Factors Affecting Instruction

Overview

Students' opportunities to learn science, mathematics, and computer science are affected by a myriad of factors, including teacher preparedness, school and district policies and practices, and administrator and community support. Although the primary focus of the 2018 NSSME+ was on teachers and teaching, the study also collected information on the context of classroom practice. Among the data collected were the extent of use of various programs and practices in the school; science, mathematics, and computer science course requirements; the extent of influence of state standards; and the extent of various problems that may affect instruction in the school. These data are presented in the following sections.

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. These individuals were also asked about several instructional arrangements for students in elementary self-contained classrooms, such as whether they were pulled out 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. Table 7.1 shows the percentage of elementary schools indicating that each program or practice is in place.

The use of elementary science specialists, either in place of, or in addition to, the regular classroom teacher, is uncommon (7–15 percent of schools). Pull-out science instruction, whether for remediation or enrichment, is also quite rare (8–10 percent of schools). The picture is quite different in elementary school mathematics instruction. Students are pulled out for mathematics remediation in more than 60 percent of schools, and in just over one-third of schools, students are pulled out for mathematics enrichment. The prevalence of these practices may be due in part to the fact that mathematics is much more likely than science to be tested for accountability purposes. In addition, Title 1 funds are more likely to be targeted for remediation in mathematics and reading than in science.

Table 7.1
Use of Various Instructional Arrangements in Elementary Schools, by Subject

	PERCENT OF SCHOOLS	
	SCIENCE	MATHEMATICS
Students in self-contained classes are pulled out for remedial instruction in science/mathematics.	8 (1.7)	62 (3.0)
Students in self-contained classes are pulled out for enrichment in science/mathematics.	10 (1.8)	36 (2.8)
Students in self-contained classes are pulled out from science/mathematics instruction for additional instruction in other content areas.	28 (2.9)	25 (2.5)
Students in self-contained classes receive instruction from a district/diocese/school science/mathematics specialist *in addition* to their regular teacher.	15 (2.1)	23 (2.4)
Students in self-contained classes receive instruction from a district/diocese/school science/mathematics specialist *instead of* their regular teacher.	7 (1.8)	8 (1.7)
Students in self-contained classes receive science instruction on a regular basis from someone outside of the school/district/diocese (e.g., museum staff).	3 (1.2)	n/a

The study asked high schools about the prevalence of several possible course policies, specifically, block scheduling, single courses resulting in credit for multiple subjects, and allowing engineering courses to count toward students' science graduation requirement. The rationale for block scheduling is largely two-fold. First, the schedule affords longer class periods, which can be especially important in science, where a 50-minute class constrains the kinds of laboratory activities that can be conducted. Second, students can take eight classes per year instead of six or seven. One main downside of block scheduling is that there is less total instructional time available for each class. As shown in Table 7.2, one-third of all high schools use block scheduling. Additionally, 1 in 5 high schools allow students to earn credits in multiple subjects with a single course, perhaps because of the increasing prominence of STEM initiatives in schools. Finally, 21 percent of the schools that offer engineering courses allow these courses to count toward students' graduation requirement for science.

Table 7.2
Prevalence of Various High School Course Policies

	PERCENT OF SCHOOLS
Block Schedule	**33 (2.4)**
Dual Credit Courses	**19 (2.4)**
Mathematics and science	9 (2.2)
Mathematics and computer science	4 (1.2)
Science and computer science	2 (1.1)
None of these combinations	8 (1.4)
Engineering Courses Count Toward Science Graduation Requirement†	**21 (2.6)**

† Includes only schools offering engineering courses.

The study also asked if high schools allow students to demonstrate mastery of course content without the normal seat time requirement by, for example, taking a test or performing a task. Results are shown in Table 7.3. About a quarter of all high schools allow for this in mathematics and science, while 10 percent of schools allow students to demonstrate computer science mastery for credit.

Table 7.3
Subjects for Which Students May Demonstrate Mastery of Course Content for Credit Without Normal Seat Time Requirement

	PERCENT OF SCHOOLS
Science	24 (2.5)
Mathematics	27 (2.4)
Computer Science	10 (1.6)

High school program representatives were asked how many years of science, mathematics, and computer science students are required to take in order to graduate. As can be seen in Table 7.4, the vast majority of high schools require at least three years of science and mathematics; more than half require four years of mathematics. For most schools, graduation requirements are just as demanding as state university entrance requirements.[22] However, when there is a difference,

[22] State (public) university entrance requirements were mined from the Internet. When state university systems included multiple tiers, the lowest four-year university tier requirements were used.

graduation requirements tend to be more rigorous; 40 percent of high schools require more science and 32 percent require more mathematics courses for graduation than state universities do for entrance.

Table 7.4
High School Graduation vs. State University Entrance Requirements, by Subject

	PERCENT OF SCHOOLS	
	SCIENCE	MATHEMATICS
Graduation Requirement		
1 Year	0 (0.0)	0 (0.5)
2 Years	14 (2.5)	4 (1.2)
3 Years	66 (2.9)	44 (3.1)
4 Years	20 (2.2)	52 (3.2)
State University Entrance Requirement		
1 Year	2 (0.5)	0 ---†
2 Years	39 (3.0)	1 (0.5)
3 Years	56 (3.0)	76 (3.1)
4 Years	3 (0.8)	23 (3.1)
Difference		
2 Years Fewer Required for Graduation	0 ---†	0 (0.5)
1 Year Fewer Required for Graduation	4 (1.9)	8 (2.3)
No Difference	56 (2.6)	60 (3.1)
1 Year More Required for Graduation	29 (2.5)	32 (2.7)
2 Years More Required for Graduation	11 (0.6)	0 ---†
3 Years More Required for Graduation	0 (0.1)	0 ---†

† No schools in the sample were in this category. Thus, it is not possible to compute the standard error of this estimate.

In contrast, nearly three-quarters of schools do not require any computer science in order to graduate; almost all that do require one year or less (see Table 7.5). Additionally, program representatives were asked if computer science counts toward graduation requirements in any other subjects. As can be seen in Table 7.6, only a small percentage of high schools allow computer science to count toward graduation requirements in mathematics, science, or foreign language.

Table 7.5
High School Computer Science Graduation Requirements

	PERCENT OF SCHOOLS
0 Years	74 (3.1)
½ Year	8 (1.9)
1 Year	17 (2.9)
2–4 Years	1 (0.4)

Table 7.6
High School Computer Science Counting for Graduation Requirements in Other Subject Areas

	PERCENT OF SCHOOLS
Mathematics	15 (2.0)
Science	12 (2.0)
Foreign language	7 (2.0)

Finally, program representatives were asked to indicate which of several practices their school employs to enhance student interest and/or achievement in science, mathematics, and computer science. The results are shown in Tables 7.7–7.9. Especially in science, such programs tend to be more prevalent as grade range increases. For example, more than three-quarters of high schools offer after-school help in science and engineering, compared to about a third of elementary schools. Similarly, 47 percent of high schools have one or more teams participating in engineering competitions, whereas only 24 percent of elementary schools do. In mathematics, the percentage of schools offering school-based programs to enhance interest and achievement (apart from tutoring) is strikingly low. For example, only about one-third of high schools have mathematics clubs, and fewer than 20 percent of all schools participate in local or regional math fairs. Computer science enhancement programs are rare at all grade levels. With the exception of encouraging students to participate in computer science-based summer programs, the majority of all schools do not provide opportunities intended to promote interest and achievement in computer science. For example, 15 percent or fewer of all schools have teams participating in computer science competitions, coordinate internships in computer science, and participate in local or regional computer science fairs.

