclusively within its own field as a medium of instruction and training. True functions of the laboratory may be stated as follows: 1. To make clear facts that are not easily visualized without concrete individual demonstration. 2. To give skill and accuracy. 3. To give an appreciation of the scientific

method. 4. To get pupils to think. The laboratory method is the method of research. It is the slowest possible way of getting facts. For this reason, where information is the main objective, the lecture-demonstration-recitation method, being more economical, and at the same time more effective, should be the chief means used.

The excessive use of the lecture method has been the target for criticism for centuries. Socrates warned against its dangers. A number of valid objections can be filed against this method, even as it is used freely in the colleges today. Aside from the pernicious effect which results from a slavish devotion to this method, directly, the high schools suffer, as an indirect result, from the effects of similar methods used in these schools by teachers, just out of college, who, consciously or unconsciously, imitate their college teachers. Quoting from Dr. T. W. Galloway, "In my opinion, the most effective teaching of biology today is being done in the best high schools by teachers who have been forced to acquire a pedagogical background that would enable them to reconstruct completely their presentation of the subject. Most of these people received very little help in this task from their college courses in biology. For this reason every college teacher will profit by what has been written by the secondary school teachers." The notion, which is quite prevalent, that scholarship is the only prerequisite to successful teaching has done much harm. Says Paul Clapper under the heading, "Professional training for college teachers", "'We consider the Ph. D. a scholar's degree and not a teacher's degree,' says the dean of one of our leading graduate schools. He (the teacher) needs to know the learning process. He needs to know the different methods and aims in the teaching of his subject and, so far as possible, the results attained by each. Too much of the college teaching is blind, groping, chartless and without compass. Instead of expecting each inexperienced teacher to start afresh, he should be set out armed with the epitomized and digested teaching experience of those who have gone before him."

The term, "lecture-demonstration-recitation" has been chosen purposely to call attention to a method of procedure which presupposes in the teacher a knowledge of

subject-matter and specific aims, a recognition of mental equipment and thought processes of the pupil and the employment of a technique particularly suited to the solution of the problem at hand. The teacher's method should be sufficiently flexible and ingenious to avoid the defects which call forth the valid criticisms of the lecture method. It should encourage pupil activity. Subject matter should be presented in such a way as to leave permanent impressions. The instructor should, at any time, be able to test the accuracy of the student's conceptions and to judge the efficiency of his own methods. This calls for contact between pupil and teacher.

Efficient technique demands a plan, organized about a main purpose, for every class exercise. This requires selection in advance of subject-matter to be presented, illustrative material to be used and, in general, the questions that are to be asked to determine the student's reaction.

As a source of illustrative material, I have found the projection lantern, with specially selected slides, made-to-order slides and home-made slides, almost limitless in possibilities offered. Ordinarily, it is cheaper to buy slides of a reliable slide-maker than to make them. Diagrams and charts made by students may be photographed and the lantern slide positive plate made from the camera negative. In the same way, diagrams and pictures from books may be copied on lantern slides and made a part of the permanent equipment of the department. Photograph negatives of illustrative views from the field may be used directly in making lantern slide positives. A camera using 4"x5" plates or films should be a part of the equipment of every biological department. If copying is to be done, an additional long-bellows camera will be needed for dark-room use.

Modern projection equipment makes it possible for the instructor to operate his own lantern while in a convenient location for speaking. There are two methods of projection of this sort which recommend themselves from the fact that the room need not be darkened. If the medium-sized lecture room is approximately square, an ordinary projection curtain may be placed across the



darker front corner of the room and the lantern near the middle of the opposite side. A small metal pointer may be used on the front side of the slide. I use a 1,000 watt mazda lamp with resistance, with a combined opaque and slide projector. It is not necessary to draw the shades unless the opaque projector is used.

The translucent screen provides a second and superior means of daylight projection. Any lantern can be equipped with a projection lens of  $4\frac{1}{8}$ " focus together with a suitable condensing system at small cost for this class of projection. An excellent translucent screen may be made of tracing cloth coated with paraffine on both sides. The paraffine is melted and xylol is added to prevent immediate hardening upon cooling. A thin coat is applied with a brush. As the xylol evaporates, the surplus of the wax should be wiped off with a soft cloth. If necessary, use some xylol on the cloth used for wiping. The screen may be bound by sewing on one inch cotton braid. It may be fastened to a frame by means of  $\frac{3}{4}$ " snap fasteners. It should be remembered that water will ruin tracing cloth.

The natural psychological process requires that a new topic be presented first as a vague whole. Then should come an analysis, a separation into its parts and a definition of details. Then finally there should be a synthesis consisting of a bringing together of component parts and related details in such a manner as to make clear the relationships of parts to the whole.

With a lantern which can be turned on or off without any attendant fuss of manipulating window shades or directing an assistant, suitable diagrams, photographs or drawings may be thrown on the screen for general impressions; then these can be brought back later for details and summary.

Microscopic detail can be best shown, in so far as class demonstration is concerned, by means of slides made from microphotographs. The proper use for the high power projection microscope is in a dark room where small groups may be taken for special demonstration.

Technique of asking questions calls for skill in setting up situations for questions as well as in questioning. The

development method is here called into use. There is contact with the student. The teacher sees the results of his teaching and the student is trained in habits of systematic thinking and concentration.

The traditional examination for testing the results of instruction, being a test for what is temporary and accidental, is not a safe criterion, in itself, by which to judge the progress of a student. Rating should be on the basis of socially useful knowledge acquired and power gained. The latter is indicated by the facility with which a student is able to interpret situations and solve problems. I have been using a system in my classes which has proven helpful to me as well as to the student. As the course progresses, mimeographed sheets of questions, prepared according to the development method, are given out and used as a basis for quiz periods. They are also used as a basis for all of the written tests of the term. At any time in the term the student has not only a complete record of work covered but also a record of the method by which the different topics were developed. The practice may be open to criticism, but as a device, it has many good points in its favor.

It seems obvious that no one method should be used to the exclusion of other methods of instruction. Effective technique employs different methods. It recognizes the aims of the course and the mental maturity and thought processes of the student, and uses such methods as are best suited to bring about the desired results.