MONITORING PROGRESS: HOW THE 2012 NATIONAL SURVEY OF SCIENCE AND MATHEMATICS EDUCATION CAN INFORM A NATIONAL K–12 STEM EDUCATION INDICATOR SYSTEM

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TABLE OF CONTENTS

List of Tables

Page

INTRODUCTION

Monitoring Progress Toward Successful K–12 STEM Education: A Nation Advancing? (National Research Council, 2013[1]) describes a set of 14 indicators for assessing and tracking the health of pre-college STEM education in the United States. However, as the report states, a great deal of work needs to be done, both in terms of developing measures for a number of the indicators and establishing a system for collecting the data. The 2012 National Survey of Science and Mathematics Education (NSSME), the fifth in a series of studies dating back to 1977, was funded by the National Science Foundation (NSF grant number DRL-1008228) to provide information about the status of the nation's science and mathematics education. This report describes how the 2012 NSSME instruments align with the indicators, relevant results from the study, and lessons learned from the NSSME about how the indicators could be measured in the future.[2]

The 2012 NSSME utilized five instruments that are referenced in this report:

1. **School Coordinator Questionnaire (SCQ*)***: the SCQ asked each school for demographic information about the students enrolled and the type of school (e.g., charter, magnet, special program).

2. **Science Program Questionnaire (SPQ)**: the SPQ was administered in each school to an employee knowledgeable about the science program in the school as a whole (e.g., an administrator, a department chair, a lead teacher). It asked about school programs and practices to support science instruction, school-wide professional development opportunities, and science courses offered at the school.

3. **Mathematics Program Questionnaire (MPQ)**: like the SPQ, the MPQ was administered in each school to an employee knowledgeable about the mathematics program in the school as a whole.

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[1] National Research Council. (2013). *Monitoring progress toward successful K-12 STEM education: A nation advancing?* Committee on the Evaluation Framework for Successful K–12 STEM Education. Board on Science Education and Board on Testing and Assessment, Division of Behavioral and Social Sciences and Education. Washington, DC: The National Academies Press.

[2] The 2012 NSSME collected demographic data for each school, as well as for students in the randomly selected class of each teacher. These data allow survey results to be disaggregated by factors such as community type, school size, proportion of students in the school eligible for free/reduced-price lunch, prior achievement level of the class, and proportion of students from race/ethnic groups historically underrepresented in STEM in the class. These types of analyses can provide insight into whether high quality science and mathematics education are equitably available. Results of these "equity" analyses are not included in this report, but can be found in the Report of the 2012 National Survey of Science and Mathematics Education:

Banilower, E. R., Smith, P. S., Weiss, I. R., Malzahn, K. A., Campbell, K. M., & Weis, A. M. (2013). *Report of the 2012 national survey of science and mathematics education.* Chapel Hill, NC: Horizon Research, Inc. Available at: http://www.horizon-research.com/2012nssme/research-products/reports/technical-report/

4. **Science Teacher Questionnaire (STQ)**: the STQ was administered to a sample of science teachers in each school and focused on several areas:
   - Teacher background (e.g., college coursework, experience) and opinions;
   - Instruction in a randomly selected science class;
   - Instruction in the most recently completed unit in the sampled class;
   - Instruction in the most recent lesson in the sampled class; and
   - Teacher demographics.

5. **Mathematics Teacher Questionnaire (MTQ)**: like the STQ, the MTQ was administered to a sample of mathematics teachers in each school, and asked about the same set of subject-specific topics.

The NRC report describes 14 indicators for monitoring the nation's K–12 STEM education system, 7 of which can be informed by the 2012 NSSME. This report is organized by indicator. For each indicator, relevant items from the 2012 NSSME are described, results from those items are provided, and considerations for future data collection efforts discussed. Items are referenced by instrument initials and item number (e.g., STQ9 refers to item 9 on the Science Teacher Questionnaire). Instruments can be found in the Appendix. It is important to note that some of the items from the NSSME are more closely related to the indicators, and some are more tangentially related. This report errs on the side of including the latter type of item, in part to consider how items could be modified to better align with the indicators.

INDICATOR 1
NUMBER OF, AND ENROLLMENT IN, DIFFERENT TYPES OF STEM SCHOOLS AND PROGRAMS IN EACH DISTRICT

Instrumentation

The School Coordinator Questionnaire asked respondents to characterize their school as a regular school, a charter school, or a special program/magnet school (SCQ4). Charter and special program/magnet school respondents were then asked if their school had a special focus on science, technology, engineering, or mathematics (STEM, SCQ5), and if so, in which of the STEM disciplines (SCQ6).

Indicator Data

As can be seen in Table 1, very few public schools report having a STEM focus. In addition, there is no difference in the proportion of schools with a STEM focus by grade levels served. Because so few schools reported having a STEM focus, the data about which STEM fields are focused on are unreliable.

Table 1
Public Schools with a STEM Focus, by Grade Range

	Percent of Schools		
	Elementary	**Middle**	**High**
Charter School	3 (1.3)	5 (1.7)	1 (0.7)
Special Program/Magnet School	1 (0.4)	1 (0.2)	2 (0.9)

Data Collection Considerations

Based on questions received from coordinators during data collection for the 2012 NSSME, it became apparent that they may have been interpreting the question as asking if their school had "a special focus on one or more of the STEM fields" very broadly. For example, one school coordinator indicated not being sure how to answer because the school did not officially have a focus on STEM, but the teachers all tried to emphasize these fields. Another issue is the lack of agreement of what comprises STEM (e.g., a focus on any one of the fields, an integrated approach), and how programs with a focus on career and technical education should be classified. A 2011 report from the National Research Council[3] describes different types of structures for STEM schools: inclusive STEM schools, exclusive STEM schools, and STEM-focused career and technical education schools. It also describes a number of ways a school could focus on STEM, such as having a rigorous curriculum that deepens STEM learning, providing additional instructional time for STEM, and/or providing more resources for teaching STEM. However, even these broad categories will need to be better operationalized to be measureable. For example, by defining how much additional instructional time devoted to STEM qualifies a school as having a STEM focus or what comprises a rigorous curriculum.

[3] National Research Council. (2011). *Successful K-12 STEM education: Identifying effective approaches in science, technology, engineering, and mathematics*. Washington, DC: The National Academies Press.

Until there are some generally accepted, well operationalized definitions of what constitutes a "STEM school," collecting data for this indicator will be challenging. The current trend of "certifying" STEM schools may provide a framework for making it easier to measure this indicator via survey methods. It may also allow an indicator system to differentiate among schools with a STEM program, in the process of obtaining certification, or with no special focus on STEM. Collecting data about the structure of the STEM school (exclusive, inclusive, etc.), which STEM fields are addressed, and who participates in the program should be relatively straightforward, though potentially burdensome.

INDICATOR 2
TIME ALLOCATED TO TEACH SCIENCE IN GRADES K–5

Instrumentation

The 2012 NSSME collected data about three aspects of instructional time for science in grades K–5. One is how often teachers in these grades teach science. The second is how much instructional time is devoted to science across the entire school year. The third is the length of a typical science lesson.

Because some elementary teachers do not teach science every week of the school year (e.g., in some schools, teachers alternate science and social studies units every six weeks), the NSSME first asked those who teach in a self-contained classroom, regardless of whether they were sampled to receive a science or mathematics questionnaire, how often they teach science (STQ4/MTQ5).

The survey then had two alternative items for ascertaining instructional time devoted to science across the school year. STQ5/MTQ6 was presented to teachers who indicated teaching science most/all weeks of the school year, and STQ6/MTQ7 was presented to teachers who indicated teaching science only some weeks during the school year. These items were presented only to self-contained teachers (those responsible for teaching multiple subjects to a single class of students). Non-self-contained elementary teachers of science (e.g., science specialists) were asked about the amount of instructional time for science in a randomly selected class (STQ40).

Although these items provide information about instructional time for science across the entire school year, they do not, by themselves, yield data about the length of a typical science lesson, which could provide insight into the nature of instruction. Consequently, the survey also asked how much time was devoted to teachers' most recent science lesson, regardless of when that lesson was taught, or whether or not the lesson was typical (STQ75).

Indicator Data

As can be seen in Table 2, only 19 percent of grades K–2 classes and 30 percent of grades 3–5 classes receive science instruction all or most days every week of the school year. A substantial percentage of elementary classes receive science instruction only a few days a week or during some weeks of the year.

Table 2
Frequency with which Self-Contained Elementary Classes Receive Science Instruction

	Percent of Classes		
	Grades K–5	**Grades K–2**	**Grades 3–5**
All/Most days, every week	24 (1.4)	19 (1.6)	30 (2.1)
Three or fewer days, every week	37 (1.4)	40 (1.6)	33 (2.0)
Some weeks, but not every week	39 (1.6)	41 (2.0)	36 (2.2)

Combining data from STQ5/MTQ6, STQ6/MTQ7, and STQ40, along with items about the grade level of the class, allows for a national-level estimate of the amount of instructional time devoted to science in grades K–5 that includes self-contained and non-self-contained classes. Overall, fewer than 25 minutes per day are devoted to science in grades K–5 (see Table 3). Classes in grades K–2 spend an average of 18 minutes per day, and classes in grades 3–5 spend an average of 30 minutes per day on science.