Table 7.7
School Programs/Practices to Enhance Students' Interest and/or Achievement in Science/Engineering, by Grade Range

	PERCENT OF SCHOOLS		
	ELEMENTARY	MIDDLE	HIGH
Offers after-school help in science and/or engineering (e.g., tutoring)	31 (2.7)	51 (2.9)	79 (2.9)
Encourages students to participate in science and/or engineering summer programs or camps (e.g., offered by community colleges, universities, museums, or science centers)	68 (2.8)	73 (2.9)	78 (3.3)
Coordinates visits to business, industry, and/or research sites related to science and/or engineering	39 (2.9)	45 (3.7)	55 (3.0)
Offers one or more science clubs	36 (3.2)	45 (3.7)	54 (3.5)
Has one or more teams participating in engineering competitions (e.g., Robotics)	24 (2.4)	35 (2.9)	47 (3.0)
Participates in a local or regional science and/or engineering fair	40 (2.8)	48 (3.2)	46 (3.6)
Has one or more teams participating in science competitions (e.g., Science Olympiad)	17 (2.0)	29 (2.9)	43 (3.0)
Coordinates meetings with adult mentors who work in science and/or engineering fields	26 (2.8)	34 (3.0)	39 (2.9)
Offers one or more engineering clubs	28 (2.5)	36 (2.9)	35 (2.6)
Offers formal after-school programs for enrichment in science and/or engineering	32 (2.7)	39 (2.9)	32 (2.5)
Coordinates internships in science and/or engineering fields	n/a	n/a	24 (2.4)
Holds family science and/or engineering nights	44 (3.0)	34 (3.0)	19 (2.3)

Table 7.8
School Programs/Practices to Enhance Students' Interest and/or Achievement in Mathematics, by Grade Range

	PERCENT OF SCHOOLS		
	ELEMENTARY	MIDDLE	HIGH
Offers after-school help in mathematics (e.g., tutoring)	67 (2.7)	79 (2.9)	85 (2.9)
Encourages students to participate in mathematics summer programs or camps (e.g., offered by community colleges, universities, museums or mathematics centers)	47 (2.9)	49 (2.9)	51 (3.1)
Has one or more teams participating in mathematics competitions (e.g., Math Counts)	27 (2.5)	37 (3.1)	43 (3.0)
Offers one or more mathematics clubs	20 (2.3)	29 (2.9)	36 (2.6)
Participates in a local or regional mathematics fair	16 (2.4)	19 (2.6)	19 (1.9)
Coordinates visits to business, industry, and/or research sites related to mathematics	17 (2.2)	14 (2.4)	19 (2.4)
Offers formal after-school programs for enrichment in mathematics	27 (2.8)	35 (3.1)	18 (1.8)
Coordinates meetings with adult mentors who work in mathematics fields	14 (2.0)	15 (2.2)	13 (2.0)
Holds family math nights	38 (2.8)	21 (2.6)	6 (1.2)
Coordinates internships in mathematics fields	n/a	n/a	6 (1.2)

Table 7.9
School Programs/Practices to Enhance Students' Interest and/or Achievement in Computer Science, by Grade Range

	PERCENT OF SCHOOLS		
	ELEMENTARY	MIDDLE	HIGH
Encourages students to participate in computer science summer programs or camps offered by community colleges, universities, museums or computer science centers	38 (2.9)	44 (3.3)	51 (2.6)
Offers after-school help in computer science (e.g., tutoring)	14 (1.8)	20 (2.1)	31 (2.8)
Coordinates visits to business, industry, and/or research sites related to computer science	14 (2.3)	22 (2.8)	30 (3.0)
Offers one or more computer science clubs	22 (2.4)	25 (2.3)	29 (2.2)
Participates in Hour of Code	38 (2.8)	34 (2.8)	27 (2.6)
Coordinates meetings with adult mentors who work in computer science fields	14 (2.0)	18 (2.1)	22 (1.9)
Offers formal after-school programs for enrichment in computer science	21 (2.3)	21 (2.6)	15 (1.8)
Has one or more teams participating in computer science competitions (e.g., USA Computer Science Olympiad)	6 (1.3)	10 (1.5)	15 (1.6)
Coordinates internships in computer science fields	n/a	n/a	15 (1.7)
Participates in a local or regional computer science fair	11 (1.9)	13 (2.1)	12 (1.5)
Holds family computer science nights	15 (2.0)	8 (1.5)	5 (1.0)

Interestingly, these programs are not distributed equally across all types of schools. Some differences are particularly evident by percentage of students eligible for free/reduced-price lunch and school size. Large schools are more likely than small schools to offer many of these programs (see Table 7.10). For example, 45 percent of the largest schools offer opportunities for students to participate in engineering clubs, compared to only 19 percent of the smallest schools, and 53 percent of the largest schools have science clubs, compared to 27 percent of the smallest schools. Results are more varied when looking at these programs by the percentage of students in the school eligible for free/reduced-price lunch. Schools with the fewest students eligible for free/reduced-price lunch are more likely to offer enrichment programs (for example, 39 percent of schools in the lowest quartile have students participating in engineering clubs, compared to 26 percent of schools in the highest quartile). In contrast, 55 percent of schools in the highest quartile offer after-school help in science and/or engineering, compared to 39 percent of schools in the lowest quartile. Similar patterns exist to a lesser degree for schools' mathematics programs and practices (see Table 7.11) and computer science programs and practices (see Table 7.12).

