The Science Curriculum Improvement Study

JACK FISHLEDER

WITH OUR SUDDEN and increasing interest in environmental education we may overlook some basic work that has been done as a result of the support and the foresight of the National Science Foundation. Recognition of this is reflected in the January 1970 report, *Institutions for Effective Management of the Environment,* of the Environmental Study Group of the National Academy of Sciences – National Academy of Engineering, which said:

"At the elementary level (K–6) the situation is somewhat brighter. There are at least three federally assisted programs of national importance, the major ones being Elementary Science Study (ESS), Science —A Process Approach (SAPA), and Science Curriculum Improvement Study (SCIS).

"Of these, SCIS is the most promising for environmental education, because it centers attention on ecological and biological questions. Also, it is unique in that it provides a variety of living organisms for classroom demonstrations and experiments as part of a complete elementary science course. The educational materials consist of textbooks, teachers' manuals, films, demonstrations, and experimental kits. At present the course is being taught to 200,000 children, and that figure is expected to rise to between 2 and 5 million within a few years. The project staff consists of approximately 30 persons, led by two scientists of national reputation and a young school administrator with a strong background in science. It is funded by the National Science Foundation in the amount of approximately $600,000 per year; the total spent so far is approximately $4 million. The project is housed in the Lawrence Hall of Science, a science museum and teacher-training center at the University of California in Berkeley.

"The project has been received favorably in U.S. schools and has been adopted by the Swedish government for use in Swedish public schools. It impresses us as an excellent beginning in environmental science for young children. The essential features that permitted success and that we believe must be present in new programs designed for the higher grades are:

"1. Inspired leadership provided by one or more distinguished scientists

"2. Sustained adequate support

Fig. 1. They're entranced by the inhabitants of the terrarium they built in the course of the SCIS *Environments* unit.

"3. The appropriate academic environment for the project itself—working space, moral support, efficient management, and a vital intellectual community, plus teacher-training facilities."

Project Began a Decade Ago

The SCIS project was begun in 1962 by Robert Karplus, professor of theoretical physics, University of California, Berkeley, in an effort to study how young children solve problems in science. Karplus was able to involve such leadership people as Herbert Thier (formerly assistant superintendent of schools in Falls Church, Va.) as assistant director and Chester Lawson (past chairman of Michigan State University's natural-science department) as director of the life-science program. The staff has consisted of a wide range of talent from elementary schools, high-school innovative programs, and college science and education departments.

Additional support for testing the experimental materials was found in the public schools of the five trial centers coordinated by leaders at Columbia University, Michigan State University, the Univer-

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Fig. 2. Mapping snail trails helps these fourth-level pupils discover some of the physical factors of the environment.

sity of Hawaii, the University of California at Los Angeles, and Oklahoma University.

In the spring 1970 *Newsletter* (no. 20) of SCIS the staff described its own work as follows:

"The Science Curriculum Improvement Study is developing ungraded, sequential physical and life science programs for the elementary school—programs which in essence turn the classroom into a laboratory. Each unit of these programs is carefully evaluated by SCIS staff as it progresses from early exploratory stages to the published edition. The units originate as scientists' ideas for investigations

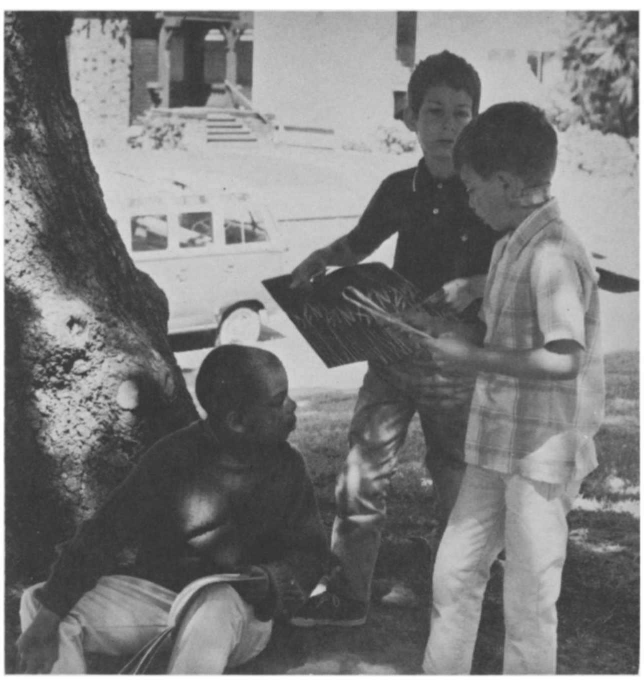

Fig. 3. These boys, investigating the *Populations* unit, are discussing ways of counting organisms in the school neighborhood.

that might challenge children and that illustrate key scientific concepts. The ideas are then adapted to fit the elementary school and the resulting units are used by teachers in regular classrooms. Thus they are tested several times in elementary schools before they are published.

