Chapter Seven

Factors Affecting Instruction

A. Overview

Students' opportunities to learn science and mathematics are affected by a myriad of factors, including not only teacher preparedness, but also school and district policies and practices, as well as administrator and community support. While the primary focus of the 2000 National Survey of Science and Mathematics Education was on teachers and teaching, some information was also collected on the context of classroom practice. The principal of each school in the sample was asked to designate persons to answer questions about the school's science and mathematics programs; typically these were the science and mathematics chairs or lead teachers. Among the data collected were the extent of use of various programs and practices in the school, the extent of influence of national standards for science and mathematics education, and the extent of various problems that may affect science and mathematics instruction in the school. These data are presented in the following sections.

B. School Programs and Practices

The designated school program representatives were given a list of programs and practices and asked to indicate whether each was being implemented in the school. Tables 7.1 and 7.2 show the percentages of elementary, middle, and high schools indicating that each program or practice is in place.[3]

Of those listed, by far the most extensively used practice is school-based management, reported in use by more than half of the schools at each grade range. Far fewer schools, ranging from 25 to 32 percent depending on subject and grade range, have designated lead teachers in science/mathematics, and only 14–21 percent provide a common daily planning period for their science/mathematics teachers.

[3] Elementary school is defined as any school containing grade K, 1, 2, and/or 3; middle school is defined as any school containing grade 7 or 8, or any school containing only grades 4, 5, and/or 6, or any school containing only grade 9; and high school is defined as any school containing grade 10, 11, or 12.

Table 7.1
Science Programs Indicating Use of Various Programs/Practices, by School Type

	Percent of Schools					
	Elementary		Middle		High	
School-based management	62	(3.9)	58	(3.6)	58	(3.2)
Common daily planning period for members of the science department	16	(2.3)	20	(3.1)	21	(3.2)
Common work space for members of the science department	17	(2.5)	27	(3.2)	40	(3.2)
Teachers *formally* designated and serving as science lead teachers	32	(3.9)	30	(3.8)	25	(3.1)
Teachers provided with release time to help other teachers in the school/district	21	(3.0)	14	(2.6)	15	(2.6)
Interdisciplinary teams of teachers who share the same students	52	(3.8)	61	(3.7)	28	(3.9)
Students assigned to science classes by ability	6	(1.5)	18	(2.5)	47	(3.2)
Use of vocational/technical applications in science instruction	31	(3.2)	46	(4.4)	60	(2.7)
Integration of science subjects (e.g., physical science, life science, and earth science all taught together each year)	67	(3.3)	56	(3.7)	33	(3.2)

Table 7.2
Mathematics Programs Indicating Use of Various Programs/Practices, by School Type

	Percent of Schools					
	Elementary		Middle		High	
School-based management	61	(3.9)	56	(4.3)	55	(3.2)
Common daily planning period for members of the mathematics department	14	(2.3)	17	(3.0)	19	(3.1)
Common work space for members of the mathematics department	12	(2.3)	17	(3.0)	32	(2.7)
Teachers *formally* designated and serving as mathematics lead teachers	27	(3.5)	25	(3.5)	28	(3.4)
Teachers provided with release time to help other teachers in the school/district	27	(4.2)	17	(2.9)	18	(2.7)
Interdisciplinary teams of teachers who share the same students	54	(3.8)	65	(4.1)	24	(3.4)
Students assigned to mathematics classes by ability	29	(3.4)	58	(3.9)	70	(3.5)
Use of vocational/technical applications in mathematics instruction	32	(3.1)	47	(3.5)	69	(2.8)
Integration of mathematics subjects (e.g., algebra, probability, geometry, etc. all taught together each year)	67	(3.6)	65	(3.7)	41	(4.1)

More than half of the elementary and middle schools, and about 1 in 4 high schools, report considerable use of interdisciplinary teams of teachers who share the same students. Similarly, elementary and middle schools are substantially more likely than high schools to report that the various science subjects (e.g., life, earth, and physical science) are taught in an integrated fashion and that mathematics topics such as algebra, probability, and geometry are taught together each year. In contrast, high schools are more likely than elementary or middle schools to use vocational/technical applications in science and mathematics instruction. Ability grouping is more common in mathematics than in science, and becomes more widespread in the higher grades. For example, 6 percent of the elementary schools, compared to 47 percent of the high schools, frequently assign students to science classes by ability level; comparable figures for mathematics are 29 percent at the elementary level and 70 percent at the high school level.