Table 7.10
Equity Analyses of School Programs/Practices to Enhance Students' Interest in Science/Engineering

	PERCENT OF SCHOOLS			
	PERCENT OF STUDENTS IN SCHOOL ELIGIBLE FOR FRL		SCHOOL SIZE	
	Lowest Quartile	Highest Quartile	Smallest Schools	Largest Schools
Encourage students to participate in summer programs/camps	70 (4.0)	70 (4.4)	68 (4.7)	71 (3.5)
Science clubs	47 (3.9)	38 (4.9)	27 (4.3)	53 (3.6)
After-school help	39 (3.6)	55 (4.4)	40 (5.6)	52 (3.3)
Participation in local or regional science/engineering fair	39 (4.3)	44 (4.8)	34 (5.1)	51 (3.3)
Visits to business, industry, and/or research sites	36 (3.9)	45 (5.4)	36 (4.8)	46 (3.7)
Family science and/or engineering nights	35 (3.9)	43 (4.9)	25 (4.9)	45 (3.6)
Participation in engineering competitions	36 (3.6)	25 (3.7)	20 (4.2)	45 (3.6)
Engineering clubs	39 (3.6)	26 (3.5)	19 (3.6)	45 (3.3)
After-school programs for enrichment	38 (4.5)	39 (4.2)	26 (4.5)	43 (3.0)
Meetings with mentors who work in science/engineering fields	26 (3.5)	28 (4.3)	24 (4.5)	34 (3.4)
Internships in science/engineering fields†	28 (4.8)	19 (4.3)	6 (3.1)	34 (3.6)
Participation in science competitions	25 (2.8)	20 (3.9)	13 (3.0)	32 (3.3)

† Includes only those schools with high school students.

Table 7.11
Equity Analyses of School Programs/Practices to Enhance Students' Interest in Mathematics

	PERCENT OF SCHOOLS			
	PERCENT OF STUDENTS IN SCHOOL ELIGIBLE FOR FRL		SCHOOL SIZE	
	Lowest Quartile	Highest Quartile	Smallest Schools	Largest Schools
After-school help	65 (4.1)	81 (3.6)	67 (5.0)	76 (3.4)
Encourage students to participate in summer programs/camps	49 (4.2)	64 (4.2)	45 (5.5)	53 (3.3)
Participation in mathematics competitions	39 (4.3)	26 (3.7)	23 (4.5)	44 (3.6)
Mathematics clubs	30 (3.8)	24 (3.4)	13 (3.6)	41 (3.5)
Family math nights	20 (3.9)	45 (4.1)	23 (4.8)	34 (3.6)
After-school programs for enrichment	30 (3.8)	36 (4.1)	26 (5.2)	31 (3.5)
Participation in local or regional mathematics fair	20 (3.2)	19 (3.2)	8 (3.1)	24 (2.8)
Meetings with mentors who work in mathematics fields	11 (2.5)	22 (3.8)	14 (3.5)	18 (2.6)
Visits to business, industry, and/or research sites	16 (3.1)	23 (4.4)	16 (4.1)	15 (2.2)
Internships in mathematics fields†	11 (3.3)	7 (2.3)	4 (2.1)	9 (1.8)

† Includes only those schools with high school students.

Table 7.12
Equity Analyses of School Programs/Practices to Enhance Students' Interest in Computer Science

	PERCENT OF SCHOOLS			
	PERCENT OF STUDENTS IN SCHOOL ELIGIBLE FOR FRL		SCHOOL SIZE	
	Lowest Quartile	Highest Quartile	Smallest Schools	Largest Schools
Participation in Hour of Code	46 (3.7)	30 (4.2)	23 (4.2)	51 (3.8)
Encourage students to participate in summer programs/camps	42 (3.9)	49 (4.5)	35 (5.5)	49 (2.8)
Computer science clubs	34 (3.5)	27 (3.7)	15 (4.3)	38 (3.0)
After-school help	21 (2.9)	24 (3.2)	20 (4.2)	25 (2.6)
After-school programs for enrichment	24 (3.8)	23 (4.1)	15 (3.9)	25 (2.7)
Visits to business, industry, and/or research sites	18 (3.0)	27 (4.1)	14 (4.3)	22 (2.4)
Internships in computer science fields†	15 (3.1)	17 (3.9)	6 (2.6)	21 (3.2)
Meetings with mentors who work in computer science fields	21 (2.8)	20 (4.1)	15 (3.3)	17 (2.0)
Participation in local or regional computer science fair	11 (2.6)	15 (3.0)	8 (2.9)	16 (2.3)
Participation in computer science competitions	11 (2.4)	7 (2.0)	5 (2.0)	14 (1.9)
Family computer science nights	9 (2.6)	20 (3.9)	11 (3.5)	12 (2.1)

† Includes only those schools with high school students.

Extent of Influence of State Standards

School science and mathematics program representatives were given a series of statements about the influence of state standards in their school and district, and asked about the extent to which they agreed with each. A summary of responses is shown in Table 7.13. It is clear that state standards have a major influence at the school level. For example, 79 percent or more of program representatives agree that teachers in the school teach to science and mathematics standards. Similarly, a large majority of representatives agree that science and mathematics standards have been thoroughly discussed by teachers in the school and that there is a school-wide effort to align instruction to standards. Both practices are especially prevalent in mathematics, with 83–90 percent of representatives agreeing across the grade levels. It is somewhat surprising that only about half of high schools are in districts that organize professional development based on science and mathematics standards.

Table 7.13
Influence† of State Science and Mathematics Standards in Schools, by Grade Range

	PERCENT OF SCHOOLS		
	ELEMENTARY	MIDDLE	HIGH
Science			
Most science teachers in this school teach to the state standards.	79 (2.6)	84 (2.5)	84 (2.7)
There is a school-wide effort to align science instruction with the state science standards.	71 (2.8)	79 (3.1)	78 (3.2)
State science standards have been thoroughly discussed by science teachers in this school.	65 (3.1)	76 (3.1)	78 (3.0)
The school/district/diocese organizes science professional development based on state standards.	54 (3.2)	61 (3.0)	57 (3.4)
Mathematics			
Most mathematics teachers in this school teach to the state standards.	93 (1.5)	93 (1.8)	87 (2.3)
There is a school-wide effort to align mathematics instruction with the state mathematics standards.	90 (1.7)	90 (2.2)	87 (2.1)
State mathematics standards have been thoroughly discussed by mathematics teachers in this school.	87 (2.4)	87 (2.7)	83 (2.9)
The school/district/diocese organizes mathematics professional development based on state standards.	73 (2.6)	67 (3.2)	53 (3.2)

† Includes schools indicating "strongly agree" or "agree" on a five-point scale ranging from 1 "strongly disagree" to 5 "strongly agree."

By combining these items in a composite variable, an overview of the influence of standards is possible. As can be seen in Table 7.14, attention to standards is generally greater in mathematics than in science, particularly in elementary and middle schools. The greater weight given to mathematics in school accountability probably contributes to these results. In addition, high schools' attention to state mathematics standards may be lower than elementary and middle schools' because they are only held accountable in a few mathematics subjects.

