

What it All Means

Ron Brandt and other members
of the ASCD Dissemination Team*

Implications of the National Science Foundation Reports on the Status of Science, Mathematics, and Social Studies Education.

This is the last in a series of articles in which an ASCD team has summarized findings of a major study sponsored by the National Science Foundation (NSF). Composed of a survey, three literature reviews, and a set of case studies, the NSF reports are a thorough assessment of the status of science, mathematics, and social studies education in elementary and secondary schools.

Instructional Materials

A recurring theme throughout the reports is the prominence of textbooks as the basis for much of the curriculum that is actually taught in science, social studies, and mathematics classrooms (Helgeson and others, 1978; Stake and Easley, 1978, Vol. II, p. 15-5; Weiss, 1978, p. 102; Wiley and Race, 1977, p. 79). Some of the materials produced with NSF sponsorship are well accepted; for example, BSCS biology is used in about 40 percent of schools (Helgeson and others, p. 26). Most NSF materials, however, are not widely used (Wiley and Race, p. 323).

Some might say that NSF programs are resisted because the assumption on which they are based—that developers can create programs for

others to “implement”—is mistaken. According to this view, teachers must be involved in developing their own curriculum, and the low usage rate of NSF-sponsored materials proves they will not use curriculums planned by others.

That teachers must be involved in curriculum planning is almost beyond dispute in ASCD circles. However, the notion that development must be done at the local level does not square with findings of the reports that teachers use textbooks (which are not locally designed) as the basis for their curriculum.

Most teachers will probably continue to plan their instruction around materials produced by others. What they want are materials that they consider usable in every sense—academically sound but practical, suitable for students with varying backgrounds and abilities, and adaptable to a variety of purposes and



*Benjamin Ebersole, Baltimore County (Maryland) Schools; Thomas Gibney, University of Toledo (Ohio); Edward Karns, Parma (Ohio) Public Schools; Ruth Long, ASCD Associate Director; Gerald Ponder, North Texas State University, Denton; Ronald Stodghill, St. Louis (Missouri) Public Schools, and Robert Yager, University of Iowa.

The material in this report is based upon work supported by the National Science Foundation under Purchase Order No. 78-SP-1131. Any opinions, findings, and conclusions or recommendations expressed in this publication are those of the author and do not necessarily reflect the views of the National Science Foundation.

circumstances. They will reject materials that seem to be too unconventional, too scholarly, or too complicated.

Development of Materials

For the foreseeable future, it would seem appropriate for ASCD members to do whatever they can to encourage development of high quality materials. Should federal agencies, such as NSF, be involved? That is a matter on which reasonable people differ. Most local and state

"... the notion that development must be done at the local level does not square with findings of the reports that teachers use textbooks (which are not locally designed) as the basis for their curriculum."

governments are not in a position to publish textbooks, and commercial publishers apparently cannot afford to develop high-risk materials or do the extensive field testing that is often needed. For these reasons, we feel that the federal government can make a contribution without necessarily establishing a national curriculum.

A reasonable guideline for federal agencies may be the one established by the National Institute of Education after a thorough airing of the question. They intend to create curriculum materials only if a clear national need exists that apparently will not be satisfied any other way, and then mostly to encourage further work by others—by conducting and disseminating applied research, testing new approaches, creating prototypes, and so on (Schaffarzick and Sykes, 1978).

Curriculum Content

An important function served by NSF projects was to raise serious questions about the content of the curriculum: what students should learn. Those questions must continue to be asked—and answered. Otherwise, whatever was taught yesterday will continue to be taught tomorrow.

No school or district, no state, no publisher—would dare try to change it singlehandedly.

In some countries, a national curriculum center is responsible for revising the curriculum periodically. For example, a revised physics curriculum was installed a few years ago throughout the Soviet Union. New textbooks were published, and all teachers were trained to use them.

Americans dislike the idea of a national curriculum because we are so firmly committed to local control of education. How, then, will substantive curriculum change come about?

One way would be for agencies or organizations with national influence, such as NSF, to organize a process by which the essentials of a given course or subject area, or even the entire curriculum, would be redefined. The result would be not a finished course or textbook, but a syllabus suggesting what should be taught.¹ We will not attempt to say exactly how this should be done or who should do it. We will only point out that it needs doing.

The Textbook Development Process

Because textbooks will almost certainly continue to be an important influence on what is actually taught, educators should examine carefully the processes by which textbooks and teachers' manuals are developed, selected, and used. In many cases, commercial materials may be produced without involvement of classroom teachers (which most NSF materials had) and with little or no field testing before they are marketed. As the major professional association concerned with curriculum and instruction in elementary and secondary schools, ASCD should search for ways to help improve the development process.