Table 3
Average Number of Minutes per Day
Spent Teaching Science, by Grade Range

	Mean	Standard Deviation
Grades K–5	24.40	18.94
Grades K–2	18.15	12.99
Grades 3–5	29.88	21.49

Table 4 shows the mean duration of elementary teachers' most recent science lesson. Given that many elementary teachers do not teach science every day, the means in Table 4 are higher than those in Table 3. In grades K–2 classes, the average duration of a science lesson is roughly 40 minutes while science lessons in grades 3–5 classes last just over 50 minutes on average.

Table 4
Duration of the Most Recent
Elementary Science Lesson (in Minutes), by Grade Range

	Mean	Standard Deviation
Grades K–5	45.61	37.54
Grades K–2	39.55	21.23
Grades 3–5	50.84	46.31

Data Collection Considerations

Although collecting data for this indicator appears straightforward, several issues may affect the quality of data. One issue is whether or how data collection accommodates both self-contained teachers and subject-matter specialists. In some schools, science specialists supplement the science instruction provided by self-contained teachers. In others, science specialists provide all of the science instruction.

Even when a school does not use the specialist model, some self-contained teachers trade classes with other teachers for particular subjects and/or units. For example, a 5th grade teacher who enjoys teaching science may teach science to both her own and another 5th grade teacher's class, and in return, the other teacher may teach social studies to both groups of students. Or, each member of a team of 3rd grade teachers may specialize in a particular unit in their science curriculum and have students rotate among the team members for the different units (in other words, each teacher would teach the same unit multiple times, each time to a different group of students). In some schools, this trading of classes is done school wide and is designed or approved by the principal; in others, the trading is done informally by individual teachers.

Another issue complicating measurement of instructional time for science at the elementary grades level is that science is not taught every day, or even every week, in many schools. For example, some schools have teachers alternate science and social studies units, spending 6–9 weeks on one subject, then switching to the other subject. Thus, items asking about instructional time in a specified calendar period will yield different results depending on the time period specified, even if the item is worded, for example, "in the last 4 weeks."

A fourth issue is how to measure instructional time when science instruction is integrated into instruction in other subjects. For example, it is often recommended that elementary teachers make more time for science instruction by using reading/language arts time to read, analyze, and/or discuss science-related text (e.g., books, newspaper articles) or by including science words in vocabulary lists. Whether and how teachers should include this type of instructional activity when answering questions about instructional time for science should be clearly delineated. As the emphasis on integrated STEM instruction grows, this issue will become more prominent.

These issues can be addressed in part by the sampling design and in part by careful wording of questionnaire items. The 2012 NSSME purposefully addressed the first three issues during the design of the sample and questionnaire development. First, the teacher listing form used to generate the teacher sampling frame asked school coordinators to list only those teachers responsible for teaching science, and to indicate whether the teacher taught a self-contained class or not. This information was verified during questionnaire administration—teachers who indicated they did not teach science at all were routed out of the questionnaire, and the weights used to analyze the data were adjusted accordingly. Finally, the questionnaire ascertained whether the teacher taught science regularly or not, and routed the teacher to an item about instructional time that would make sense given their response to the first item (this process was facilitated by the use of a web-based questionnaire that allowed the questionnaire to be adaptive in a manner transparent to the respondents).

The issue of integrated instruction was not explicitly addressed by the 2012 NSSME. It may be feasible to include instructions to teachers about how to allocate such instructional time. However, data from cognitive interviews conducted during questionnaire development indicate that some teachers do not read lengthy instructions when responding to questionnaire items. Another approach would be to ask first about instructional time for science that was integrated into instruction for other subjects and then ask about instructional time solely for science (in this order). However, this approach would need testing in cognitive interviews as some teachers may indicate that all of their instruction is "integrated," leading to responses that cannot be interpreted.

There are other approaches one could take to generating national estimates of instructional time in elementary science, though none seem as practicable or efficient as a teacher questionnaire. Despite the fact that items such as the ones on the 2012 NSSME have been used for many years, additional, or updated, evidence of their validity may be worth gathering. In particular, the accuracy of teachers' estimates of instructional time spent on a subject over an extended period of time may need investigating, though such a study would need to be carefully designed to avoid potential biases such as the Hawthorne effect. For example, asking teachers to keep a daily log of instruction would likely provide more accurate data on instructional time for science, but using a daily log is much more burdensome and more likely to influence teachers' instructional practice. In addition, using a log to validate the questionnaire item about instructional time would likely affect teachers' responses, as the process of recording instructional time daily may improve their more general estimate.

INDICATOR 3
SCIENCE-RELATED LEARNING OPPORTUNITIES IN ELEMENTARY SCHOOLS

Instrumentation

Science program representatives were asked to indicate which of a variety of programs or practices their school included to enhance student interest and/or achievement in science and/or engineering (SPQ5). The practices included activities such as science or engineering clubs, competitions (e.g., Science Olympiad), as well as partnerships with entities in the community (e.g., mentors, businesses, institutes of higher education).

Indicator Data

Table 5 shows the percentage of elementary schools implementing programs and practices that might enhance student interest and/or achievement in science/engineering. Half of elementary schools encourage students to participate in science and/or engineering summer programs or camps, 35 percent participate in a science and/or engineering fair, and 31 percent offer after-school help in science and/or engineering. Very few elementary schools offer after-school programs for enrichment in science and/or engineering, or participate in science/engineering competitions.

Table 5
Elementary School Programs/Practices to Enhance Students' Interest and/or Achievement in Science/Engineering

	Percent of Schools
Encourages students to participate in science and/or engineering summer programs or camps offered by community colleges, universities, museums, or science centers	50 (3.5)
Participates in a local or regional science and/or engineering fair	35 (3.0)
Offers after-school help in science and/or engineering (e.g., tutoring)	31 (2.7)
Sponsors visits to business, industry, and/or research sites related to science and/or engineering	30 (2.7)
Holds family science and/or engineering nights	26 (2.8)
Offers one or more science clubs	20 (2.6)
Offers formal after-school programs for enrichment in science and/or engineering	17 (2.5)
Sponsors meetings with adult mentors who work in science and/or engineering fields	16 (2.4)
Has one or more teams participating in engineering competitions (e.g., Robotics)	11 (1.9)
Has one or more teams participating in science competitions (e.g., Science Olympiad)	13 (2.0)
Offers one or more engineering clubs	7 (2.0)

Data Collection Considerations

Overall, these items are straightforward to respond to and appear to function fairly well. One item that may need revisiting is asking if the school "Encourages students to participate in science and/or engineering summer programs or camps." The extent to which and nature of encouragement given to students likely varies at schools; one school may post a single flyer on a school bulletin board about a science summer camp, while another school may distribute information to all students as well as send information about these opportunities directly to parents/guardians. Thus, what constitutes “encourage” may need to be clarified. Follow-up items could also be used to ask how schools encourage students to participate.

Similarly, additional data could be collected to give a more complete picture of out-of-classroom science learning opportunities. For example, the proportion of students participating in these programs and the extent of their participation would be useful information. Some schools may offer these opportunities, but they may be sparsely attended. Information about which students participate may also be valuable. Future data collection efforts could ask about prerequisites for participating, how students are recruited, and which students participate (e.g., high prior achievers, students from race/ethnic groups historically underrepresented in STEM).

These data should be relatively straightforward to collect; the main trade-off is response burden. Asking about student participation in each of a number of programs, particularly if the data are to be disaggregated by various factors (race/ethnicity, gender, etc.), could be quite time intensive.

INDICATOR 4
ADOPTION OF INSTRUCTIONAL MATERIALS IN GRADES K–12 THAT EMBODY THE *COMMON CORE STATE STANDARDS FOR MATHEMATICS* AND A *FRAMEWORK FOR K–12 SCIENCE EDUCATION*

Instrumentation

The 2012 NSSME collected data on the use of commercially published textbooks/modules/ programs in science and mathematics classes. However, it is important to note that determining the extent to which these materials embody the *Common Core State Standards: Mathematics* (CCSSM) and the *Framework for K–12 Science Education* (hereafter referred to as the "Framework") would require analysis of the materials. First, teachers were asked what type of instructional material they used most often in the randomly selected class, such as a single textbook/program, modules from multiple publishers, non-commercially published materials (STQ53/MTQ40). Teachers who indicated that the randomly selected class used commercially published textbooks/programs were asked to record the title, author, year, and ISBN of the material used most often (STQ54/MTQ41). The survey also included items about the proportion of instructional time that utilized the instructional materials (STQ56/MTQ44) and the proportion of the instructional materials covered over the entire course (STQ57/MTQ45).

Indicator Data

Tables 6 and 7 show the type of instructional material used most often in science and mathematics classes, overall and by whether the class is in a "textbook adoption" state (i.e., the state has an approved list of materials that districts/schools can use).[4] In science, especially at the elementary and middle grades levels, the data indicate that a wide variety of types of instructional materials are used. At the high school level, a slight majority of classes use a single textbook. A substantial portion of classes in each grade band uses non-commercially published materials most of the time (ranging from 20 to 31 percent of classes). Interestingly, while elementary classes in non-textbook adoption states are more likely than those in textbook adoption states to use non-commercially published materials for science instruction, this difference is not evident at the secondary level.

In mathematics, classes are more likely than in science to base instruction on commercially published materials. The percentage of mathematics classes using one or more commercially published materials is similar across grade ranges (81–85 percent). In each grade range, classes in textbook adoption states are more likely than those in non-textbook adoption states to use a multiple textbooks/programs and less likely to use a single textbook/program.

