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Achieving Useful Science: Reforming the Reforms of the '60s

Science programs developed during the 1960s should be replaced by S/T/S programs, which build on students' curiosity and concern about local problems.

Should we teach science as a review of what scientists know or as something students can use?

During the 1960s, in response to the launching of the Soviet Sputnik, science in schools focused on what scientists know. Curriculum writers assumed that science would be both inherently interesting and appropriate for all if it were presented as scientists conceptualize it. Much money and effort were expended in defining the various disciplines of science and the skills scientists possess. Because it was believed that students needed to know certain information *before* they could formulate real questions or engage in meaningful inquiry, the study of science began with an outline of information to assimilate.

By the late '70s it had become clear that the premises of this approach were flawed: science as scientists know it was neither inherently interesting nor appropriate for all. Requiring all students to learn such science was proving disastrous. Students could see little use for the science they learned. Moreover, their science study allowed them no scope for using logic or imagination—skills purported to be basic processes of science. Consequently, students often left school with negative attitudes about science.

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A Different Approach

In 1980, John Ziman recommended that scholars develop more engaging science programs for elementary and secondary students, using the term *science/technology/society* (S/T/S) to guide their efforts. Teachers should promote student involvement, Ziman argued, by posing questions and problems relevant for the students. These might include national or worldwide problems, but the primary focus should be on problems of local interest.

Thus, in an actual S/T/S program, students investigate problems that affect their communities, employing their natural curiosity and concern. Using local resources—human and material—they actively seek information that will help solve these problems. Possible solutions are considered and often tried. Students acquire knowledge because they need it, not because the teacher insists it will be useful later.

The study of technology is often the starting point of S/T/S efforts. For many students, technology is the only understandable and important aspect of science. Students are typically curious about technology; usually, basic science information is needed to satisfy that curiosity. A skillful teacher can use the appeal of technology to develop students' interest in the more "academic" aspects of science.

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Widespread Efforts

In one of the first efforts to develop S/T/S materials, John Lewis and his colleagues in the United Kingdom developed a series of *Science in Society* modules. Later, with John Ziman as a major adviser, Joan Solomon developed *Science in a Social Context (SisCon)*. Educators in the United Kingdom continue to develop materials, to assess their success with teachers and schools, and to publish the results of their efforts.

In the United States, the National Science Foundation has funded several projects in the past few years to promote S/T/S approaches. For example, Rustum Roy's S-STS Project at Pennsylvania State University has es-

tablished a national network for promoting S/T/S and a system for collecting and evaluating S/T/S materials. Also, in a major project at the University of Iowa (1986), more than 300 teachers have participated in reorganizing their school programs to solve local problems with applications of science and technology.

The Future of S/T/S

Some educators argue that S/T/S is just the latest fad, that it is an attempt to de-emphasize basic science, and that it cannot succeed unless students first have some "basics." But look around; traditional science study has failed to engage students. Students need science that involves ideas and experiences they can use in their daily lives, that helps them understand and deal with real-world issues, and that helps them make career choices. Science education for all implies that it must be useful for all. And this usefulness should not be merely a promise, but readily apparent to the learner.□

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National Science Foundation "Troika" Programs

Since 1987, the National Science Foundation has sponsored one middle school and seven elementary "Troika" projects (partnerships made up of publishers, scientists and science educators, and schools) to produce high-caliber innovative curriculums. In early 1989, the National Science Foundation plans to fund several more alternative programs for the middle schools and will solicit proposals for high school level programs. What follows are brief notes about the eight projects with contact persons and addresses to write for further information.

- *Elementary School Science and Health Materials* (K-6). Funded by NSF and Kendall/Hunt Publishing Co., this program emphasizes personal/social goals, problem solving, decision making, and technology in relation to science knowledge and procedures. Rodger W. Bybee, Biological Sciences Curriculum Study, 1115 N. Cascade Ave., Colorado Springs, CO 80903.
- *Improving Urban Elementary Science: A Collaborative Approach* (K-6). Funded by NSF and Sunburst Communications, Inc., this partnership is developing a program using the natural world as an experimental starting point to enhance students' critical thinking and problem-solving skills. Karen Worth and Judith Sandler, Education Development Center, Inc., 55 Chapel St., Newton, MA 02160.
- *The Life Lab Science Program: Development of a Comprehensive Experiential Elementary Science Curriculum* (K-6). Funded by NSF and Addison-Wesley Publishing Co., this comprehensive garden-based program aims to show students, through a variety of hands-on experiences, the connections between science and daily life. Gary Appel and Roberta Jaffe, Life Lab Science Program, Inc., 809-H Bay Ave., Capitola, CA 95010.
- *The Science Connection* (1-6). Funded by NSF and Silver, Burdett and Ginn, this program supplements existing basal science texts with materials to enhance science instruction and improve students' abilities to think critically. Carolyn Sumners and Terry Contant, Houston Museum of Natural Science, 1 Hermann Circle Dr., Houston, TX 77030.
- *Super Science: A Mass Media Program*. This program, funded by NSF and Scholastic Inc., introduces two classroom magazines (for grades 1-3 and for grades 4-6) accompanied by computer disk resources whose activities blend science with math, reading, and social studies. Victoria Chapman, Scholastic Inc., 730 Broadway, New York, NY 10003.
- *Full Option Science System* (3-6). Funded by NSF and Ohaus Scale Corporation, this project is producing multisensory laboratory-based activities for the elementary classroom. Lawrence Lowery, University of California, Berkeley Campus, Lawrence Hall of Science, M-11 Wheeler Hall, Berkeley, CA 94720.
- *National Geographic Kids Network Project* (4-6). Funded by NSF and the National Geographic Society, this project's series of units can be used with existing classroom materials or as complete courses. Using telecommunications to share information across the country, students investigate issues of scientific, social, and geographic importance. Robert F. Tinker, Technical Education Research Center, Inc., 1696 Massachusetts Ave., Cambridge, MA 02138.
- *Interactive Middle-Grades Science* (6-8). Funded by NSF and Houghton Mifflin, this project is developing a multimedia system of instruction/classroom management/student evaluation that addresses problems of science, technology, and society. George Dawson, Florida State University, Science Education Program, Tallahassee, FL 32306-1047.

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