Evaluation of Materials

A related issue is that of evaluation. Some NSF materials may have been rejected not because teachers failed to recognize their merits, but because they were in fact faulty. Teachers who stopped using some of the materials com-

¹For an example, see: *Master Curriculum Guide in Economics for the Nation's Schools, Part 1: A Framework for Teaching Economics*. New York: Joint Council on Economic Education, 1977.

plained they were too rigid, too difficult, and too abstract for many students (Helgeson and others, p. 181). If that is true, why were such criticisms not resolved when the materials were field tested? The answer is complex, of course. For one thing, times have changed. In the 1960s, national opinion supported education of a scientific elite. The emphasis now is more on basic skills and equality of opportunity.

We may observe, however, that developers who evaluate their own products find it difficult to be objective. Materials developed in the future, no matter who develops them, should be evaluated by an independent party. Such an agency should take seriously the concerns of teachers for whom the materials are intended and should collect extensive data from teachers and students in a variety of circumstances.

Teacher Education and Support

A second major concern is that existing organizational arrangements frequently do not provide for the support that teachers need and want. For example, very few school districts have full-time coordinators (Weiss, p. 39). Nearly half of all teachers report they do not receive adequate assistance in learning about new teaching methods and instructional materials. Add the fact that teachers are not always well prepared academically (Wiley and Race, p. 143), and it becomes evident that something more is needed.

Of course, there is no consensus among educators as to exactly *what* is needed. Some would have more specialists, such as assistant principals, curriculum directors, and general supervisors. Still others would opt for teacher centers and other ways by which practicing teachers can help one another. All these may be desirable, but tightened school budgets will probably result in fewer, rather than more, of any of them.

School System Organization

Fortunately, ASCD is launching a major study of school organization. The project team, to be headed by Charles A. Reavis of Texas Tech University, is charged with analyzing the impact of recent developments—including decentralization, collective bargaining, management studies,

encroachments on principals' time, and declining revenues—on provision of supervisory services. Their report could contribute to a needed redefinition of middle management roles in education.

Continuing Education of Teachers

Another need is for mechanisms that ensure that teachers have opportunities for continuing education. NSF institutes, although they were in-

"NSF institutes . . . did much to promote teacher-teacher and teacher-scientist exchanges. Such national efforts should be continued and expanded."

tended primarily as a means for updating teachers' knowledge of their subjects, did much to promote teacher-teacher and teacher-scientist exchanges. Such national efforts should be continued and expanded.

Knowledge

Perhaps what is needed most of all is knowledge about teaching and learning. Those who have read our summaries—or better yet the reports themselves—know that they tell us very little of what we need to know. In fact, their most important contribution may be to clarify what we do not know for sure.

For example, Wiley and Race say there is almost no documentation about what actually goes on in classrooms and consequently how that may or may not have changed over time (p. 77). Teachers report using inquiry methods, but one cannot be certain about what they mean by that (p. 73). Available research provides no help in determining the kind of content that would best achieve the goals of social studies (p. 168). People do not even agree about what the field of social studies is, or what its goals are supposed to be (pp. 275-77).

Under the circumstances, we believe educators concerned with supervision and curriculum development should shift their focus from speculation and advocacy to a greater emphasis on

understanding. Questions formerly asked in prescriptive terms (What should be done?) might be more productively couched in descriptive and analytical terms (What is happening here and why is it happening?), at least as a first step. Such an approach will delay the rush to "improve," to

"Nevertheless, all those interested in what schools are doing should exhibit greater respect for evidence and less inclination to rely on their own prejudices. We have enough charges, countercharges, blaming, and quarreling already. We need more understanding as the basis of real improvement."

be sure, but it offers the possibility of increasing the long-term impact of change efforts.

Points of View

One matter requiring more thorough study is that of varying "orbits" (Smith in Stake and Easley, 1978; also see article in this series by Ponder, pp. 6-8). Members of various groups, such as college professors, central office administrators, and principals, hold views about content and methods of teaching influenced by their positions. There seem to be major differences in orientation between classroom teachers and many of those who are supposed to help them do a better job. That can be troublesome if they do not agree about what is better and what is not. For example, the curriculum developers sponsored by NSF apparently held views about the kinds of materials needed that differed from the perceptions of many of the teachers who were expected to use them. If similar efforts are to be more successful in the future, such differences must be understood and moderated.

The Change Process

Another matter that should be better understood is the change process in schools. Not only should researchers continue to investigate the factors associated with successful and unsuccessful

change efforts, but administrators should learn to use the findings in managing change.

An approach that would seem to be especially fruitful is to focus investigation on the sites where changes have been implemented successfully in order to find out why. What accounts for the fact that some teachers are using inquiry processes and NSF materials? An example of this approach is a recent study by the Rand Corporation (Berman and McLaughlin, 1978) in which several elements of an effective change strategy are identified (pp. 22-34).