Table 7.14
School Mean Scores for the Focus on State Standards Composite, by Subject

	MEAN SCORE	
	SCIENCE	MATHEMATICS
Elementary	66 (1.6)	81 (1.2)
Middle	73 (1.6)	81 (1.5)
High	73 (1.4)	75 (1.6)

Factors That Promote and Inhibit Instruction

Program representatives were asked about a number of factors that might affect science and mathematics instruction in their school. Schools were asked whether teachers travel among different classrooms, for example, using rooms available during other teachers' planning periods, due to a shortage of classrooms within the school.[23] Table 7.15 displays the percentage of schools at each grade level that employ this strategy. High schools are the most likely to have

[23] Dubois, S. L., & Luft, J. A. (2014). Science teachers without classrooms of their own: A study of the phenomenon of floating. *Journal of Science Teacher Education*, *25*(1), 5-23.

teachers travel among classrooms (39 percent). Schools were also asked whether first-year teachers were purposefully given a classroom of their own. Fewer than 10 percent of all schools, including those that currently do not have teachers traveling, have policies in place to ensure first-year teachers do not have to travel among classrooms.

Table 7.15
School Policies Related to Teachers Traveling Among Rooms Due to a Shortage of Classrooms, by Grade Range

	PERCENT OF SCHOOLS		
	ELEMENTARY	MIDDLE	HIGH
Teachers currently traveling among classrooms	16 (2.3)	24 (2.5)	39 (2.6)
Policy that first-year teachers do not travel among classrooms	6 (1.6)	9 (2.1)	8 (1.6)

Program representatives were also given a list of factors and asked to indicate their influence on science and mathematics instruction. Results for science instruction are presented in Table 7.16, and those for mathematics instruction are in Table 7.17. As there is little variation by grade range, the results are presented for schools overall. Two factors are perceived by a majority of schools as promoting effective science instruction: school/district science professional development policies and practices and the importance that the school places on science. Additionally, fewer than one-fourth of schools see either of these factors as inhibiting science instruction.

Table 7.16
Effect† of Various Factors on Science Instruction

	PERCENT OF SCHOOLS		
	INHIBITS	NEUTRAL	PROMOTES
The school/district/diocese science professional development policies and practices	14 (1.6)	34 (2.1)	52 (2.4)
The importance that the school places on science	21 (1.9)	27 (2.2)	51 (2.5)
How science instructional resources are managed (e.g., distributing and refurbishing materials)	22 (1.8)	30 (2.1)	49 (2.5)
The amount of time provided by the school/district/diocese for teacher professional development in science	32 (2.3)	32 (2.4)	36 (2.2)
The amount of time provided by the school/district/diocese for teachers to share ideas about science instruction	35 (2.3)	29 (1.9)	36 (2.2)
Other school and/or district/diocese initiatives	23 (2.1)	42 (1.9)	35 (2.3)

† Schools rated the effect of each factor on a five-point scale ranging from 1 "inhibits effective instruction" to 5 "promotes effective instruction." The "Inhibits" column includes those indicating 1 or 2. The "Promotes" column includes those indicating 4 or 5.

The climate for mathematics instruction seems generally more supportive than that for science. For example, 78 percent of schools indicate that the importance the school places on the subject promotes effective mathematics instruction (compared to 51 percent for science). Similarly, professional development policies and practices, as well as time provided for professional development, are more likely to be viewed as promoting effective mathematics instruction than science instruction.

Table 7.17
Effect† of Various Factors on Mathematics Instruction

	PERCENT OF SCHOOLS		
	INHIBITS	NEUTRAL	PROMOTES
The importance that the school places on mathematics	7 (1.0)	15 (1.6)	78 (1.7)
The school/district/diocese mathematics professional development policies and practices	7 (1.0)	28 (2.0)	66 (2.3)
How mathematics instructional resources are managed (e.g., distributing and replacing materials)	13 (1.5)	28 (2.0)	59 (2.2)
The amount of time provided by the school/district/diocese for teacher professional development in mathematics	17 (1.7)	30 (2.2)	52 (2.4)
The amount of time provided by the school/district/diocese for teachers to share ideas about mathematics instruction	20 (1.8)	28 (2.1)	52 (2.1)
Other school and/or district/diocese initiatives	10 (1.2)	44 (2.0)	46 (2.1)

† Schools rated the effect of each factor on a five-point scale ranging from 1 "inhibits effective instruction" to 5 "promotes effective instruction." The "Inhibits" column includes those indicating 1 or 2. The "Promotes" column includes those indicating 4 or 5.

These items were combined into a composite variable in order to look at the effects of the factors on science and mathematics instruction more holistically. As Table 7.18 displays, elementary schools generally provide a less supportive context for science instruction than middle or high schools. In addition, elementary and middle schools tend to be more supportive for mathematics teaching than science teaching.

Table 7.18
School Mean Scores for the Supportive Context for Science/Mathematics Instruction Composites, by Subject

	MEAN SCORE	
	SCIENCE	MATHEMATICS
Elementary	54 (1.5)	68 (1.3)
Middle	59 (1.5)	66 (1.3)
High	61 (1.4)	63 (1.2)

Program representatives were also asked to rate whether each of several factors is a problem for instruction in their school. In science, low student prior knowledge and skills is perceived as a problem across grade levels (64–75 percent of schools), particularly high school, as can be seen in Table 7.19. Inadequate science-related professional development opportunities is perceived as a problem by 61–76 percent of the schools, inadequate materials for differentiating instruction by 54–67 percent, and inadequate funds for purchasing science equipment and supplies by 54–62 percent. In high schools, low student interest is seen as a problem by 61 percent of schools, compared to 44 percent of middle schools and 29 percent of elementary schools. Lack of teacher interest in science is more likely to be seen as a problem in elementary schools (46 percent) than in high schools (13 percent).

Table 7.19
Science Program Representatives Viewing Each of a Number of Factors as a Problem† for Science Instruction in Their School, by Grade Range

	PERCENT OF SCHOOLS		
	ELEMENTARY	MIDDLE	HIGH
Low student prior knowledge and skills	64 (2.5)	64 (3.2)	75 (3.0)
Lack of parent/guardian support and involvement	45 (2.8)	51 (2.5)	63 (3.0)
Inadequate science-related professional development opportunities	76 (2.5)	64 (3.3)	61 (3.5)
Low student interest in science	29 (2.7)	44 (3.0)	61 (3.3)
High student absenteeism	33 (2.3)	39 (2.8)	56 (3.5)
Inadequate funds for purchasing science equipment and supplies	62 (2.7)	60 (3.2)	54 (2.9)
Inadequate materials for differentiating science instruction	67 (2.6)	59 (3.4)	54 (3.0)
Large class sizes	42 (2.7)	46 (2.6)	46 (3.3)
Insufficient instructional time to teach science	71 (2.9)	50 (3.3)	45 (3.5)
Poor quality of science textbooks/modules	49 (2.6)	48 (2.9)	44 (3.2)
Inappropriate student behavior	43 (2.4)	46 (2.4)	42 (3.7)
Lack of science facilities (e.g., lab tables, electric outlets, faucets and sinks in classrooms)	58 (3.1)	53 (3.0)	41 (3.4)
Lack of science textbooks/modules	46 (2.7)	43 (3.5)	37 (3.2)
High teacher turnover	31 (2.8)	36 (3.0)	37 (3.2)
Inadequate teacher preparation to teach science	59 (2.7)	39 (3.0)	27 (3.5)
Community resistance to the teaching of "controversial" issues in science (e.g., evolution, climate change)	16 (2.3)	19 (2.8)	21 (3.1)
Lack of teacher interest in science	46 (2.8)	25 (3.3)	13 (2.7)

† Includes schools indicating "somewhat of a problem" or "serious problem" on a three-point scale from 1 "not a significant problem" to 3 "serious problem."