[4] Scudella, V. (2013). *State textbook adoption.* Denver, CO: Education Commission of the States. Available at: http://www.ecs.org/clearinghouse/01/09/23/10923.pdf

Table 6
Type of Instructional Materials
Used Most of the Time in Science Classes, by Grade Range and State Type

	Percent of Classes		
	Overall	Non-Textbook Adoption State	Textbook Adoption State
Elementary			
One textbook	26 (2.0)	18 (2.3)	32 (3.1)
Multiple textbooks	5 (0.8)	5 (1.2)	4 (1.0)
Modules from a single publisher	12 (1.5)	17 (2.7)	8 (1.4)
Modules from multiple publishers	4 (1.0)	5 (1.4)	4 (1.6)
A roughly equal mix of commercially published textbooks and commercially published modules	22 (1.7)	18 (2.1)	25 (2.7)
Non-commercially published materials	31 (2.1)	37 (3.1)	26 (2.5)
Middle			
One textbook	34 (2.3)	30 (2.9)	38 (3.2)
Multiple textbooks	11 (1.0)	14 (1.7)	8 (1.2)
Modules from a single publisher	11 (1.9)	15 (3.0)	7 (2.2)
Modules from multiple publishers	3 (0.7)	4 (1.0)	3 (0.9)
A roughly equal mix of commercially published textbooks and commercially published modules	20 (2.0)	19 (3.2)	21 (2.0)
Non-commercially published materials	20 (1.9)	18 (2.5)	23 (2.7)
High			
One textbook	52 (1.7)	54 (2.1)	48 (2.6)
Multiple textbooks	7 (0.7)	6 (0.9)	8 (1.1)
Modules from a single publisher	2 (0.4)	2 (0.5)	2 (0.6)
Modules from multiple publishers	2 (0.4)	1 (0.4)	2 (0.8)
A roughly equal mix of commercially published textbooks and commercially published modules	15 (1.2)	14 (1.7)	16 (1.6)
Non-commercially published materials	23 (1.2)	22 (1.7)	24 (2.0)

Table 7
Type of Instructional Materials
Used Most of the Time in Mathematics Classes, by Grade Range and State Type

	Percent of Classes		
	Overall	Non-Textbook Adoption State	Textbook Adoption State
Elementary			
One commercially published textbook or program	62 (2.2)	67 (2.9)	57 (3.0)
Multiple commercially published textbooks/programs	23 (1.6)	20 (2.3)	27 (2.2)
Non-commercially published instructional materials	15 (1.5)	13 (1.6)	17 (2.4)
Middle			
One commercially published textbook or program	55 (2.4)	63 (3.4)	46 (2.8)
Multiple commercially published textbooks/programs	27 (2.1)	21 (2.4)	33 (3.2)
Non-commercially published instructional materials	19 (1.8)	16 (2.6)	21 (2.3)
High			
One commercially published textbook or program	65 (1.4)	71 (1.6)	55 (2.7)
Multiple commercially published textbooks/programs	16 (0.9)	13 (1.2)	21 (1.8)
Non-commercially published instructional materials	19 (1.0)	16 (1.2)	23 (2.1)

For teachers using commercially published materials, the ISBN of each instructional material named in STQ54/MTQ42 was used to identify the publisher and exact title. For instructional materials missing a valid ISBN, HRI staff attempted to look up the ISBN based on other information provided by the teacher (e.g., title, author). Tables 8 and 9 list the most commonly used science and mathematics textbooks and publisher in each grade range; secondary textbooks are shown by course type. Consolidation in the textbook industry has resulted in the market being dominated by three publishers: Houghton Mifflin Harcourt, McGraw-Hill, and Pearson.

Table 8
Most Commonly Used Science Instructional Materials, by Grade Range and Course

	Publisher	Title
Elementary		
Elementary Science	Houghton Mifflin Harcourt	*Harcourt Science*
	Pearson	*Scott Foresman Science*
Middle		
Life Science	Houghton Mifflin Harcourt	*Life Science*
	McGraw-Hill	*Life Science*
Earth Science	Pearson	*Earth Science*
	Houghton Mifflin Harcourt	*Earth Science*
Physical Science	Houghton Mifflin Harcourt	*Physical Science*
	Pearson	*Focus on Physical Science*
General/Integrated Science	McGraw-Hill	*Glencoe Science*
	Houghton Mifflin Harcourt	*Holt Science & Technology*
High		
Biology	Pearson	*Biology*
	Houghton Mifflin Harcourt	*Biology*
Earth Science	Houghton Mifflin Harcourt	*Earth Science*
	Pearson	*Earth Science*
Chemistry	Pearson	*Chemistry*
	Houghton Mifflin Harcourt	*Modern Chemistry*
Physics	Pearson	*Conceptual Physics*
	McGraw-Hill	*Physics - Principles and Problems*
Environmental Science	Houghton Mifflin Harcourt	*Environmental Science*
	Cengage Learning	*Living in the Environment*
Coordinated/Integrated/Physical Science	Pearson	*Physical Science Concepts in Action*
	McGraw-Hill	*Physical Science*

Table 9
Most Commonly Used Mathematics Instructional Materials, by Grade Range and Course

	Publisher	Title
Elementary		
Elementary Mathematics	Pearson	*Envision Math*
	McGraw-Hill	*Everyday Mathematics*
Middle		
Middle School Mathematics	McGraw-Hill	*Math Connects*
	Pearson	*Connected Mathematics*
	Houghton Mifflin Harcourt	*Mathematics Course 3*
	Houghton Mifflin Harcourt	*Algebra I*
	Houghton Mifflin Harcourt	*Mathematics Course 2*
High		
Non-college prep Mathematics	Houghton Mifflin Harcourt	*Algebra 1*
	Houghton Mifflin Harcourt	*Geometry*
	Pearson	*Algebra 1*
Formal/College-prep Mathematics Level 1	Houghton Mifflin Harcourt	*Algebra 1*
	Pearson	*Algebra 1*
	McGraw-Hill	*Algebra 1*
Formal/College-prep Mathematics Level 2	Houghton Mifflin Harcourt	*Geometry*
	Pearson	*Geometry*
Formal/College-prep Mathematics Level 3	Houghton Mifflin Harcourt	*Algebra 2*
	Pearson	*Algebra 2*
Formal/College-prep Mathematics Level 4	Cengage Learning	*Precalculus with Limits: A Graphing Approach*
	McGraw-Hill	*Advanced Mathematical Concepts: Precalculus with Applications*
Courses that might qualify for college credit	Pearson	*Calculus: Graphical, Numerical, Algebraic*
	Cengage Learning	*Calculus of a Single Variable*

The commercially published instructional materials being used in a majority of science classes, and a substantial portion of mathematics classes, are relatively old. As can be seen in Table 10, in 2012 more than half of science classes were using textbooks published prior to 2007. In mathematics, 52 percent of high school classes, 40 percent of middle school classes, and 30 percent of elementary school classes were using textbooks published prior to 2007.

Table 10
Publication Year of Instructional Materials, by Subject and Grade Range

	Percent of Classes†		
	Elementary	**Middle**	**High**
Science			
2006 or earlier	58 (3.0)	52 (2.6)	60 (1.9)
2007–09	24 (2.8)	35 (2.9)	26 (1.8)
2010–12	18 (2.6)	13 (2.0)	14 (1.3)
Mathematics			
2006 or earlier	30 (2.4)	40 (2.4)	52 (1.9)
2007–09	52 (2.5)	44 (2.6)	33 (1.6)
2010–12	18 (2.3)	16 (1.4)	15 (1.0)

† Only classes using published textbooks/modules were included in these analyses.

Tables 11 and 12 show the proportion of instructional time spent using the instructional materials. Mathematics classes are much more likely than science classes to base a large proportion of instruction on their textbook/program. In mathematics, almost two-thirds of elementary classes and nearly half of secondary mathematics classes use their mathematics textbook more than 75 percent of the time. In contrast, only 35 percent of elementary school classes, 26 percent of middle school science classes, and 13 percent of high school science classes use their instructional materials 75 percent or more of the time. These patterns do not vary by whether there is a statewide adoption policy.