An obvious hypothesis is that too many administrators have underestimated the difficulty and complexity of change. Even such a straightforward change as the introduction of new instructional materials must be carefully managed and supported, particularly when the materials differ substantially from familiar ones. Change is not a matter of simply selecting a new program and "plugging it in."

Effects of Practices

We also need better information about the effects of various practices and programs. Of course, much of the research and evaluation conducted in education is designed to produce that very thing. It is all the more discouraging, then, to find that a careful review of research literature tells us that little can be said with assurance about the effectiveness of various methods. Our nation needs more well-qualified researchers who have the facilities and financial support necessary to investigate important educational problems. At present, much of the research in education is done by graduate students and other individuals working with very limited resources. Problems tend to be defined so that they are manageable. The result is that "... a large proportion of the effectiveness research . . . falls under the heading of instructional methods and much of this focuses on various methods labeled 'critical thinking,' 'inquiry,' and the like. Most of this research shows no significant differences between 'critical thinking' methods and so-called traditional methods; however, weaknesses in research design and weaknesses in attempts at interpreting existing research may well be hiding real differences in effectiveness" (Wiley and Race, p. 9).

The fact that there has been little research on learner variables (Wiley and Race, p. 204) suggests that researchers should stop trying to prove that "critical thinking" teaching is superior to "traditional" teaching and start trying to find out what practices are effective with what students for what purposes under what conditions.

Our limited knowledge puts us in an awkward position. As honest professionals, we must concede those limits. At the same time, however, we must continue to act. Many of us have supported practices such as teaching for inquiry, even though we could not prove their superiority. Were we wrong to commit ourselves? Should we have remained neutral until we had better evidence? Probably not. We have a right to our convictions; indeed, we have a responsibility to encourage what we believe is good education.

Nevertheless, all those interested in what schools are doing (and that seems to include a lot of people these days) should exhibit greater respect for evidence and less inclination to rely on their own prejudices. We have enough charges, countercharges, blaming, and quarreling already. We need more understanding as the basis for real improvement.

Summary

In summary, based on findings of the NSF studies, we see a need for:

1. Continued development of high quality instructional materials, with federal sponsorship if necessary;
2. Procedures for periodically redefining what students should learn;
3. A thorough examination of the processes by which textbooks and teachers' manuals are developed, selected, and used—so that they may be improved;
4. Objective evaluation of instructional materials.

Teacher Education and Support

1. Redefinition of middle management roles to provide more adequate staff development and support for teachers;

2. Mechanisms, such as NSF institutes, to provide for continuing education of teachers.

Knowledge

1. Knowledge about differences in points of view between teachers and other educators;
2. Knowledge about the change process in schools;
3. Knowledge about effects of various practices and programs.

References

- P. Berman and M. W. McLaughlin. *Federal Programs Supporting Educational Change, Volume VIII: Implementing and Sustaining Innovations (R-1589/8-HEW)*. Santa Monica, California: The Rand Corporation, 1978.
- S. L. Helgeson, P. E. Blosser, and R. W. Howe. *Science Education, Volume 1 of The Status of Pre-college Science, Mathematics, and Social Science Education: 1955-1975*. Washington, D.C.: U.S. Government Printing Office, 1978.
- J. Schaffarzick and C. Sykes. "A Changing N.I.E.: New Leadership, a New Climate." *Educational Leadership* 35(5):367-72; February 1978.
- R. E. Stake and J. A. Easley, Jr. *The Case Reports, Volume 1 of Case Studies in Science Education*. Washington, D.C.: U.S. Government Printing Office, 1978.
- R. E. Stake and J. A. Easley, Jr. *Design, Overview, and General Findings, Volume 2 of Case Studies in Science Education*. Washington, D. C.: U.S. Government Printing Office, 1978.
- M. N. Suydam and A. Osborne. *Mathematics Education, Volume 2 of The Status of Pre-college Science, Mathematics, and Social Science Education: 1955-1975*. Washington, D.C.: U.S. Government Printing Office, 1978.
- I. R. Weiss. *Report of the 1977 National Survey of Science, Mathematics, and Social Studies Education*. Washington, D.C.: U.S. Government Printing Office, 1978.
- K. B. Wiley, with J. Race. *Social Science Education, Volume 3 of The Status of Pre-college Science, Mathematics, and Social Science Education*. Washington, D.C.: U.S. Government Printing Office, 1978.



Ron Brandt is Executive Editor, *Educational Leadership*, ASCD, Alexandria, Virginia.

Copyright © 1979 by the Association for Supervision and Curriculum Development. All rights reserved.