School science and mathematics program representatives were also asked about several instructional arrangements for elementary students—whether they were pulled out from self-contained classes for remediation or enrichment in science and mathematics and whether they received science and mathematics instruction from specialists instead of, or in addition to, their regular teacher. These results are shown in Tables 7.3 and 7.4. Note that pulling students out of self-contained classes for remedial instruction is much more common in mathematics, with 55 percent of the elementary schools using that approach in mathematics, but only 7 percent in science, likely a reflection of the fact that Title I funds for students in poverty are more frequently targeted to improving instruction in reading and mathematics than in science or other subjects. Elementary schools are also more likely to pull students out for enrichment in mathematics (29 percent of the schools), than in science (13 percent).

Table 7.3
Use of Science and Mathematics
Instructional Arrangements in Elementary Schools

	Percent of Schools					
	Used		Not Used		Don't Know/ Not Applicable	
Science						
Students receiving instruction from science specialists *in addition to* their regular teacher	15	(2.8)	83	(2.8)	1	(0.8)
Students pulled out from self-contained classes for enrichment in science	13	(2.1)	81	(2.7)	5	(2.0)
Students receiving instruction from science specialists *instead of* their regular teacher	12	(2.6)	87	(2.7)	1	(0.8)
Students pulled out from self-contained classes for remedial instruction in science	7	(1.8)	88	(2.6)	6	(2.0)
Mathematics						
Students pulled out from self-contained classes for remedial instruction in mathematics	55	(4.0)	42	(4.0)	3	(1.4)
Students pulled out from self-contained classes for enrichment in mathematics	29	(3.3)	67	(3.3)	4	(1.5)
Students receiving instruction from mathematics specialists *in addition to* their regular teacher	21	(3.0)	77	(3.1)	2	(1.0)
Students receiving instruction from mathematics specialists *instead of* their regular teacher	14	(2.4)	83	(2.6)	3	(1.1)

Table 7.4
Use of Science and Mathematics Instructional Arrangements in Middle Schools

	Percent of Schools					
	Used		Not Used		Don't Know/ Not Applicable	
Science						
Students pulled out from self-contained classes for remedial instruction in science	16	(2.4)	76	(3.0)	7	(2.1)
Students receiving instruction from science specialists *in addition to* their regular teacher	12	(2.6)	84	(2.7)	4	(1.3)
Students receiving instruction from science specialists *instead of* their regular teacher	12	(3.0)	83	(3.2)	5	(1.8)
Students pulled out from self-contained classes for enrichment in science	11	(1.9)	81	(2.5)	8	(2.3)
Mathematics						
Students pulled out from self-contained classes for remedial instruction in mathematics	48	(4.4)	46	(4.2)	6	(1.7)
Students pulled out from self-contained classes for enrichment in mathematics	20	(3.3)	74	(3.7)	6	(1.7)
Students receiving instruction from mathematics specialists *in addition to* their regular teacher	20	(2.7)	75	(3.0)	6	(2.0)
Students receiving instruction from mathematics specialists *instead of* their regular teacher	16	(2.9)	78	(3.3)	6	(2.0)

Finally, high school science and mathematics program representatives were asked about opportunities for students to take courses that are not a regular part of the school's course offerings. As can be seen in Table 7.5, high schools are more likely to have students go to colleges and universities for courses in mathematics (42 percent of the schools) than science (28 percent). Ten percent of the high schools offer science and mathematics courses by telecommunications. Only a handful of the high schools send students to other K–12 schools for courses in either science (4 percent) or mathematics (7 percent).