Table 11
Percentage of Instructional Time Spent Using Instructional Materials during Science Courses

	Percent of Classes		
	Overall	**Non-Textbook Adoption State**	**Textbook Adoption State**
Elementary			
Less than 25 percent	15 (3.2)	17 (5.1)	13 (4.2)
25–49 percent	27 (3.4)	23 (6.2)	31 (5.3)
50–74 percent	22 (4.0)	28 (7.8)	18 (4.2)
75 percent or more	35 (4.2)	32 (6.7)	38 (5.6)
Middle			
Less than 25 percent	25 (5.1)	29 (7.1)	22 (6.4)
25–49 percent	22 (3.3)	17 (3.8)	29 (5.4)
50–74 percent	26 (3.2)	29 (5.7)	22 (4.1)
75 percent or more	26 (4.8)	25 (7.1)	27 (6.2)
High			
Less than 25 percent	46 (2.8)	49 (3.2)	41 (4.6)
25–49 percent	26 (2.3)	23 (2.7)	31 (4.2)
50–74 percent	15 (2.4)	17 (3.0)	12 (3.1)
75 percent or more	13 (2.1)	11 (2.3)	16 (3.9)

Table 12
Percentage of Instructional Time Spent Using Instructional Materials during Mathematics Courses

	Percent of Classes					
	Overall		Non-Textbook Adoption State		Textbook Adoption State	
Elementary						
Less than 25 percent	4	(1.2)	4	(1.4)	4	(1.8)
25–49 percent	12	(2.3)	9	(3.3)	15	(3.1)
50–74 percent	20	(2.6)	20	(3.5)	20	(4.1)
75 percent or more	64	(3.4)	67	(4.9)	61	(5.1)
Middle						
Less than 25 percent	14	(2.0)	14	(3.0)	13	(2.9)
25–49 percent	14	(1.9)	12	(2.4)	18	(2.9)
50–74 percent	23	(3.2)	26	(4.4)	17	(4.2)
75 percent or more	49	(3.5)	47	(4.7)	52	(6.2)
High						
Less than 25 percent	21	(2.2)	23	(2.5)	17	(3.6)
25–49 percent	14	(1.7)	13	(2.2)	16	(2.6)
50–74 percent	20	(1.7)	19	(2.4)	22	(3.6)
75 percent or more	45	(2.7)	45	(3.4)	46	(4.5)

Tables 13 and 14 show the percentage of science and mathematics classes that "cover" various proportions of their textbooks. In science, 52 percent of elementary classes, 47 percent of middle school classes, and 41 percent of high school classes cover 75 percent or more of their textbook. A large majority of mathematics classes, regardless of grade level, cover 75 percent or more of their textbook during the course. Again, these patterns do not vary by whether there is a statewide adoption policy.

Table 13
Percentage of Science Textbooks/Programs Covered during the Course

	Percent of Classes					
	Overall		Non-Textbook Adoption State		Textbook Adoption State	
Elementary						
Less than 25 percent	13	(3.3)	18	(6.2)	11	(4.1)
25–49 percent	8	(2.6)	12	(5.3)	6	(2.7)
50–74 percent	27	(4.7)	28	(8.3)	26	(5.5)
75 percent or more	52	(5.6)	42	(8.5)	58	(7.1)
Middle						
Less than 25 percent	3	(1.3)	1	(1.0)	5	(2.5)
25–49 percent	15	(3.9)	17	(5.4)	14	(5.4)
50–74 percent	35	(4.7)	38	(7.8)	31	(5.9)
75 percent or more	47	(5.7)	44	(8.7)	50	(7.1)
High						
Less than 25 percent	8	(1.7)	8	(2.3)	8	(2.8)
25–49 percent	18	(2.4)	19	(3.1)	14	(3.3)
50–74 percent	33	(2.8)	35	(3.5)	30	(5.0)
75 percent or more	41	(3.5)	38	(4.2)	48	(5.5)

Table 14
Percentage of Mathematics
Textbooks/Programs Covered during the Course

	Percent of Classes		
	Overall	Non-Textbook Adoption State	Textbook Adoption State
Elementary			
Less than 25 percent	2 (0.8)	2 (1.0)	2 (1.3)
25–49 percent	5 (1.3)	4 (1.5)	6 (2.1)
50–74 percent	13 (1.8)	11 (2.1)	15 (3.5)
75 percent or more	81 (2.4)	83 (2.7)	77 (4.2)
Middle			
Less than 25 percent	2 (0.7)	2 (0.9)	2 (1.1)
25–49 percent	7 (2.1)	11 (3.3)	3 (1.4)
50–74 percent	22 (3.1)	25 (4.3)	18 (3.7)
75 percent or more	69 (3.5)	63 (5.1)	78 (4.1)
High			
Less than 25 percent	1 (0.4)	0 (0.2)	3 (1.3)
25–49 percent	7 (1.2)	7 (1.6)	6 (1.8)
50–74 percent	25 (2.1)	25 (2.6)	24 (3.2)
75 percent or more	67 (2.1)	67 (2.9)	67 (3.6)

Data Collection Considerations

Although this indicator focuses on district adoption of instructional materials aligned with the CCSSM and Framework, data from the 2012 NSSME highlight some of the challenges related to collecting informative data. First, although asking for ISBN codes to identify instructional materials has some advantages, particularly in making it easier to distinguish different editions of a material, it is not a perfect solution. Different ISBN codes are assigned to teacher and student versions of materials; different codes are also assigned when the name of the publisher changes. Consequently, a great deal of effort was still required to identify materials with different ISBN codes that were really the same material.

Second, a fairly sizeable proportion of teachers use non-commercially published instructional materials, and even those who use commercially published materials tend to skip portions of and/or supplement those materials, sometimes because the district tells them to do so. Consequently, even if districts have adopted a common set of materials, the extent to which teachers implement those materials will likely vary. Thus, while the detailed analysis that will be required to determine the extent to which any set of instructional materials embodies the CCSSM or Framework will provide information about the written curriculum, it may not be sufficient to understand the extent to which the intended (by the district) or enacted (by the teacher) curriculum embodies the content of these documents.

INDICATOR 5
CLASSROOM COVERAGE OF CONTENT AND PRACTICES IN *COMMON CORE STATE STANDARDS FOR MATHEMATICS* AND A *FRAMEWORK FOR K–12 SCIENCE EDUCATION*

Instrumentation

The 2012 NSSME contained several items about classroom instruction that may provide insight into the extent to which the content and practices described in the CCSSM and Framework are covered in classrooms. First, the program questionnaire asked a series of questions about the influence of state standards on teachers and their teaching (SPQ6/MPQ6). Although not a direct indicator of classroom coverage of specific content and practices, these items do provide a general sense of the extent to which teachers are basing their instruction on state standards.

Second, the teacher questionnaires included several items about science and mathematics instruction in a randomly selected class. One item asked about the emphasis teachers give to various student objectives (STQ45/MTQ33); another asks about the frequency with which they use a variety of instructional activities (STQ46/MTQ34). The survey also asked an open-ended item about what ideas/skills were addressed in the most recently completed science/mathematics unit (STQ66/MTQ51), though data from these items were intended for secondary analysis and have not yet been analyzed. In addition, teachers were asked about the activities included in their most recent lesson (STQ77/MTQ62).

Some of these objectives and instructional practices are clearly more aligned with the CCSSM and Framework than others, and some may serve as counterfactuals. Data from all of these items are presented in this report to illustrate typical survey approaches to capturing data about classroom instruction.

Indicator Data

It is clear that state standards have a major influence on instruction (see Tables 15 and 16). In both subjects, more than 80 percent of program representatives agree or strongly agree that there is a school-wide effort to align instruction with the standards and that most teachers in the school teach to those standards.

Table 15
Opinions about Various Statements
Regarding State Science Standards, by Grade Range

	Percent of Schools									
	Strongly Disagree		Disagree		No Opinion		Agree		Strongly Agree	
Elementary										
There is a school-wide effort to align science instruction with the state science standards	4	(1.3)	9	(1.8)	7	(1.6)	46	(3.1)	34	(2.9)
Most science teachers in this school teach to the state standards	2	(1.0)	5	(1.2)	9	(2.3)	53	(3.6)	29	(2.8)
Middle										
There is a school-wide effort to align science instruction with the state science standards	4	(1.1)	9	(2.1)	4	(1.0)	42	(2.9)	41	(3.1)
Most science teachers in this school teach to the state standards	3	(1.0)	3	(0.9)	8	(2.1)	46	(3.3)	40	(3.1)
High										
There is a school-wide effort to align science instruction with the state science standards	3	(0.9)	8	(1.9)	7	(2.4)	37	(3.7)	44	(3.5)
Most science teachers in this school teach to the state standards	3	(0.8)	3	(1.0)	13	(3.7)	40	(3.6)	41	(3.6)

Table 16
Opinions about Various Statements
Regarding State Mathematics Standards, by Grade Range

	Percent of Schools									
	Strongly Disagree		Disagree		No Opinion		Agree		Strongly Agree	
Elementary										
There is a school-wide effort to align mathematics instruction with the state mathematics standards	3	(1.2)	4	(1.4)	2	(0.7)	37	(2.4)	54	(2.5)
Most mathematics teachers in this school teach to the state standards	2	(0.6)	4	(1.1)	4	(1.3)	38	(2.9)	53	(3.2)
Middle										
There is a school-wide effort to align mathematics instruction with the state mathematics standards	4	(1.5)	3	(1.4)	2	(0.9)	35	(3.1)	55	(3.2)
Most mathematics teachers in this school teach to the state standards	2	(0.8)	2	(0.7)	5	(1.8)	37	(3.5)	53	(3.5)
High										
There is a school-wide effort to align mathematics instruction with the state mathematics standards	3	(1.0)	6	(2.3)	5	(2.1)	36	(3.8)	50	(3.7)
Most mathematics teachers in this school teach to the state standards	3	(1.0)	4	(0.9)	9	(3.1)	37	(3.7)	46	(3.7)

The science and mathematics teacher questionnaires provide much more data about instruction. Data on instructional objectives in science are generally in line with recommendations from the Framework, though there is room for improvement in this area (see Table 17). Understanding science concepts receives heavy emphasis in 59 percent of elementary and 80 percent of secondary science classes. Increasing students' interest in science, learning science process skills, and learning about real life applications of science are also heavily emphasized by about half of classes across the grade ranges. Objectives least likely to receive heavy emphasis are learning test taking skills/strategies (fewer than 25 percent of science classes) and memorizing science vocabulary and/or facts (roughly 10 percent of science classes).