In mathematics, three factors are seen as a problem in a substantial proportion of schools: low student interest in the subject, low student prior knowledge and skills, and lack of parent/guardian support and involvement (see Table 7.20). Low student interest and low student prior knowledge are both more likely to be seen as problems in high schools than in elementary schools.

Table 7.20
Mathematics Program Representatives Viewing Each of a Number of Factors as a Problem† for Mathematics Instruction in Their School, by Grade Range

	PERCENT OF SCHOOLS		
	ELEMENTARY	MIDDLE	HIGH
Low student prior knowledge and skills	71 (2.8)	77 (3.0)	87 (1.5)
Low student interest in mathematics	56 (3.5)	67 (3.9)	82 (2.2)
Lack of parent/guardian support and involvement	60 (3.0)	63 (3.7)	67 (2.8)
High student absenteeism	44 (2.9)	51 (3.4)	59 (3.0)
Inadequate mathematics-related professional development opportunities	52 (3.0)	51 (3.5)	53 (3.1)
Inadequate materials for differentiating mathematics instruction	54 (3.0)	53 (3.0)	50 (2.8)
Community attitudes toward mathematics instruction	37 (3.0)	43 (3.4)	49 (3.3)
Inappropriate student behavior	46 (2.8)	51 (3.1)	46 (2.9)
Inadequate funds for purchasing mathematics equipment and supplies	35 (2.4)	43 (3.5)	45 (3.2)
Insufficient instructional time to teach mathematics	36 (3.0)	36 (3.0)	44 (3.3)
Large class sizes	35 (3.3)	38 (2.9)	41 (3.2)
Poor quality mathematics textbooks	27 (2.5)	28 (2.7)	40 (3.2)
Lack of equipment and supplies and/or manipulatives for teaching mathematics (e.g., materials for students to draw, cut, and build in order to make sense of problems)	26 (3.0)	34 (3.5)	39 (3.5)
High teacher turnover	29 (2.8)	34 (3.1)	38 (3.1)
Lack of mathematics textbooks	17 (2.3)	19 (2.7)	29 (3.0)
Inadequate teacher preparation to teach mathematics	39 (3.2)	29 (3.2)	19 (2.6)
Lack of teacher interest in mathematics	25 (2.8)	19 (2.7)	15 (2.4)

† Includes schools indicating "somewhat of a problem" or "serious problem" on a three-point scale from 1 "not a significant problem" to 3 "serious problem."

Composite variables created from these items allow for a summary of the factors affecting science and mathematics instruction. One striking difference is that the extent to which student issues are seen as problematic is more pronounced in mathematics instruction compared to science instruction (see Table 7.21). Some differences across grade ranges are also apparent, particularly in science. Specifically, lack of resources and teacher-related issues are more notable at the elementary level than at the high school level.

Table 7.21
School Mean Scores for Factors Affecting Instruction Composites, by Grade Range

	MEAN SCORE		
	ELEMENTARY	MIDDLE	HIGH
Science			
Extent to Which Student Issues are Problematic	24 (1.0)	28 (1.3)	33 (1.6)
Extent to Which a Lack of Resources is Problematic	37 (1.5)	34 (1.6)	29 (1.8)
Extent to Which Teacher Issues are Problematic	42 (1.5)	28 (1.7)	22 (1.6)
Mathematics			
Extent to Which Student Issues are Problematic	33 (1.6)	39 (1.9)	43 (1.5)
Extent to Which a Lack of Resources is Problematic	19 (1.1)	21 (1.5)	24 (1.6)
Extent to Which Teacher Issues are Problematic	22 (1.4)	19 (1.4)	19 (1.3)

When disaggregated by the percentage of students eligible for free/reduced-price lunch, some differences in composite means emerge (see Table 7.22). The mean score for the Extent to Which Student Issues are Problematic composite, which includes items such as low student interest, high absenteeism, and inappropriate behavior, varies considerably in both science and mathematics by the percentage of students eligible for free/reduced-price lunch (ranging from 16 for the lowest quartile to 38 for the highest in science, and from 23 to 48 in mathematics). Though not as pronounced, similar gaps are seen in science for the Extent to Which a Lack of Resources is Problematic composite, which includes items about a lack of equipment and textbooks, and the Extent to Which Teacher Issues are Problematic composite, which includes items about teacher interest in the subject and teacher preparation to teach the subject.

Table 7.22
Equity Analyses of School Mean Scores for Factors Affecting Instruction Composites by Percentage of Students in School Eligible for Free/Reduced-Price Lunch

	MEAN SCORE		
	EXTENT TO WHICH A LACK OF RESOURCES IS PROBLEMATIC	EXTENT TO WHICH STUDENT ISSUES ARE PROBLEMATIC	EXTENT TO WHICH TEACHER ISSUES ARE PROBLEMATIC
Science			
Lowest Quartile	32 (2.5)	16 (1.5)	33 (2.1)
Second Quartile	31 (2.3)	24 (1.6)	30 (2.2)
Third Quartile	38 (2.8)	33 (1.8)	35 (2.3)
Highest Quartile	40 (2.1)	38 (2.1)	41 (2.5)
Mathematics			
Lowest Quartile	20 (1.5)	23 (2.1)	21 (2.0)
Second Quartile	18 (1.8)	32 (2.3)	18 (1.9)
Third Quartile	20 (1.7)	46 (1.9)	20 (1.6)
Highest Quartile	26 (2.3)	48 (2.3)	25 (2.0)

Teachers were asked about factors that affect instruction in their randomly selected class. Elementary science teacher results are shown in Table 7.23. Similar to findings from the program questionnaires, teachers indicate that students' motivation, interest, and effort in science tend to promote science instruction in elementary classes (75 percent). However, instructional time available for science instruction is seen as one of the biggest inhibitors of science instruction (28 percent).