Table 7.5
Opportunities for High School Students to Take Science and Mathematics Courses Not Offered in Their School

	Percent of Schools					
	Used		Not Used		Don't Know/ Not Applicable	
Science						
Students going to a college or university for science courses	28	(2.7)	67	(2.9)	5	(1.4)
Science courses offered by telecommunications	10	(2.0)	85	(2.2)	5	(1.2)
Students going to another K–12 school for science courses	4	(1.1)	91	(1.7)	5	(1.2)
Mathematics						
Students going to a college or university for mathematics courses	42	(3.0)	56	(3.0)	2	(0.7)
Mathematics courses offered by telecommunications	10	(1.9)	85	(2.3)	5	(1.4)
Students going to another K–12 school for mathematics courses	7	(1.3)	90	(1.5)	3	(0.8)

C. Extent of Influence of National Standards

The decade preceding the 2000 National Survey saw a great deal of activity in relation to naturally promulgated standards, first in mathematics and later in science. School mathematics program representatives were given a series of statements about the influence of the NRC or NCTM *Standards* in their school and district, and asked the extent to which they agreed with each. As can be seen in Table 7.6, in 2000, roughly a third of elementary, middle, and high schools were reportedly engaged in school-wide efforts to make changes inspired by national science standards, and roughly half in relation to national standards in mathematics. Interestingly, while nearly 40 percent of the science program respondents reported that teachers in their school had implemented the *Standards* in their teaching, only about half that many indicated that the NRC *Standards* had been thoroughly discussed by teachers in the school. Analogous figures for mathematics were 55–59 percent for teachers implementing the NCTM *Standards* and 30–33 percent for thorough discussion school-wide. Most surprising was the fact that only 23–30 percent of the designated science program representatives and only 38–45 percent of the designated mathematics program representatives reported that they themselves were prepared to explain the *Standards* to their colleagues.

Implementing changes in response to national standards will require that administrators and other key stakeholders are knowledgeable about, and supportive of, these efforts. In both science and mathematics, larger percentages of school program representatives reported that principals and superintendents than local school boards are well-informed about national standards. Percentages of schools reporting that parents are well-informed about standards were lowest of all: 5–8 percent in science and 6–14 percent in mathematics.

Reforming science and mathematics education to align with the vision of the national standards documents will also require that school and district policies both encourage and facilitate the use of reform-oriented curriculum and instruction. The 2000 National Survey provides evidence that some district policies are changing more rapidly than others in response to national standards in science and mathematics. For example, 26–34 percent of the school science program representatives and 38–46 percent of the school mathematics program representatives reported that their districts are organizing staff development based on the *Standards*, but only 9–11 percent in science and 12–16 percent in mathematics indicated that their districts had changed how they evaluate teachers accordingly.

Table 7.6
Respondents Agreeing* with Various Statements Regarding the NRC *Standards* for Science Curriculum, Instruction, and Evaluation, by School Type

	Percent of Schools					
	Elementary		Middle		High	
I am prepared to explain the NRC *Standards* to my colleagues	26	(3.1)	23	(3.0)	30	(3.2)
The *Standards* have been thoroughly discussed by teachers in this school	18	(3.0)	21	(3.4)	21	(2.5)
There is a school-wide effort to make changes inspired by the *Standards*	34	(3.5)	39	(3.8)	36	(3.5)
Teachers in this school have implemented the *Standards* in their teaching	39	(3.7)	39	(3.7)	37	(3.6)
The principal of this school is well-informed about the *Standards*	29	(3.3)	19	(2.5)	25	(2.6)
Parents of students in this school are well-informed about the *Standards*	8	(1.8)	6	(1.5)	5	(1.2)
The superintendent of this district is well-informed about the *Standards*	27	(3.2)	19	(2.8)	21	(2.6)
The School Board is well-informed about the *Standards*	16	(2.5)	12	(2.3)	12	(2.5)
Our district is organizing staff development based on the *Standards*	34	(3.2)	28	(3.1)	26	(3.0)
Our district has changed how it evaluates teachers based on the *Standards*	11	(2.3)	9	(2.0)	10	(2.5)

* Includes responses of "Strongly Agree" or "Agree" to each statement.