Table 17
Emphasis Given in Science Classes
to Various Instructional Objectives, by Grade Range

	Percent of Classes			
	None	Minimal Emphasis	Moderate Emphasis	Heavy Emphasis
Elementary				
Understanding science concepts	1 (0.3)	5 (0.7)	36 (2.1)	59 (2.2)
Increasing students' interest in science	1 (0.3)	4 (0.7)	39 (1.8)	56 (2.0)
Learning science process skills (e.g., observing, measuring)	1 (0.3)	10 (1.1)	43 (2.0)	47 (2.1)
Learning about real-life applications of science	1 (0.3)	9 (0.9)	44 (2.2)	46 (2.3)
Preparing for further study in science	1 (0.4)	16 (1.4)	48 (2.1)	35 (2.0)
Learning test taking skills/strategies	9 (1.3)	29 (1.7)	40 (2.0)	22 (1.6)
Memorizing science vocabulary and/or facts	5 (0.8)	42 (2.1)	43 (2.3)	10 (1.3)
Middle				
Understanding science concepts	0 (0.1)	0 (0.2)	19 (2.1)	80 (2.1)
Increasing students' interest in science	0 (0.2)	6 (1.5)	36 (2.1)	57 (2.2)
Learning science process skills (e.g., observing, measuring)	0 (0.2)	6 (0.9)	40 (2.3)	54 (2.3)
Learning about real-life applications of science	0 (0.2)	6 (0.8)	48 (2.1)	45 (2.3)
Preparing for further study in science	0 (0.1)	11 (1.0)	49 (2.1)	40 (2.1)
Learning test taking skills/strategies	1 (0.4)	24 (1.9)	51 (2.1)	24 (1.7)
Memorizing science vocabulary and/or facts	1 (0.5)	30 (1.7)	58 (2.1)	10 (1.2)
High				
Understanding science concepts	0 ---†	1 (0.3)	19 (1.2)	80 (1.2)
Increasing students' interest in science	0 (0.1)	7 (0.8)	43 (1.4)	50 (1.4)
Learning science process skills (e.g., observing, measuring)	0 (0.1)	9 (0.9)	42 (1.6)	49 (1.6)
Preparing for further study in science	1 (0.5)	10 (0.9)	44 (1.3)	46 (1.3)
Learning about real-life applications of science	0 (0.1)	8 (0.7)	47 (1.5)	45 (1.5)
Learning test taking skills/strategies	2 (0.4)	26 (1.4)	50 (1.5)	22 (1.2)
Memorizing science vocabulary and/or facts	1 (0.3)	32 (1.5)	54 (1.7)	13 (1.3)

† No teachers in the sample selected this response option. Thus, it is not possible to calculate the standard error of this estimate.

In mathematics, about 7 out of 10 elementary, middle, and high school mathematics classes focus heavily on having students understand mathematical ideas; a majority also have a heavy emphasis on learning mathematical practices (see Table 18). Other objectives heavily emphasized by about half of classes across grade levels are preparing for further study in mathematics and learning mathematical procedures and/or algorithms. Learning to perform computations with speed and accuracy is one of the least emphasized objectives across grade levels, receiving a heavy emphasis in only 36 percent of elementary school classes, 24 percent of middle school classes, and 18 percent of high school classes.

Table 18
Emphasis Given in Mathematics Classes to Various Instructional Objectives, by Grade Range

	Percent of Classes							
	None		Minimal Emphasis		Moderate Emphasis		Heavy Emphasis	
Elementary								
Understanding mathematical ideas	0	(0.1)	2	(0.5)	29	(1.4)	69	(1.4)
Learning mathematical practices (e.g., considering how to approach a problem, justifying solutions)	0	(0.2)	7	(0.8)	41	(1.5)	51	(1.5)
Increasing students' interest in mathematics	0	(0.2)	10	(1.1)	40	(1.8)	50	(1.7)
Preparing for further study in mathematics	2	(0.5)	11	(0.9)	41	(1.8)	47	(1.8)
Learning about real-life applications of mathematics	0	(0.1)	10	(1.2)	44	(1.8)	45	(1.7)
Learning mathematical procedures and/or algorithms	1	(0.3)	9	(0.9)	45	(1.9)	44	(1.9)
Learning test taking skills/strategies	2	(0.5)	19	(1.3)	42	(1.5)	37	(1.5)
Learning to perform computations with speed and accuracy	2	(0.4)	16	(1.3)	47	(1.7)	36	(1.9)
Middle								
Understanding mathematical ideas	0	(0.2)	1	(0.3)	29	(2.0)	70	(2.0)
Preparing for further study in mathematics	1	(0.4)	8	(1.0)	34	(2.0)	57	(2.2)
Learning mathematical practices (e.g., considering how to approach a problem, justifying solutions)	0	(0.2)	6	(0.9)	40	(2.2)	54	(2.3)
Learning mathematical procedures and/or algorithms	1	(0.5)	7	(0.9)	42	(2.1)	49	(2.2)
Learning about real-life applications of mathematics	0	---†	11	(1.4)	47	(1.9)	42	(1.9)
Increasing students' interest in mathematics	0	(0.1)	12	(1.2)	50	(2.1)	37	(1.9)
Learning test taking skills/strategies	1	(0.3)	16	(1.6)	47	(2.4)	36	(2.5)
Learning to perform computations with speed and accuracy	1	(0.4)	25	(1.6)	51	(2.1)	24	(1.8)
High								
Understanding mathematical ideas	0	(0.0)	2	(0.4)	30	(1.3)	69	(1.4)
Learning mathematical practices (e.g., considering how to approach a problem, justifying solutions)	0	(0.1)	6	(0.8)	39	(1.4)	55	(1.3)
Preparing for further study in mathematics	1	(0.2)	9	(0.8)	35	(1.5)	55	(1.6)
Learning mathematical procedures and/or algorithms	0	(0.1)	6	(0.7)	45	(1.5)	48	(1.5)
Learning about real-life applications of mathematics	1	(0.3)	16	(1.2)	54	(1.6)	29	(1.3)
Learning test taking skills/strategies	2	(0.3)	22	(1.2)	48	(1.6)	28	(1.3)
Increasing students' interest in mathematics	1	(0.3)	19	(1.2)	52	(1.7)	27	(1.4)
Learning to perform computations with speed and accuracy	2	(0.4)	29	(1.2)	51	(1.4)	18	(1.2)

† No teachers in the sample selected this response option. Thus, it is not possible to calculate the standard error of this estimate.

The teacher questionnaires asked how often teachers used each of a number of instructional practices in their randomly selected class. As can be seen in Tables 19–21, the dominant mode of science instruction at all grade levels is based on whole class discussion and lecture, with weekly laboratory activities fairly common at the secondary level. That students are asked to use evidence at about the same frequency with which they engage in hands-on/laboratory activities suggests a link between these two strategies. Having students represent and/or analyze data using tables, charts, or graphs occurs weekly in about half of science classes.

Forty-four percent of elementary and middle school science classes have students write reflections at least once a week, with roughly 10 percent of classes never implementing this practice. Perhaps most striking, and in contrast to what is known from learning theory about the importance of reflection, is that students in one-fourth of high school science classes are never asked to write reflections on what they are learning.

Table 19
Elementary School Science Classes in which Teachers Report Various Activities in their Classrooms

	Percent of Classes									
	Never		Rarely (e.g., a few times a year)		Sometimes (e.g., once or twice a month)		Often (e.g., once or twice a week)		All or almost all science lessons	
Engage the whole class in discussions	0	---†	2	(0.4)	8	(0.8)	33	(1.6)	57	(1.6)
Explain science ideas to the whole class	0	---†	2	(0.5)	10	(1.0)	38	(1.8)	50	(1.8)
Have students work in small groups	0	(0.2)	5	(0.8)	22	(1.6)	45	(2.0)	28	(1.9)
Focus on literacy skills (e.g., informational reading or writing strategies)	6	(0.9)	15	(1.3)	31	(1.7)	31	(1.8)	17	(1.5)
Do hands-on/laboratory activities	2	(0.5)	12	(1.3)	32	(1.6)	39	(1.8)	16	(1.5)
Require students to supply evidence in support of their claims	5	(0.7)	13	(1.1)	28	(1.9)	39	(2.0)	15	(1.4)
Have students read from a science textbook, module, or other science-related material in class, either aloud or to themselves	9	(1.2)	16	(1.8)	28	(2.1)	33	(2.1)	15	(1.3)
Have students write their reflections (e.g., in their journals) in class or for homework	10	(1.0)	18	(1.4)	29	(1.7)	31	(2.1)	13	(1.2)
Engage the class in project-based learning (PBL) activities	8	(1.4)	27	(1.8)	34	(1.9)	21	(1.9)	9	(1.3)
Have students represent and/or analyze data using tables, charts, or graphs	2	(0.5)	14	(1.5)	40	(1.8)	36	(2.0)	8	(0.9)
Give tests and/or quizzes that are predominantly short-answer (e.g., multiple choice, true/false, fill in the blank)	15	(1.3)	19	(1.7)	34	(2.1)	25	(2.0)	6	(0.9)
Give tests and/or quizzes that include constructed-response/open-ended items	19	(1.5)	24	(1.7)	36	(2.2)	16	(1.5)	6	(0.7)
Have students practice for standardized tests	32	(2.1)	26	(1.9)	23	(2.0)	15	(1.5)	4	(0.8)
Have students make formal presentations to the rest of the class (e.g., on individual or group projects)	16	(1.5)	44	(2.1)	28	(1.7)	9	(1.0)	4	(0.7)
Have students attend presentations by guest speakers focused on science and/or engineering in the workplace	51	(1.8)	39	(1.8)	8	(0.9)	2	(0.4)	1	(0.4)

† No teachers in the sample selected this response option. Thus, it is not possible to calculate the standard error of this estimate.