Table 7.23
Effect† of Various Factors on Instruction in Elementary Science Classes

	PERCENT OF CLASSES		
	INHIBITS	NEUTRAL	PROMOTES
Students' motivation, interest, and effort in science	9 (1.6)	16 (1.8)	75 (2.2)
Principal support	6 (1.4)	29 (2.3)	65 (2.5)
Current state standards	5 (1.0)	31 (2.2)	64 (2.3)
Students' prior knowledge and skills	15 (2.0)	25 (2.0)	60 (2.3)
Amount of time for you to plan, individually and with colleagues	21 (1.8)	22 (2.3)	57 (2.8)
Pacing guides	11 (1.5)	34 (2.5)	55 (2.7)
Amount of instructional time devoted to science	28 (2.3)	22 (2.4)	49 (2.7)
Amount of time available for your professional development	26 (1.8)	30 (2.3)	44 (2.7)
Teacher evaluation policies	14 (1.7)	48 (2.8)	38 (3.1)
Parent/guardian expectations and involvement	18 (1.8)	45 (2.0)	37 (2.3)
State/district/diocese testing/accountability policies‡	19 (2.0)	45 (2.6)	36 (2.5)
Textbook/module selection policies	26 (2.9)	42 (3.2)	32 (2.5)

† Teachers rated the effect of each factor on a five-point scale ranging from 1 "inhibits effective instruction" to 5 "promotes effective instruction." The "Inhibits" column includes those indicating 1 or 2. The "Promotes" column includes those indicating 4 or 5.
‡ This item was presented only to teachers in public and Catholic schools.

In middle school science classes, principal support, current state standards, and the amount of time provided to plan individually and with colleagues are seen as promoting effective instruction in two-thirds or more of classes (see Table 7.24). Conversely, teachers of about a quarter of middle school science classes see students' prior knowledge and skills, parent/guardian expectations and involvement, and state/district testing/accountability policies as inhibiting science instruction.

Table 7.24
Effect† of Various Factors on Instruction in Middle School Science Classes

	PERCENT OF CLASSES		
	INHIBITS	NEUTRAL	PROMOTES
Principal support	10 (2.1)	19 (1.9)	71 (2.5)
Current state standards	8 (1.7)	25 (2.3)	68 (2.5)
Amount of time for you to plan, individually and with colleagues	20 (2.5)	14 (1.5)	66 (2.6)
Students' motivation, interest, and effort in science	24 (1.9)	18 (1.8)	58 (2.4)
Students' prior knowledge and skills	27 (2.4)	19 (1.5)	55 (2.5)
Pacing guides	11 (1.7)	35 (2.9)	54 (2.8)
Amount of time available for your professional development	20 (2.4)	29 (2.6)	51 (2.8)
Teacher evaluation policies	15 (1.7)	44 (2.5)	40 (2.7)
Parent/guardian expectations and involvement	27 (2.4)	33 (2.3)	40 (2.4)
Textbook/module selection policies	20 (2.6)	43 (2.8)	37 (2.8)
State/district/diocese testing/accountability policies‡	27 (2.9)	39 (2.6)	35 (2.8)

† Teachers rated the effect of each factor on a five-point scale ranging from 1 "inhibits effective instruction" to 5 "promotes effective instruction." The "Inhibits" column includes those indicating 1 or 2. The "Promotes" column includes those indicating 4 or 5.
‡ This item was presented only to teachers in public and Catholic schools.

Similar to middle school classes, the amount of time for teachers to plan individually and with colleagues, as well as principal support, are both seen as promoting science instruction in two-thirds or more of high school science classes (see Table 7.25). State testing/accountability policies are seen as inhibiting science instruction in one-fourth of high school science classes. In addition, high school teachers were asked how college entrance requirements affect science instruction. In about half of classes, teachers see these requirements as promoting effective instruction; in only 4 percent of high school science classes do teachers consider them as inhibiting instruction.

Table 7.25
Effect† of Various Factors on Instruction in High School Science Classes

	PERCENT OF CLASSES		
	INHIBITS	NEUTRAL	PROMOTES
Amount of time for you to plan, individually and with colleagues	15 (1.6)	17 (1.7)	69 (2.2)
Principal support	7 (1.2)	27 (1.8)	66 (1.9)
Students' motivation, interest, and effort in science	21 (1.5)	19 (1.8)	60 (1.9)
Students' prior knowledge and skills	20 (1.5)	21 (2.4)	59 (2.2)
Current state standards	8 (0.9)	37 (1.9)	55 (2.2)
College entrance requirements	4 (0.9)	43 (2.1)	53 (2.1)
Amount of time available for your professional development	20 (1.7)	28 (1.6)	52 (2.2)
Pacing guides	11 (1.5)	41 (2.4)	48 (2.3)
Parent/guardian expectations and involvement	18 (1.2)	39 (2.5)	43 (2.6)
Teacher evaluation policies	13 (1.3)	44 (2.0)	42 (2.3)
Textbook/module selection policies	15 (1.5)	47 (2.3)	38 (2.5)
State/district/diocese testing/accountability policies‡	25 (1.9)	46 (2.2)	29 (1.8)

† Teachers rated the effect of each factor on a five-point scale ranging from 1 "inhibits effective instruction" to 5 "promotes effective instruction." The "Inhibits" column includes those indicating 1 or 2. The "Promotes" column includes those indicating 4 or 5.
‡ This item was presented only to teachers in public and Catholic schools.

Table 7.26 displays the results for elementary mathematics. In stark contrast to the results about time available for elementary science instruction, the amount of time available for elementary mathematics instruction was rated as the greatest promoter of effective instruction. Students' motivation, interest, and effort in mathematics, as well as their prior knowledge and skills, are seen as promoting mathematics instruction in 70 percent or more elementary classes.

Table 7.26
Effect† of Various Factors on Instruction in Elementary Mathematics Classes

	PERCENT OF CLASSES		
	INHIBITS	NEUTRAL	PROMOTES
Amount of instructional time devoted to mathematics	5 (0.9)	12 (1.5)	84 (1.8)
Current state standards	4 (0.9)	17 (1.8)	79 (1.9)
Principal support	5 (1.1)	17 (1.7)	78 (2.0)
Amount of time for you to plan, individually and with colleagues	14 (1.9)	16 (1.7)	71 (2.3)
Students' motivation, interest, and effort in mathematics	14 (1.7)	15 (1.9)	71 (2.2)
Students' prior knowledge and skills	14 (1.8)	16 (1.8)	70 (2.3)
District/Diocese/School pacing guides	13 (1.7)	21 (1.9)	65 (2.0)
Amount of time available for your professional development	16 (1.6`)	25 (2.0)	59 (2.3)
Parent/guardian expectations and involvement	23 (1.9)	24 (1.8)	53 (2.1)
Teacher evaluation policies	11 (1.6)	40 (2.2)	49 (2.6)
State/district/diocese testing/accountability policies‡	21 (2.1)	34 (2.7)	44 (2.2)
Textbook selection policies	18 (2.2)	39 (2.5)	42 (2.3)

† Teachers rated the effect of each factor on a five-point scale ranging from 1 "inhibits effective instruction" to 5 "promotes effective instruction." The "Inhibits" column includes those indicating 1 or 2. The "Promotes" column includes those indicating 4 or 5.
‡ This item was presented only to teachers in public and Catholic schools.

As in middle school science, principal support, amount of time for planning, and current state standards are all seen as the top factors for promoting instruction in middle school mathematics classes (see Table 7.27). Students' motivation, interest, and effort in mathematics as well as parent/guardian expectations and involvement are seen as inhibiting instruction in more than a quarter of middle school mathematics classes.