Table 7.7
Respondents Agreeing* with Various Statements Regarding the NCTM *Standards* for Mathematics Curriculum, Instruction, and Evaluation, by School Type

	Percent of Schools					
	Elementary		Middle		High	
I am prepared to explain the NCTM *Standards* to my colleagues	38	(3.6)	41	(4.0)	45	(3.8)
The *Standards* have been thoroughly discussed by teachers in this school	33	(3.7)	30	(3.0)	32	(2.7)
There is a school-wide effort to make changes inspired by the *Standards*	55	(3.8)	54	(4.2)	49	(3.5)
Teachers in this school have implemented the *Standards* in their teaching	59	(4.2)	57	(4.0)	55	(3.2)
The principal of this school is well-informed about the *Standards*	50	(3.6)	35	(3.4)	32	(2.8)
Parents of students in this school are well-informed about the *Standards*	14	(2.5)	8	(1.9)	6	(1.1)
The superintendent of this district is well-informed about the *Standards*	34	(3.4)	30	(3.3)	26	(2.6)
The School Board is well-informed about the *Standards*	22	(2.9)	20	(2.2)	14	(2.6)
Our district is organizing staff development based on the *Standards*	46	(3.9)	39	(3.6)	38	(2.7)
Our district has changed how it evaluates teachers based on the *Standards*	16	(2.5)	14	(2.3)	12	(1.9)

* Includes responses of "Strongly Agree" or "Agree" to each statement.

Factor analysis of this series of items revealed strong relationships within subsets of them. (For a detailed description of the creation of composites, definitions of all composite variables, and reliability information, please see Appendix E.) For example, schools where the department chair, lead teacher, or other program representative reported that they were prepared to explain the national standards to their colleagues were also likely to have school-wide discussion and implementation of the *Standards*. Similarly, schools where the program representative reported that one type of stakeholder—e.g., the district superintendent—was well-informed about the *Standards* were more likely to report that the School Board and other stakeholders were also well-informed about them, and that district policy was changing based on the national standards. As can be seen in Table 7.8, attention to national standards was generally greater in mathematics than in science, which is likely a reflection of the fact that the NCTM *Standards* were published a number of years earlier.

Table 7.8
Science/Mathematics Program Scores on Composites Related to the NRC/NCTM *Standards,* by School Type

	Mean Score					
	Elementary Schools		Middle Schools		High Schools	
Science						
Teacher Attention to *Standards*	41	(1.8)	43	(1.6)	42	(1.6)
Other Stakeholders' Attention to *Standards*	44	(1.5)	42	(1.3)	38	(1.4)
Mathematics						
Teacher Attention to *Standards*	52	(1.9)	52	(1.5)	52	(1.4)
Other Stakeholders' Attention to *Standards*	50	(1.3)	46	(1.3)	41	(1.0)

D. Problems Affecting Instruction

School science and mathematics program representatives were given a list of "factors" that might affect science and mathematics instruction in their school and asked to indicate which, if any, cause serious problems. (The other response options were "not a significant problem" and "somewhat of a problem.")

Results for individual science items are presented in Table 7.9 and those for mathematics in Table 7.10. In science, resource-related issues were typically the ones most often cited as serious problems. Inadequate funds for purchasing equipment and supplies was labeled a serious problem by 25–35 percent of the respondents, inadequate facilities by 20–28 percent, and lack of materials for individualized instruction by 16–27 percent. Inadequate access to computers and computer software also appeared to be quite problematic, with as many as 40 percent of the middle schools rating lack of appropriate computer software a serious problem for teaching science. Finally, 15–22 percent of the school program representatives reported that the lack of a system for distributing and refurbishing science materials was a serious problem at their schools.