Table 20
Middle School Science Classes in which Teachers Report Various Activities in their Classrooms

	Percent of Classes									
	Never		Rarely (e.g., a few times a year)		Sometimes (e.g., once or twice a month)		Often (e.g., once or twice a week)		All or almost all science lessons	
Explain science ideas to the whole class	0	---†	0	(0.2)	3	(0.9)	42	(2.3)	54	(2.2)
Engage the whole class in discussions	0	(0.1)	1	(0.3)	7	(1.0)	44	(2.3)	48	(2.5)
Have students work in small groups	0	(0.1)	1	(0.4)	20	(1.9)	54	(2.2)	25	(2.0)
Require students to supply evidence in support of their claims	1	(0.7)	7	(1.3)	28	(2.4)	46	(2.3)	17	(1.8)
Have students write their reflections (e.g., in their journals) in class or for homework	9	(1.1)	20	(1.7)	27	(1.7)	31	(2.1)	13	(1.5)
Have students read from a science textbook, module, or other science-related material in class, either aloud or to themselves	4	(1.1)	11	(1.3)	29	(2.1)	44	(2.1)	12	(2.0)
Do hands-on/laboratory activities	2	(0.9)	3	(0.5)	33	(2.3)	52	(2.7)	10	(1.4)
Focus on literacy skills (e.g., informational reading or writing strategies)	3	(0.7)	20	(1.6)	32	(2.0)	34	(2.0)	10	(1.5)
Give tests and/or quizzes that are predominantly short-answer (e.g., multiple choice, true/false, fill in the blank)	2	(0.5)	7	(1.0)	47	(2.3)	35	(2.3)	9	(1.4)
Have students represent and/or analyze data using tables, charts, or graphs	0	(0.1)	9	(1.4)	37	(1.8)	47	(2.0)	8	(1.3)
Give tests and/or quizzes that include constructed-response/open-ended items	3	(0.5)	13	(1.4)	48	(2.2)	28	(1.6)	8	(1.5)
Engage the class in project-based learning (PBL) activities	4	(0.7)	28	(2.0)	45	(2.5)	17	(1.6)	6	(1.2)
Have students practice for standardized tests	13	(1.5)	35	(2.5)	30	(2.2)	18	(1.8)	5	(1.2)
Have students make formal presentations to the rest of the class (e.g., on individual or group projects)	6	(1.1)	40	(2.0)	44	(2.3)	9	(1.4)	1	(0.3)
Have students attend presentations by guest speakers focused on science and/or engineering in the workplace	45	(2.3)	42	(2.4)	9	(2.2)	2	(0.7)	1	(0.4)

† No teachers in the sample selected this response option. Thus, it is not possible to calculate the standard error of this estimate.

Table 21
High School Science Classes in which
Teachers Report Various Activities in their Classrooms

	Percent of Classes									
	Never		Rarely (e.g., a few times a year)		Sometimes (e.g., once or twice a month)		Often (e.g., once or twice a week)		All or almost all science lessons	
Explain science ideas to the whole class	0	(0.1)	0	(0.1)	5	(0.7)	39	(1.5)	56	(1.6)
Engage the whole class in discussions	1	(0.5)	3	(0.5)	14	(1.0)	45	(1.6)	38	(1.5)
Have students work in small groups	0	(0.3)	2	(0.5)	14	(1.2)	61	(1.5)	22	(1.4)
Require students to supply evidence in support of their claims	1	(0.3)	8	(0.8)	30	(1.3)	43	(1.7)	18	(1.0)
Give tests and/or quizzes that are predominantly short-answer (e.g., multiple choice, true/false, fill in the blank)	3	(0.4)	11	(0.9)	43	(1.4)	35	(1.5)	9	(0.8)
Do hands-on/laboratory activities	1	(0.3)	4	(0.8)	25	(1.3)	62	(1.7)	8	(0.7)
Have students represent and/or analyze data using tables, charts, or graphs	0	(0.2)	8	(1.0)	34	(1.4)	50	(1.6)	8	(0.7)
Give tests and/or quizzes that include constructed-response/open-ended items	3	(0.4)	11	(0.9)	46	(1.5)	32	(1.3)	8	(0.8)
Have students read from a science textbook, module, or other science-related material in class, either aloud or to themselves	10	(0.9)	24	(1.3)	28	(1.5)	30	(1.6)	7	(0.8)
Have students write their reflections (e.g., in their journals) in class or for homework	25	(1.5)	28	(1.4)	25	(1.1)	14	(1.1)	7	(0.7)
Have students practice for standardized tests	19	(1.3)	33	(1.5)	28	(1.2)	15	(1.1)	5	(0.5)
Focus on literacy skills (e.g., informational reading or writing strategies)	9	(0.9)	31	(1.4)	35	(1.6)	21	(1.4)	4	(0.6)
Engage the class in project-based learning (PBL) activities	9	(1.0)	33	(1.6)	40	(1.6)	15	(1.0)	3	(0.5)
Have students make formal presentations to the rest of the class (e.g., on individual or group projects)	11	(0.9)	47	(1.6)	34	(1.5)	7	(0.9)	2	(0.5)
Have students attend presentations by guest speakers focused on science and/or engineering in the workplace	51	(1.6)	41	(1.5)	6	(0.8)	2	(0.4)	1	(0.2)

Tables 22–24 show the extent to which various activities are used in K–12 mathematics classes. As in science, lecture and discussion appear to be the predominant modes of instruction. Having students work in small groups and explaining and justifying their solution methods also occur in a large proportion of classes on a weekly basis. In addition, the majority of mathematics classes include students considering multiple representations, comparing and contrasting different methods for solving a problem, and presenting their solution strategies to the rest of the class at least once a week. Students developing mathematical proofs occurs less frequently, with roughly a quarter of mathematics classes never having students write proofs.

Table 22
Elementary School Mathematics Classes in which Teachers Report Various Activities in their Classrooms

	Percent of Classes									
	Never		Rarely (e.g., a few times a year)		Sometimes (e.g., once or twice a month)		Often (e.g., once or twice a week)		All or almost all mathematics lessons	
Explain mathematical ideas to the whole class	0	(0.2)	0	(0.2)	2	(0.4)	20	(1.6)	77	(1.7)
Engage the whole class in discussions	0	(0.2)	1	(0.2)	3	(0.7)	20	(1.5)	76	(1.6)
Have students explain and justify their method for solving a problem	0	(0.1)	2	(0.4)	10	(0.9)	39	(1.7)	49	(1.7)
Have students work in small groups	0	(0.2)	2	(0.5)	13	(1.1)	51	(1.9)	34	(1.8)
Provide manipulatives for students to use in problem-solving/investigations	0	---†	2	(0.4)	16	(1.1)	47	(1.9)	34	(1.9)
Have students consider multiple representations in solving a problem (e.g., numbers, tables, graphs, pictures)	1	(0.2)	3	(0.6)	18	(1.3)	44	(1.6)	33	(1.9)
Have students present their solution strategies to the rest of the class	3	(0.5)	8	(0.8)	25	(1.3)	38	(1.6)	26	(1.5)
Have students compare and contrast different methods for solving a problem	2	(0.4)	7	(0.8)	25	(1.7)	41	(1.5)	25	(1.5)
Have students read from a mathematics textbook/program or other mathematics-related material in class, either aloud or to themselves	14	(1.1)	22	(1.6)	23	(1.5)	24	(1.4)	18	(1.5)
Focus on literacy skills (e.g., informational reading or writing strategies)	11	(1.0)	20	(1.5)	30	(1.6)	25	(1.9)	15	(1.4)
Give tests and/or quizzes that are predominantly short-answer (e.g., multiple choice, true/false, fill in the blank)	11	(1.2)	13	(1.2)	29	(1.8)	35	(1.7)	12	(1.4)
Have students develop mathematical proofs	28	(1.6)	20	(1.5)	22	(1.2)	20	(1.5)	10	(1.5)
Give tests and/or quizzes that include constructed-response/open-ended items	13	(1.2)	15	(1.2)	33	(1.7)	30	(1.7)	9	(1.0)
Have students practice for standardized tests	17	(1.4)	24	(1.4)	29	(1.8)	22	(1.4)	9	(1.1)
Have students write their reflections (e.g., in their journals) in class or for homework	22	(1.4)	25	(1.4)	28	(1.4)	17	(1.5)	9	(1.2)
Have students attend presentations by guest speakers focused on mathematics in the workplace	79	(1.5)	16	(1.4)	3	(0.5)	2	(0.6)	1	(0.3)

† No teachers in the sample selected this response option. Thus, it is not possible to calculate the standard error of this estimate.