Table 7.27
Effect† of Various Factors on Instruction in Middle School Mathematics Classes

	PERCENT OF CLASSES		
	INHIBITS	NEUTRAL	PROMOTES
Principal support	5 (1.4)	21 (1.8)	74 (2.2)
Amount of time for you to plan, individually and with colleagues	12 (1.6)	16 (2.0)	73 (2.2)
Current state standards	6 (1.0)	24 (2.8)	69 (2.9)
District/Diocese/School pacing guides	10 (1.7)	30 (2.7)	60 (2.9)
Students' prior knowledge and skills	27 (2.3)	15 (1.6)	58 (2.6)
Students' motivation, interest, and effort in mathematics	28 (2.5)	16 (1.8)	55 (2.6)
Amount of time available for your professional development	14 (2.1)	32 (2.9)	54 (2.9)
Parent/guardian expectations and involvement	27 (2.3)	28 (2.0)	45 (2.2)
Teacher evaluation policies	13 (1.6)	43 (2.6)	43 (2.6)
State/district/diocese testing/accountability policies‡	25 (2.6)	35 (3.0)	40 (3.0)
Textbook selection policies	23 (2.6)	44 (3.1)	33 (2.7)

† Teachers rated the effect of each factor on a five-point scale ranging from 1 "inhibits effective instruction" to 5 "promotes effective instruction." The "Inhibits" column includes those indicating 1 or 2. The "Promotes" column includes those indicating 4 or 5.
‡ This item was presented only to teachers in public and Catholic schools.

Table 7.28 shows that in high school mathematics, principal support and the amount of time for planning promote effective instruction in more than two-thirds of classes. Like with middle school mathematics, students' motivation, interest, and effort in mathematics are the biggest inhibitors of instruction in high school mathematics classes. College entrance requirements are seen as promoting or have a neutral effect on high school mathematics instruction in nearly all classes.

Table 7.28
Effect† of Various Factors on Instruction in High School Mathematics Classes

	PERCENT OF CLASSES		
	INHIBITS	NEUTRAL	PROMOTES
Principal support	6 (1.0)	23 (2.0)	70 (2.0)
Amount of time for you to plan, individually and with colleagues	14 (1.4)	18 (1.4)	69 (1.6)
Current state standards	8 (1.0)	31 (1.6)	62 (1.6)
College entrance requirements	5 (0.8)	35 (2.3)	60 (2.3)
District/Diocese/School pacing guides	10 (1.5)	31 (1.8)	59 (2.0)
Students' prior knowledge and skills	27 (2.1)	16 (1.4)	57 (2.1)
Amount of time available for your professional development	16 (1.6)	30 (1.8)	55 (2.0)
Students' motivation, interest, and effort in mathematics	30 (1.7)	18 (1.6)	52 (1.8)
Teacher evaluation policies	12 (1.1)	40 (2.3)	47 (2.3)
Textbook selection policies	16 (1.7)	41 (2.3)	43 (2.2)
Parent/guardian expectations and involvement	24 (1.8)	36 (1.9)	40 (1.9)
State/district/diocese testing/accountability policies‡	22 (2.0)	39 (2.4)	39 (1.9)

† Teachers rated the effect of each factor on a five-point scale ranging from 1 "inhibits effective instruction" to 5 "promotes effective instruction." The "Inhibits" column includes those indicating 1 or 2. The "Promotes" column includes those indicating 4 or 5.
‡ This item was presented only to teachers in public and Catholic schools.

Table 7.29 displays the results for high school computer science. Unlike high school science and mathematics, students' motivation, interest, and effort in computer science are seen by teachers in the large majority of classes as promoting effective instruction. Principal support, time to plan, and the amount of time for professional development are also seen as promoters of effective instruction in two-thirds or more of classes. Current state standards and textbook selection policies have a neutral or mixed effect on computer science instruction in approximately half of the classes, likely because these standards and policies are absent from most schools.

Table 7.29
Effect† of Various Factors on Instruction in High School Computer Science Classes

	PERCENT OF CLASSES		
	INHIBITS	NEUTRAL	PROMOTES
Principal support	3 (1.1)	18 (2.7)	79 (2.9)
Students' motivation, interest, and effort in computer science	10 (2.6)	14 (3.3)	76 (4.0)
Amount of time for you to plan, individually and with colleagues	11 (2.1)	19 (3.6)	70 (3.8)
Amount of time available for your professional development	12 (2.3)	21 (3.5)	67 (3.8)
Students' prior knowledge and skills	15 (3.1)	25 (3.5)	60 (4.0)
College entrance requirements	5 (1.3)	49 (4.7)	47 (4.9)
Teacher evaluation policies	9 (2.0)	46 (4.9)	45 (5.0)
Parent/guardian expectations and involvement	9 (2.1)	48 (3.9)	43 (4.1)
Current state standards	11 (2.6)	49 (4.5)	40 (4.7)
Textbook selection policies	13 (2.5)	60 (4.9)	27 (4.5)

† Teachers rated the effect of each factor on a five-point scale ranging from 1 "inhibits effective instruction" to 5 "promotes effective instruction." The "Inhibits" column includes those indicating 1 or 2. The "Promotes" column includes those indicating 4 or 5.

Composites from these teacher questionnaire items were created to summarize the extent to which various factors support effective science and mathematics instruction. The means for each subject and grade range are shown in Table 7.30. Several patterns are apparent in the results. The extent to which the policy environment promotes effective instruction is about the same across grade levels in science. Similarly, the extent to which school support promotes effective instruction varies little across grade levels in mathematics. In addition, stakeholders are seen to be the most supportive in the elementary grades for both science and mathematics. Finally, in high school computer science, school and stakeholder support is generally high (mean scores of 74 and 70, respectively) compared with the policy environment (mean score of 59).

Table 7.30
Class Mean Scores for Factors Affecting Instruction Composites, by Grade Range

	MEAN SCORE		
	ELEMENTARY	MIDDLE	HIGH
Science			
Extent to Which School Support Promotes Effective Instruction	62 (1.6)	67 (2.0)	69 (1.5)
Extent to Which Stakeholders Promote Effective Instruction	68 (1.4)	60 (1.6)	64 (1.0)
Extent to Which the Policy Environment Promotes Effective Instruction	62 (1.0)	63 (1.1)	61 (0.8)
Mathematics			
Extent to Which School Support Promotes Effective Instruction	72 (1.4)	71 (1.4)	69 (1.0)
Extent to Which Stakeholders Promote Effective Instruction	71 (1.2)	60 (1.7)	60 (1.2)
Extent to Which the Policy Environment Promotes Effective Instruction	68 (1.0)	63 (1.2)	64 (0.9)
Computer Science			
Extent to Which School Support Promotes Effective Instruction	n/a	n/a	74 (1.9)
Extent to Which Stakeholders Promote Effective Instruction	n/a	n/a	70 (1.7)
Extent to Which the Policy Environment Promotes Effective Instruction	n/a	n/a	59 (2.1)

The means for some of these factors vary substantially by equity factors. As can be seen in Tables 7.31–7.33, the mean for the stakeholder composite is substantially higher when classes are composed of mostly high-achieving students, compared to classes with mostly low-achieving students in both science and mathematics. There is also a large gap for this variable in both subjects with regard to poverty—classes in schools with a high percentage of students eligible for free/reduced-price lunch have lower scores than classes in schools with the lowest percentage of these students. These patterns do not tend to exist in computer science, perhaps because far fewer schools offer computer science programs.

