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Although much emphasis has been placed, in professional journals, science textbooks and teacher training programs, on the inquiry method of teaching, the inquiry teaching concept has achieved only a limited acceptance in secondary schools. Esler (1970) lists several reasons for this apparent lack of success:

1. There is a more in-depth understanding of subject matter required of of the teacher.
2. It is often necessary for the teacher to accept a new and alien position as an indirect, integrative leader.
3. Additional, difficult-to-master skills are necessary for the teacher. These skills are those of asking good questions and administering selective reinforcements to student response.
4. There are many failures by teachers in early attempts at conducting inquiry lessons.
5. The students do not know how to react to the new and strange atmosphere of inquiry.

These difficulties may explain, to some degree, the lack of general acceptance of the inquiry teaching approach in science classrooms.

Biology courses developed by the Biological Sciences Curriculum Study were designed to be laboratory centered and inquiry oriented (Glass, 1969). However, many biology teachers attempt to use BSCS materials without ever implementing the BSCS philosophy, and thus a major goal, teaching science as process, is never attained. Teaching the process of science is important in that the student is allowed to use his mind and develop critical thinking skills that are generalizable to other types of situations.

Although laboratory experiences of an investigative nature should be emphasized in biology courses, there are other means to involve students in inquiry. One means consists of providing students with an opportunity to read, study and critique scientific articles or other reports in order to discover the methods scientists use in solving problems. There are occasions when this can be a challenging activity if employed in the appropriate manner.

Using scientific articles in teaching biology is not a new innovation. Baumel and Berger (1965) provide one approach in which the student is asked to

read a selected article and then answer questions similar to the following:

1. What problem was the scientist studying?
2. What information did the scientist have at hand when he investigated the problem?
3. What hypothesis did the scientist probably have in mind as he planned the investigation?
4. What was the outcome of the experiment?
5. What conclusion was reached?
6. Is the conclusion justified?
7. What simple experiments could you plan that make it possible to confirm the scientist's conclusions?
8. What have you used in your experimental plan that was not available to the scientist?

Benson (1968) provides a similar but more specific approach. In his method students are asked to read a selected research article and relate certain concepts to an upcoming experiment. In both approaches just discussed, the emphasis is on science as process or inquiry.

For teachers interested in using research articles to enhance an inquiry approach in the classroom, an excellent beginning would be to read and study the "Invitations to Inquiry" in the *Biology Teachers' Handbook.* These invitations can then be used as models for scientific articles selected by the teacher. For example, the teacher may decide not to give students the research article prior to the classroom discussion. Instead, the experimental work is described to the class step by step. The teacher poses questions to the students as the investigation is being described. Students are presented with the experimental data and are asked to explain and interpret the data before the scientist's conclusions are given. Thus, the article is used in much the same way as an invitation to inquiry would be.

By using research articles for inquiry, it is hoped that, in looking at the experimental work critically, the student will experience the feeling of the scientist as he examined the work. In this way science becomes much more than just a collection of facts to be memorized. The facts evolve from the process and thus are much more meaningful.

Research articles must be carefully chosen and must involve material similar to that being studied at the time. If a college library is not located nearby, then the following sources can be used to obtain suitable research articles:

Great Experiments in Biology (Text) by Gabriel and Fogel. This is an excellent source of original research articles. It contains most of the classical experiments in biology.

Certain *Scientific American* offprints and *Science Reprints,* especially those containing graphs, charts and other experimental data, are appropriate for this approach. A complete listing of all *Scientific American* offprints may be obtained from: W. H. Freeman and Company, 660 Market Street, San Francisco, California 94101. A listing of *Science Reprints* may be obtained from:

AAAS Reprints, Department LW (1420), 1515 Massachusetts Avenue, N.W., Washington, D.C. 20005.

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Helping Children Learn Earth-Space Science

For teachers who are looking for more ideas and background in teaching earth and space science, this new publication should provide just the lift.

Helping Children Learn Earth-Space Science is a compilation of outstanding articles which have been brought together from *Science and Children, 1963-1971,* by William B. Matthews III, Professor of Geology at Lamar State College of Technology, Texas. Dr. Matthews groups his material into five main sections: astronomy, geology, meteorology, oceanography and water, and conservation and environment. He has selected the pieces not only for their appropriateness, accuracy and clarity, but also for their potential and practical use to teachers who are not science specialists.

In each section articles concerned primarily with subject matter appear first. Next comes supportive material dealing with resources for teaching-learning, and then pieces which present teaching-learning experiences. Short items useful as "Teaching Tips" are also included. Dr. Matthews has taken particular care in helping the teacher bring to children material which helps develop skills in observation, in collecting and analyzing scientific data, and in testing theories and hypotheses.

Helping Children Learn Earth-Space Science is published by the National Science Teachers Association. It is available from NEA Publications Sales, 1201 16th Street, N.W., Washington, D.C. 20036. Stock number 471-14606; 256 pages; 1971; $5.00. Discount on quantity orders of two to nine copies is 10 percent; 10 or more, 20 percent. Payment must accompany all orders except those on official purchase order forms. Postage and handling charges will be added to billed orders.