"Central to these elementary school programs are current ideas of intellectual development. A child's elementary school years are a period of transition as he continues the exploration of the world he began in infancy, builds the abstractions with which he interprets that world, and develops confidence in his own ideas. Extensive laboratory experiences at this time will enable him to relate scientific concepts to the real world in a meaningful way. As he matures, the continual interplay of interpretations and observations will frequently compel him to revise his ideas about his environment.

"The teaching strategy is for the children to explore selected science materials. They are encouraged to investigate, to discuss what they observe and to ask questions. The SCIS teacher has two functions: to be an observer who listens to the children and

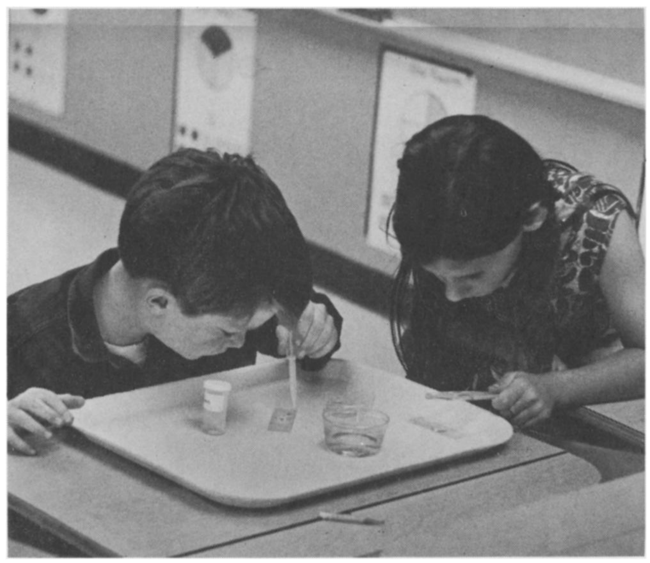

Fig. 4. Third-level children count *Daphnia* as part of their study of the SCIS *Populations* unit.

notices how well they are progressing in their investigations, and to be a guide who leads the children to see the relationship of their findings to the key concepts of science."

The Child Is the Key

The key to this kind of curriculum development is the child. The feedback from first hundreds and then thousands of children has played a major role in the development of this program. Their hands and minds have been the sieves for what could or could not be included in a proposed unit. Their motto for the program might be found in the title of the SCIS life science film, "Don't Tell Me, I'll Find Out."

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Arthur D. Roberts and Odvard E. Dyrli, in their article "Environmental Education" (1971: *Clearing House* 45 [8]: 451–455), offered the following assessment:

"At present, a national curriculum program immediately available that builds a comprehensive and sequential view of the natural environment through the elementary school grades is the Science Curriculum Improvement Study (SCIS). . . . By supplementing the life science sequence of this project with a distinct social dimension, a very strong recommendation can be made for designing a program of environmental education around these well developed laboratory-centered units. The units are arranged as follows: first level, *Organisms*; second level, *Life Cycles*; third level, *Populations*; fourth level, *Environments*; fifth level, *Communities*; and sixth level, *Ecosystems*. In the last unit, for example, children learn through experimentation that substances in our ecosystem can become pollutants when they reach concentrations that populations of organisms cannot tolerate. They soon discover that man's technology is polluting the environment and, furthermore, altering the ecosystem of which he is a part."

The happy marriage of the ideas of the physical sciences with those of the life sciences provides the added dimension of an interdisciplinary approach. The process concepts of the physical-science units are used by the children in solving problems posed in the life-science units. Sometimes overlooked by environmental educators are the units *Material Objects* (first level), *Interaction and Systems* (second level), *Subsystems and Variables* (third level), *Relative Position and Motion* (fourth level), *Energy Sources* (fifth level), and *Models: Electric and Magnetic Interaction* (sixth level). The names of these units may indicate the experiences children will have, to produce the kinds of spin-offs needed not only to extend the SCIS ecology program but to provide input for other environmental programs.

Ed Labinowich (1971: "A Closer Look at Environmental Education," *Science and Children* 8 [6]: 31-35) called attention to this feature of such a program. He wrote:

"Furthermore, given enough time to experiment with their bio-physical environment, children can gradually develop a belief in their own ability to change things and to control the outcomes of an event. Mary Budd Rowe of Columbia University has observed that young inner-city children interpret events in their life as a matter of fate; they are either lucky or unlucky. She places great faith in science education as a means of combating the inability of these children to act on their own behalf. . . . The SCIS program also contributes to the development of a positive self concept which is essential to environmental problem solving—a goal of environmental education."

For more information about the SCIS Life Science Program write for a complimentary copy of "Ecology and Children," by Chester Lawson, at SCIS, Lawrence Hall of Science, University of California, Berkeley 94720. SCIS units in final form are published by Rand McNally & Co., Chicago.

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Liberal Education . . . from p. 388

ogy works and by comparing the various ways it does work and could work for the resolution of any particular problem, the student can assess the status of existing claims. He can, for instance, recognize logical inadequacies upon which certain claims may be based; or he may recognize the likelihood that a problem approached in one way may be approached more adequately in another way. In this sense, the learner is capable of acting as Aristotle's "critic" of the field.

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