Other issues appeared to become increasingly problematic for science education in the higher grades, including student reading ability, student absences, and large classes. In contrast, time to teach science was more problematic in the lower grades, with 20 percent of the elementary school representatives and 12 percent of those in middle schools compared to only 4 percent at the high school level citing lack of time to teach science as a serious problem. Similarly, teacher preparation to teach science, time available for teacher professional development in science, and time for teachers to plan and prepare science lessons all seemed more problematic at the elementary level.

Two other areas were considered serious problems for science instruction by sizeable proportions of school program representatives in each grade range: 28–30 percent of the respondents cited lack of opportunities for teachers to work with one another during the school year as a serious problem, and 21–24 percent indicated that a lack of opportunities for teachers to share ideas was a serious problem. Maintaining discipline, public attitudes toward reform, and conflicting reforms within the district were less often cited as serious problems for science instruction.

Table 7.9
Science Program Representatives Viewing Each of a Number of Factors as a Serious Problem for Science Instruction in Their School, by School Type

	Percent of Schools					
	Elementary		Middle		High	
Facilities	20	(3.0)	28	(4.0)	21	(3.3)
Funds for purchasing equipment and supplies	35	(3.6)	33	(4.0)	25	(3.4)
Materials for individualizing instruction	27	(3.2)	25	(3.8)	16	(2.1)
Access to computers	17	(2.9)	18	(3.0)	22	(2.7)
Appropriate computer software	33	(3.5)	40	(3.9)	32	(3.0)
Student interest in science	4	(1.8)	4	(1.0)	8	(1.8)
Student reading abilities	11	(2.2)	18	(2.4)	22	(2.4)
Student absences	4	(1.4)	9	(2.0)	20	(2.6)
Teacher interest in science	8	(2.0)	3	(1.2)	2	(1.4)
Teacher preparation to teach science	14	(2.7)	5	(2.1)	5	(2.5)
Time to teach science	20	(2.9)	12	(3.2)	4	(0.9)
Opportunities for teachers to share ideas	24	(3.2)	21	(2.9)	21	(2.8)
In-service education opportunities	14	(2.6)	13	(2.8)	9	(1.4)
Interruptions for announcements, assemblies, other school activities	10	(2.3)	12	(2.7)	13	(1.9)
Large classes	7	(1.9)	12	(1.7)	14	(2.0)
Maintaining discipline	6	(1.8)	6	(1.1)	5	(0.9)
Parental support for education	12	(2.4)	11	(2.1)	13	(2.2)
State and/or district curriculum frameworks	5	(1.6)	3	(0.9)	7	(1.6)
State and/or district testing policies and practices	11	(2.1)	9	(1.4)	13	(1.9)
Importance that the school places on science	10	(2.1)	8	(2.2)	5	(1.1)
Public attitudes toward science reform at this school	4	(1.6)	3	(1.1)	6	(1.4)
Conflict between science reform efforts at this school and other school/district reform efforts	6	(1.8)	3	(0.8)	4	(1.0)
Time available for teachers to plan and prepare lessons	24	(3.5)	18	(3.5)	15	(2.1)
Time available for teachers to work with other teachers during the school year	30	(3.5)	29	(3.9)	28	(2.8)
Time available for teacher professional development	24	(3.2)	18	(3.0)	14	(2.1)
System of managing instructional resources at the district or school level (e.g., distributing science materials, refurbishing materials)	22	(2.8)	20	(3.6)	15	(2.5)

As in science, resource-related issues were the ones most likely to be cited as problematic in mathematics, although the problems appear to be less widespread. Lack of appropriate computer software was cited as a serious problem by 20–29 percent of the respondents, funds for purchasing equipment by 18–23 percent, access to computers by 14–19 percent, materials for individualized instruction by 11–14 percent, and the district system for maintaining and distributing materials by 6–11 percent. Only 4–5 percent of the school program representatives indicated that school facilities were a serious problem for mathematics, compared to 20 percent or more in science.