Table 23
Middle School Mathematics Classes in which Teachers Report Various Activities in their Classrooms

	Percent of Classes									
	Never		Rarely (e.g., a few times a year)		Sometimes (e.g., once or twice a month)		Often (e.g., once or twice a week)		All or almost all mathematics lessons	
Explain mathematical ideas to the whole class	0	---†	1	(0.2)	2	(0.5)	26	(1.8)	71	(1.8)
Engage the whole class in discussions	0	---†	1	(0.3)	6	(1.0)	34	(1.7)	59	(1.9)
Have students explain and justify their method for solving a problem	0	(0.2)	3	(1.0)	11	(1.1)	37	(1.8)	48	(1.9)
Have students consider multiple representations in solving a problem (e.g., numbers, tables, graphs, pictures)	0	(0.2)	4	(0.6)	21	(1.5)	51	(2.1)	24	(1.7)
Have students work in small groups	1	(0.2)	6	(0.9)	23	(1.8)	46	(2.3)	24	(1.6)
Have students present their solution strategies to the rest of the class	2	(0.5)	10	(1.0)	28	(1.7)	39	(1.8)	21	(1.8)
Have students compare and contrast different methods for solving a problem	1	(0.3)	11	(1.4)	26	(1.8)	43	(1.9)	19	(1.5)
Give tests and/or quizzes that include constructed-response/open-ended items	4	(0.7)	12	(1.5)	33	(1.9)	38	(2.4)	13	(1.4)
Have students practice for standardized tests	4	(0.8)	21	(2.2)	35	(2.0)	29	(2.0)	10	(1.5)
Have students read from a mathematics textbook/program or other mathematics-related material in class, either aloud or to themselves	9	(1.0)	32	(1.9)	25	(2.0)	24	(1.8)	10	(1.3)
Give tests and/or quizzes that are predominantly short-answer (e.g., multiple choice, true/false, fill in the blank)	8	(1.2)	19	(1.4)	34	(1.9)	30	(2.1)	8	(0.9)
Have students write their reflections (e.g., in their journals) in class or for homework	26	(1.9)	31	(1.9)	22	(1.6)	15	(1.5)	6	(0.9)
Focus on literacy skills (e.g., informational reading or writing strategies)	14	(1.3)	35	(1.8)	29	(1.8)	18	(1.8)	5	(0.8)
Have students develop mathematical proofs	28	(1.8)	30	(2.0)	25	(2.1)	12	(1.5)	5	(0.9)
Provide manipulatives for students to use in problem-solving/investigations	1	(0.4)	18	(1.3)	48	(1.9)	28	(1.8)	4	(0.9)
Have students attend presentations by guest speakers focused on mathematics in the workplace	76	(1.8)	18	(1.4)	4	(1.0)	1	(0.3)	1	(0.5)

† No teachers in the sample selected this response option. Thus, it is not possible to calculate the standard error of this estimate.

Table 24
High School Mathematics Classes in which Teachers Report Various Activities in their Classrooms

	Percent of Classes									
	Never		Rarely (e.g., a few times a year)		Sometimes (e.g., once or twice a month)		Often (e.g., once or twice a week)		All or almost all mathematics lessons	
Explain mathematical ideas to the whole class	0	(0.2)	1	(0.3)	3	(0.6)	24	(1.3)	72	(1.4)
Engage the whole class in discussions	0	(0.2)	3	(0.6)	12	(0.9)	36	(1.4)	48	(1.3)
Have students explain and justify their method for solving a problem	0	(0.2)	3	(0.6)	17	(1.2)	44	(1.4)	36	(1.6)
Have students work in small groups	1	(0.5)	8	(0.9)	28	(1.2)	43	(1.5)	20	(1.3)
Have students consider multiple representations in solving a problem (e.g., numbers, tables, graphs, pictures)	1	(0.3)	6	(0.6)	29	(1.3)	45	(1.5)	19	(1.0)
Give tests and/or quizzes that include constructed-response/open-ended items	4	(1.0)	9	(0.8)	30	(1.4)	38	(1.5)	18	(1.0)
Have students compare and contrast different methods for solving a problem	2	(0.3)	10	(0.9)	33	(1.4)	41	(1.4)	14	(1.0)
Have students present their solution strategies to the rest of the class	4	(0.6)	17	(1.1)	34	(1.4)	33	(1.2)	12	(1.0)
Give tests and/or quizzes that are predominantly short-answer (e.g., multiple choice, true/false, fill in the blank)	13	(1.2)	25	(1.2)	26	(1.1)	26	(1.1)	10	(0.8)
Have students practice for standardized tests	9	(0.8)	25	(1.4)	34	(1.3)	22	(1.3)	9	(0.9)
Have students read from a mathematics textbook/program or other mathematics-related material in class, either aloud or to themselves	18	(1.1)	34	(1.1)	23	(1.1)	18	(1.2)	8	(0.8)
Have students develop mathematical proofs	24	(1.2)	33	(1.4)	26	(1.3)	13	(1.0)	4	(0.6)
Focus on literacy skills (e.g., informational reading or writing strategies)	23	(1.3)	38	(1.3)	25	(1.2)	11	(0.9)	4	(0.4)
Provide manipulatives for students to use in problem-solving/investigations	7	(0.7)	34	(1.4)	40	(1.3)	15	(1.0)	3	(0.5)
Have students write their reflections (e.g., in their journals) in class or for homework	43	(1.5)	30	(1.2)	16	(1.1)	8	(0.9)	3	(0.4)
Have students attend presentations by guest speakers focused on mathematics in the workplace	78	(1.2)	18	(1.1)	3	(0.4)	1	(0.3)	0	(0.1)

The 2012 NSSME also asked teachers about activities that took place during their most recent lesson in the randomly selected class. As can be seen in Table 25, responses to this item paint a similar picture of predominantly lecture-based instruction in both subjects and all grade ranges.

These data also show a trend of less use of hands-on/laboratory/manipulative-based activities as grade range increases.

Table 25
Classes Participating in
Various Activities in the Most Recent Lesson, by Subject and Grade Range

	Percent of Classes					
	Elementary		Middle		High	
Science						
Teacher explaining a science idea to the whole class	89	(1.2)	89	(1.4)	90	(0.9)
Whole class discussion	91	(1.1)	77	(1.8)	67	(1.4)
Students completing textbook/worksheet problems	43	(1.8)	51	(2.2)	59	(1.6)
Students doing hands-on/manipulative activities	52	(1.9)	50	(2.3)	39	(1.5)
Students reading about science	53	(2.2)	50	(2.1)	35	(1.5)
Teacher conducting a demonstration while students watched	40	(2.0)	32	(2.4)	32	(1.4)
Students using instructional technology	22	(1.5)	30	(2.0)	27	(1.4)
Test or quiz	12	(1.2)	22	(2.0)	20	(1.4)
Practicing for standardized tests	5	(0.8)	9	(1.2)	10	(0.8)
None of the above	0	(0.1)	0	(0.3)	1	(0.3)
Mathematics						
Teacher explaining a mathematical idea to the whole class	93	(0.9)	93	(1.0)	95	(0.7)
Students completing textbook/worksheet problems	80	(1.5)	78	(1.8)	83	(1.0)
Whole class discussion	89	(1.1)	85	(1.4)	75	(1.3)
Teacher conducting a demonstration while students watched	74	(1.5)	71	(2.0)	65	(1.2)
Students using instructional technology	29	(1.7)	31	(1.8)	43	(1.3)
Students doing hands-on/manipulative activities	77	(1.4)	37	(1.6)	21	(1.3)
Test or quiz	19	(1.3)	19	(1.6)	20	(1.3)
Students reading about mathematics	19	(1.3)	23	(1.7)	17	(1.2)
Practicing for standardized tests	14	(1.3)	23	(1.9)	16	(1.1)
None of the above	0	(0.1)	1	(0.2)	0	(0.2)

Data Collection Considerations

There are a number of challenges to gathering data about classroom instruction with survey methodology. Surveys have been shown to be valid for collecting data at a large scale about opinions (e.g., perceptions of preparedness, beliefs), easily counted quantities (e.g., number of computers available for instruction), and practices for which teachers have a common understanding and do not require judgments of quality (e.g., how often calculators are used in instruction, how often students work in small groups).[5] Surveys are not good for measuring constructs for which teachers do not share a common understanding (e.g., the science/engineering and mathematical practices) or ones that include a quality component (e.g., the extent to which students had sufficient opportunity to learn a topic).

[5] See for example, Mayer, D. P. (1999). Measuring instructional practice: Can policymakers trust survey data? *Educational Evaluation and Policy Analysis, 21*(1), 29–46.

Although the 2012 NSSME did not capture detailed data about content coverage in courses, other surveys such as the Survey of Enacted Curriculum[6] are available to do so, and these surveys could be modified to align with the content expectations in the CCSSM and Framework (specifically, the disciplinary core ideas). Additional research and development is needed to create survey measures of teachers' use of practices. This work will likely require unpacking the various ways in which the practices can be implemented at different grade levels and then an iterative cycle of item development, testing, and revision, as well as the collection of validity evidence.

Currently, collecting data on the quality of instruction requires much more time-intensive methods than surveys. One common approach is to conduct an observation study, though these studies have their own sets of challenges. Conducting observations on a large scale is very costly as one must employ and train observers in addition to travel costs. Furthermore, a teacher may alter instruction due to having an observer present; although this potential bias could be addressed by spending more time in each teacher's classroom (allowing the teacher to be comfortable having an observer in the room), doing so further increases the cost of this methodology.

[6] Blank, R. K., Porter, A., & Smithson, J. (2001). *New tools for analyzing teaching, curriculum and standards in mathematics and science: Results from survey of enacted curriculum project, final report*. Washington, DC: Council of Chief State School Officers.