Table 7.31
Equity Analyses of Class Mean Scores for Factors Affecting Science Instruction Composites

	MEAN SCORE		
	EXTENT TO WHICH THE POLICY ENVIRONMENT PROMOTES EFFECTIVE INSTRUCTION	EXTENT TO WHICH STAKEHOLDERS PROMOTE EFFECTIVE INSTRUCTION	EXTENT TO WHICH SCHOOL SUPPORT PROMOTES EFFECTIVE INSTRUCTION
Prior Achievement Level of Class			
Mostly High	63 (1.2)	73 (1.3)	72 (1.9)
Average/Mixed	63 (0.8)	66 (0.9)	65 (1.2)
Mostly Low	58 (1.4)	52 (2.9)	58 (3.1)
Percent of Historically Underrepresented Students in Class			
Lowest Quartile	62 (1.4)	68 (1.1)	64 (1.8)
Second Quartile	61 (1.2)	68 (1.5)	64 (2.0)
Third Quartile	63 (1.3)	65 (1.9)	66 (2.1)
Highest Quartile	61 (1.5)	61 (2.6)	66 (2.6)
Percent of Students in School Eligible for FRL			
Lowest Quartile	63 (1.2)	71 (1.4)	68 (1.8)
Second Quartile	62 (1.4)	68 (1.2)	63 (1.9)
Third Quartile	62 (1.3)	63 (1.4)	63 (1.5)
Highest Quartile	60 (1.2)	60 (2.4)	65 (2.6)

Table 7.32
Equity Analyses of Class Mean Scores for Factors Affecting Mathematics Instruction Composites

	MEAN SCORE		
	EXTENT TO WHICH THE POLICY ENVIRONMENT PROMOTES EFFECTIVE INSTRUCTION	EXTENT TO WHICH STAKEHOLDERS PROMOTE EFFECTIVE INSTRUCTION	EXTENT TO WHICH SCHOOL SUPPORT PROMOTES EFFECTIVE INSTRUCTION
Prior Achievement Level of Class			
Mostly High	66 (1.6)	71 (2.1)	71 (1.9)
Average/Mixed	67 (0.8)	67 (1.0)	71 (1.0)
Mostly Low	62 (1.4)	55 (2.2)	69 (2.1)
Percent of Historically Underrepresented Students in Class			
Lowest Quartile	67 (1.2)	69 (1.6)	70 (1.6)
Second Quartile	67 (1.0)	69 (1.4)	71 (1.6)
Third Quartile	64 (1.4)	65 (1.7)	71 (1.8)
Highest Quartile	64 (1.5)	59 (2.1)	71 (1.7)
Percent of Students in School Eligible for FRL			
Lowest Quartile	66 (1.0)	72 (1.4)	72 (1.7)
Second Quartile	65 (1.2)	66 (1.4)	71 (1.0)
Third Quartile	66 (1.2)	63 (1.5)	70 (1.6)
Highest Quartile	65 (1.3)	60 (1.7)	71 (1.5)

Table 7.33
Equity Analyses of Class Mean Scores for Factors Affecting Computer Science Instruction Composites

	MEAN SCORE		
	EXTENT TO WHICH THE POLICY ENVIRONMENT PROMOTES EFFECTIVE INSTRUCTION	EXTENT TO WHICH STAKEHOLDERS PROMOTE EFFECTIVE INSTRUCTION	EXTENT TO WHICH SCHOOL SUPPORT PROMOTES EFFECTIVE INSTRUCTION
Prior Achievement Level of Class			
Mostly High	57 (2.4)	73 (2.0)	71 (2.9)
Average/Mixed	59 (3.0)	68 (2.2)	75 (2.3)
Percent of Historically Underrepresented Students in Class			
Lowest Quartile	56 (3.7)	67 (3.7)	64 (4.6)
Second Quartile	52 (4.8)	68 (3.1)	79 (3.9)
Third Quartile	56 (3.3)	67 (3.6)	75 (3.8)
Highest Quartile	66 (3.8)	75 (3.0)	76 (4.3)
Percent of Students in School Eligible for FRL			
Lowest Quartile	53 (2.9)	69 (2.6)	70 (2.5)
Second Quartile	58 (3.2)	69 (2.8)	75 (4.3)
Third Quartile	63 (2.9)	68 (5.4)	79 (4.6)
Highest Quartile	66 (6.6)	74 (4.4)	75 (4.1)

Summary

The 2018 NSSME+ data indicate that the use of special instructional arrangements—e.g., subject matter specialists or pull-out instruction for enrichment and/or remediation—is much more prevalent in mathematics than in science, perhaps because of accountability pressures associated with mathematics. The availability of federal funds for mathematics instruction probably also plays a role. In contrast, programs to encourage student interest in mathematics are strikingly uncommon. For example, fewer than 20 percent of schools have students compete in mathematics competitions. Such practices are more common in science and engineering and tend to be more prevalent in higher grades. All schools tend to offer more enhancement opportunities in science and mathematics than computer science. Further, in all three subjects, the opportunities are not distributed evenly across types of schools, as they are more likely to occur in large schools than small ones. There are also differences in opportunities related to the percentage of students in schools eligible for free/reduced-prince lunch, with similar patterns within science, mathematics, and computer science. For example, opportunities such as after-school help, family nights, and visits to industry are more prevalent in schools with a high percentage of eligible students, whereas subject-specific clubs and opportunities to participate in academic competitions are more likely to be available in schools with a low percentage of eligible students.

In mathematics, the substantial influence of state standards is evident in multiple ways, including school-wide efforts to discuss and align instruction with standards. And although science standards clearly exert their own influence, there is evidence that standards play a larger role in mathematics instruction than in science, especially in the elementary grades.

Overall, the climate for mathematics instruction is generally seen as more supportive than that for science. For example, in 78 percent of schools, the importance that the school places on mathematics is seen as supporting instruction, compared to only 51 percent of schools for science. Lack of time and materials for science instruction, especially in the elementary grades, is particularly problematic. Programs to support students in computer science are relatively uncommon, with only 26 percent of high schools requiring any amount of computer science for graduation and fewer than one-third of all schools offering programs or practices to enhance interest in computer science beyond encouraging students to participate in camps.