A lack of time available for teachers to work with one another during the school year was cited as a serious problem for mathematics instruction in 21–23 percent of the schools lack of

opportunities for teachers to share ideas in 14–15 percent, and inadequate teacher in-service education opportunities in 9–10 percent.

Table 7.10
Mathematics Program Representatives Viewing Each of a Number of Factors as a Serious Problem for Mathematics Instruction in Their School, by School Type

	Percent of Schools					
	Elementary		Middle		High	
Facilities	4	(1.5)	4	(1.6)	5	(1.1)
Funds for purchasing equipment and supplies	23	(4.1)	19	(4.0)	18	(3.1)
Materials for individualizing instruction	14	(2.5)	13	(2.9)	11	(1.6)
Access to computers	14	(2.5)	17	(2.7)	19	(3.0)
Appropriate computer software	20	(2.9)	29	(3.7)	27	(3.1)
Student interest in mathematics	5	(1.3)	10	(1.7)	20	(2.5)
Student reading abilities	15	(2.5)	15	(2.2)	20	(2.5)
Student absences	4	(1.3)	7	(1.6)	17	(2.0)
Teacher interest in mathematics	1	(0.4)	0	(0.2)	0	(0.3)
Teacher preparation to teach mathematics	7	(2.0)	5	(2.2)	2	(1.0)
Time to teach mathematics	2	(0.9)	3	(0.9)	5	(1.2)
Opportunities for teachers to share ideas	15	(2.9)	14	(2.9)	14	(2.2)
In-service education opportunities	10	(2.3)	9	(2.8)	10	(2.6)
Interruptions for announcements, assemblies, other school activities	4	(1.1)	9	(1.6)	11	(1.7)
Large classes	8	(2.0)	6	(1.2)	10	(1.3)
Maintaining discipline	7	(1.9)	4	(0.9)	5	(1.1)
Parental support for education	11	(2.0)	11	(2.0)	15	(2.2)
State and/or district curriculum frameworks	3	(1.2)	5	(1.1)	9	(1.4)
State and/or district testing policies and practices	15	(2.8)	10	(1.8)	17	(1.9)
Importance that the school places on mathematics	1	(0.8)	2	(1.2)	3	(0.8)
Public attitudes toward mathematics reform at this school	2	(1.0)	2	(0.7)	6	(1.3)
Conflict between mathematics reform efforts at this school and other school/district reform efforts	2	(0.6)	3	(1.0)	4	(1.4)
Time available for teachers to plan and prepare lessons	17	(3.2)	7	(1.7)	9	(1.4)
Time available for teachers to work with other teachers during the school year	23	(3.3)	23	(3.1)	21	(2.5)
Time available for teacher professional development	15	(2.6)	9	(2.1)	12	(1.8)
System of managing instructional resources at the district or school level (e.g., distributing materials for mathematics activities, refurbishing materials)	11	(2.1)	11	(3.0)	6	(1.3)

Student reading abilities appeared to be problematic across the board, with 15–20 percent of the mathematics program representatives indicating that this area posed a serious problem for mathematics instruction. Some issues seemed more problematic in the higher grades, including student absences, rated a serious problem in 17 percent of the high schools, and lack of student interest in mathematics, considered serious in 20 percent of the high schools. Other areas were rarely considered a serious problem at any of the three levels, including maintaining discipline (4–7 percent) and large classes (6–10 percent).

The role of mathematics in the overall curriculum was rarely considered a serious problem, with only 1–3 percent of the school program representatives citing the importance that the school places on mathematics and only 2–5 percent citing a lack of time to teach mathematics. Similarly, only a handful of schools (2–4 percent) reported serious conflicts between mathematics reform and other school/district reform efforts.

