Appendix C

OTA Survey of the National Association for Research in Science Teaching

The National Association for Research in Science Teaching (NARST) is an organization of university researchers in mathematics and science education. In June 1987, OTA mailed questionnaires to the American membership of NARST, asking for their opinions on a range of current and past Federal programs designed to improve precollege mathematics and science education. Of 500 questionnaires mailed out in this informal, one-shot survey, 135 were returned for a response rate of just over 30 percent.

The survey was designed to give OTA a general impression of the opinions held by individuals knowledgeable about previous Federal efforts in this area. NARST includes many active participants and evaluators of previous Federal mathematics and science education programs; their responses provided valuable, often first-hand, accounts of programs such as National Science Foundation (NSF) summer institutes and curriculum development programs. Respondents also had extensive familiarity with other local, State, and NSF-sponsored programs that are listed below. OTA recognizes that the members of NARST are neither representative of the broad population of researchers and teacher educators in mathematics and science education, nor are the responses statistically representative of the entire NARST membership.

OTA solicited opinions on the effectiveness of the following programs:

- grants for equipment and supplies under the National Defense Education Act (NDEA) of 1958;
- NSF summer institutes and other inservice training for teachers;
- NSF summer institutes for students and other research participation programs for students;
- NSF-funded new curriculum programs;
- assistance for magnet schools for racial desegregation purposes;
- funds allocated through Title II of the Education for Economic Security Act of 1984; and
- support for informal science education, including educational television and science and technology centers.

Of these programs, NSF teacher institutes, research participation for students, and curriculum development programs received the highest ratings. Many respondents thought that significant lessons had been learned from the teacher institutes and curriculum development programs, such as the need to ensure that participating teachers are given followup training and that training covers both subject knowledge and ideas for teaching mathematics and science in real-life situations. Magnet school programs were the least highly rated, although less than one-half of the respondents cited these programs at all.

OTA also asked respondents to identify other Federal programs that they thought had had a positive effect on mathematics and science education. These nominations provide a fairly comprehensive overview of the kinds of Federal programs that have been attempted since passage of the NDEA:

- NSF-funded Institutes for Science and Mathematics Supervisors;
- funds for Research on Teaching and Learning of Science and Mathematics;
- NSF-funded Chautauqua Institutes for Teachers;
- the Department of Education's National Diffusion Network for the dissemination of effective curricula materials;
- Programs for Metric Education;
- the Department of Education's Fund for the Improvement of Post-Secondary Education;[1]
- Presidential Awards for Teaching Excellence in Mathematics and Science;
- the National Assessment of Educational Progress, funded by the Department of Education;
- NSF's Project SERAPHIM;
- the National Aeronautics and Space Administration's program for sending astronauts and scientists to schools, and a similar program funded by NSF;
- the Clearinghouse for Research in Science, Mathematics, and Environmental Education that is part of the ERIC system;
- National Sea Grant College Marine Education Activities;
- the Department of Energy's Honors Science Program; and
- NSF's program of Resource Centers for Science and Engineering.

[1]Despite its name, this source has funded some precollege programs, such as the *Family Math* series of books and materials from the EQUALS program at the Lawrence Hall of Science, University of California at Berkeley.

Several respondents made noteworthy observations regarding:

- the importance of educating guidance counselors, principals, and school board members about the problems of science education, particularly to convey that science is a collection of facts as well as a way of exploring and examining the world, and that the interest of many students in science needs to be developed;
- the diminutive size of Federal mathematics and science education programs in relation to the size of the problems;
- the fact that past programs have not done a good job at distinguishing between programs for training future scientists and engineers and programs for boosting technological literacy. NSF programs have often been aimed at the former, and have made too great a use of working scientists who have limited appreciation of the culture of schools and the need to involve parents, school boards, and administrators if improvement is to be lasting and meaningful;
- the need for ongoing training and support for programs, once mounted. In many cases, programs have attempted too much too quickly, and have failed to follow through, allowing the status quo to be reasserted;
- the increased use of science specialists and consultants to be shared among schools or even school districts;
- the need for more emphasis on elementary mathematics and science education, where the battle is won or lost, rather than on secondary education when too many deficiencies are already irrevocable; and
- the recognition that good teachers are an absolute precondition to improvements in other areas, such as curriculum, equipment, and testing. Science and mathematics teacher education programs at universities need to be updated and fortified.