While 11–15 percent of the school mathematics program representatives indicated that parental support for education posed a serious problem, the issues seemed not to be specific to mathematics instruction, with only 2–6 percent indicating that public attitudes toward mathematics reform at their school posed a serious problem. It is also interesting to note that relatively few mathematics program representatives (10–17 percent, depending on grade range) considered state/district testing problems as problematic for mathematics instruction, similar to the percentages in science (9–13 percent), even though testing is much more prevalent in mathematics.

Table 7.11 summarizes these data by presenting the scores for science and mathematics programs on a number of composite variables derived from a factor analysis of the individual items. Three factors were identified: (1) problems associated with time constraints, (2) those related to facilities and equipment, and (3) those involving student and parent attitudes and behaviors. Each composite has a minimum possible score of 0 and a maximum of 100. (See Appendix E for a detailed description of the composites, along with their reliabilities.) Note that problems with facilities are generally seen as more serious in science than in mathematics. Similarly, problems associated with time—to plan lessons, work with other teachers during the school year, participate in professional development, and teach the subject—are more likely to be perceived as serious in science than in mathematics. In contrast, perceptions of the extent of the problems caused by student-related factors (e.g., reading abilities, absenteeism, interest in the subject, and discipline problems) are roughly equivalent for science and mathematics, becoming more problematic with increasing grade level in each subject.

Table 7.11
Science and Mathematics Program Scores on Composites Related to Problems Affecting Instruction, by School Type

	Mean Score					
	Elementary		Middle		High	
Science						
Extent to Which Time Constraints Pose a Problem for Instruction	48	(1.9)	43	(1.8)	40	(1.5)
Extent to Which Facilities and Equipment Pose a Problem for Instruction	47	(1.7)	50	(2.2)	46	(1.7)
Extent to Which Students and Parents Pose a Problem for Instruction	23	(1.7)	29	(1.7)	34	(1.9)
Mathematics						
Extent to Which Time Constraints Pose a Problem for Instruction	37	(1.9)	36	(1.7)	35	(1.5)
Extent to Which Facilities and Equipment Pose a Problem for Instruction	34	(1.8)	37	(1.9)	38	(1.5)
Extent to Which Students and Parents Pose a Problem for Instruction	24	(1.6)	30	(1.8)	38	(1.6)

E. Summary

The 2000 National Survey data suggest that national standards in science and mathematics are influencing instruction, though the extent of impact is limited. Overall, attention to national standards is greater in mathematics than in science, likely due to the NCTM *Standards* being in the field for a longer period of time. About one-third of the schools at each level report making changes in keeping with the NRC *Standards*, and about half report such changes influenced by the NCTM *Standards*. Only about half of the schools that report changes inspired by the standards also report discussing the standards thoroughly among teachers in the school. Another indicator of the relatively shallow penetration is that only 23–30 percent of the science program representatives and only 38–45 percent of mathematics program representatives reported that they themselves were prepared to explain the *Standards* to their colleagues. Further, a third or fewer schools in each grade range report that their districts are planning staff development based on the NRC *Standards*, and less than half of the schools indicate such planning for the NCTM *Standards*.

Relatively few schools have structures in place specifically to facilitate the teaching of science and mathematics. One-fourth to one-third of elementary, middle, and high schools have designated lead teachers in science/mathematics, and one-fifth or fewer provide a common daily planning period for their science/mathematics teachers. Sizeable proportions of program representatives pointed to a lack of opportunities for teachers to work together and share ideas as a serious problem for science and mathematics instruction.

According to science and mathematics program representatives, the most serious instructional problems are related to resources. In science, these include funds for equipment and supplies, inadequate facilities, lack of computers and software, and lack of materials for individualizing instruction. In mathematics, lack of appropriate software, funds for equipment, access to computers, and lack of materials for individualizing instruction were the most commonly cited resource-related problems. Generally, problems with facilities were more frequently cited in science than in mathematics, as were problems associated with time; e.g., to plan lessons, work with other teachers during the school year, and teach the subject.