INDICATOR 6
TEACHERS' SCIENCE AND MATHEMATICS CONTENT KNOWLEDGE FOR TEACHING

Instrumentation

Although teachers' science/mathematics content knowledge for teaching was not directly measured by the 2012 NSSME, the teacher questionnaires included several items that could serve as proxy measures. One such proxy is the subject of their college degrees (STQ11–13/MTQ11–12). Another proxy measure is college course taking; science and mathematics teachers were asked about the number of semester and quarter college courses they took in each of a number of fields (STQ26/MTQ13). In addition, science teachers completing courses beyond the general/introductory level in a particular field (e.g., biology, chemistry) were asked follow-up items about the specific advanced courses within that field they completed (STQ14–25). The survey also asked teachers about when they last took a formal course for college credit in several areas related to disciplinary content and pedagogy (STQ33/MTQ21).

Another commonly used proxy measure is teachers' perceptions of preparedness. The 2012 NSSME asked teachers about their preparedness to teach each of a number of science/mathematics topics at their assigned grade level (STQ36–37/MTQ24–25). In addition to disciplinary content knowledge, content knowledge for teaching includes an understanding of how students develop an understanding of the content, including effective approaches for teaching the content and common ways in which students will struggle. The 2012 NSSME asked teachers about their preparedness to implement a variety of instructional practices related to content knowledge for teaching, such as anticipating difficulties students will have with the topic (STQ73/MTQ58).

Indicator Data

As can be seen in Table 26, very few teachers of science/mathematics at the elementary level have college degrees in these disciplines. The percentage of teachers with a degree in science/mathematics increases with increasing grade range, with 52 percent of high school mathematics teachers and 61 percent of high school science teachers having a degree in their discipline. If the definition of degree in discipline is expanded to include degrees in science/mathematics education, these figures increase to 73 percent of high school mathematics teachers and 82 percent of high school science teachers.

Table 26
Teacher Degrees, by Grade Range

	Percent of Teachers		
	Elementary	**Middle**	**High**
Science Teachers			
Science/Engineering	4 (0.7)	26 (2.0)	61 (1.6)
Science Education	2 (0.5)	27 (1.9)	48 (1.4)
Science/Engineering or Science Education	5 (0.8)	41 (2.5)	82 (1.3)
Mathematics Teachers			
Mathematics	4 (0.5)	23 (1.7)	52 (1.5)
Mathematics Education	2 (0.3)	26 (2.0)	54 (1.7)
Mathematics or Mathematics Education	4 (0.6)	35 (2.2)	73 (1.7)

Table 27 shows the percentage of science teachers in each grade range with at least one college course in each of a number of science disciplines. Although 90 percent or more of science teachers at each level have had coursework in the life sciences and about two-thirds have had coursework in Earth/space science, the percentage of teachers with coursework in other core science subjects decreases dramatically as grade level decreases. Very few teachers at any grade level have had coursework in engineering. (Note: Data tables showing specific courses completed by teachers within each science discipline can be found in the STQ section of the compendium table report.[7])

Table 27
Science Teachers with College Coursework
in Various Science Disciplines, by Grade Range

	Percent of Teachers		
	Elementary	**Middle**	**High**
Chemistry	47 (1.8)	72 (2.3)	93 (1.1)
Life sciences	90 (1.1)	96 (0.9)	91 (0.9)
Physics	32 (1.7)	61 (2.3)	86 (1.1)
Earth/space science	65 (2.0)	75 (2.3)	61 (1.7)
Environmental science	33 (1.8)	57 (2.5)	56 (1.1)
Engineering	1 (0.4)	7 (1.1)	14 (1.0)
Science education	89 (1.1)	89 (1.7)	85 (1.4)

At the elementary level, where teachers are typically responsible for instruction across science disciplines, few teachers meet the National Science Teachers Association (NSTA) recommendations for content preparation (at least one course each in life science, Earth science, and physical science). As can be seen in Table 2.16, 36 percent of elementary science teachers have had courses in all three of those areas, and another 38 percent have had coursework in two

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[7] Fulkerson, W. O., Campbell, K. M., & Hudson, S. B. (2013). *2012 National survey of science and mathematics education: Compendium of tables.* Chapel Hill, NC: Horizon Research, Inc. Available at: http:www.horizon-research.com/2012nssme/research-products/reports/compendium-of-tables/

of the three areas. At the other end of the spectrum, 6 percent of elementary science teachers have not had any college science courses in these areas.

Table 28
Elementary Science Teachers
Meeting NSTA Course-Background Standards

	Percent of Teachers
Courses in life, Earth, and physical science†	36 (1.6)
Courses in two of the three areas	38 (1.7)
Courses in one of the three areas	20 (1.4)
No courses in any of the three areas	6 (0.9)

† Physical science is defined as a course in either chemistry or physics.

NSTA recommends that teachers in the middle grades have coursework in both chemistry and physics, as well as in the life and Earth sciences. Forty-five percent of middle grades teachers assigned to classes in general and/or integrated science meet that standard, and another 28 percent have had coursework in three of the four areas (see Table 29).

Table 29
Middle School Teachers of General/Integrated
Science Meeting NSTA Course-Background Standards

	Percent of Teachers
Coursework in life science, Earth science, physics, and chemistry	45 (2.4)
Three of four recommended courses	28 (2.3)
Two of four recommended courses	22 (2.4)
One of four recommended courses	5 (0.9)
None of four recommended courses	1 (0.7)

Many secondary science classes, especially at the high school level, focus on a single area of science, such as biology or chemistry. Table 30 provides information about the course background of secondary school science teachers. Life science/biology teachers tend to have relatively strong backgrounds in their discipline, with 27 percent of middle school teachers and 53 percent of high school teachers having a degree in biology, and another 31 and 37 percent respectively with at least three college courses beyond introductory biology. Less than 10 percent of physical science and environmental science teachers have a degree in their field. In addition, 64 percent of middle school Earth science teachers have not taken courses beyond introductory, and nearly half of high school environmental science teachers have not completed a course beyond introductory.

Table 30
Secondary Science Teachers with
Varying Levels of Background in Subject†, by Grade Range

	Percent of Teachers							
	Degree in Field		No Degree in Field, but 3+ Courses beyond Introductory		No Degree in Field, but 1–2 Courses beyond Introductory		No Degree in Field or Courses beyond Introductory	
Middle								
Life science/biology	27	(4.1)	31	(4.4)	20	(3.9)	22	(3.9)
Earth science	9	(2.6)	16	(2.8)	10	(3.3)	64	(5.0)
Physical science	8	(3.3)	23	(3.7)	27	(4.8)	42	(5.8)
High								
Life science/biology	53	(2.4)	37	(2.3)	4	(1.0)	6	(1.2)
Chemistry	25	(1.8)	43	(2.2)	21	(2.3)	11	(2.4)
Physics	20	(2.4)	36	(3.1)	16	(2.5)	29	(3.7)
Earth science	14	(3.0)	24	(4.3)	20	(3.4)	42	(6.9)
Physical science	10	(2.9)	48	(6.0)	25	(3.9)	17	(4.0)
Environmental science	9	(2.7)	19	(3.4)	23	(5.4)	49	(5.1)

† Teachers assigned to teach classes in more than one subject area are included in each category.

In mathematics, nearly all elementary teachers have completed college coursework in mathematics for elementary school teachers and mathematics education. Roughly half of elementary mathematics teachers have had college courses in algebra, computer science, and statistics (see Table 31).

Table 31
Elementary Mathematics Teachers Completing Various College Courses

	Percent of Teachers	
Mathematics content for elementary school teachers	95	(0.7)
College algebra/trigonometry/elementary functions	55	(1.6)
Computer Science	50	(2.1)
Statistics	46	(1.6)
Integrated mathematics	43	(1.7)
Probability	24	(1.5)
College Geometry	24	(1.5)
Calculus	19	(1.4)
Mathematics education	95	(0.7)
Student teaching in mathematics	86	(1.2)

The National Council of Teachers of Mathematics (NCTM) has recommended that elementary mathematics teachers take college coursework in a number of different areas, including number and operations (for which “mathematics for elementary teachers” can serve as a proxy), algebra, geometry, probability, and statistics. As can be seen in Table 32, only 10 percent of elementary mathematics teachers have had courses in each of these areas; the typical elementary teacher has had coursework in only 1 or 2 of these 5 areas.

Table 32
Elementary Mathematics Teachers' Coursework Related to NCTM Course-Background Standards

	Percent of Teachers
All 5 courses	10 (1.2)
3–4 courses	32 (1.6)
1–2 courses	57 (1.8)
No courses	1 (0.3)

Table 33 shows the percentage of middle and high school mathematics teachers with coursework in each of a number of areas. Note that nearly all high school mathematics teachers have completed a calculus course, and 79 percent have taken a course in advanced calculus. Similarly, more than 3 out of 4 high school mathematics teachers have had college coursework in linear algebra and in statistics. Other college courses completed by a majority of high school mathematics teachers include abstract algebra, differential equations, axiomatic geometry, analytic geometry, probability, number theory, and discrete mathematics. Substantially fewer teachers at the middle grades have had college coursework in each of these areas.

Table 33
Secondary Mathematics Teachers Completing Various College Courses, by Grade Range

	Percent of Teachers	
	Middle	High
Calculus	63 (2.3)	93 (0.9)
Advanced calculus	37 (2.1)	79 (1.6)
Differential equations	22 (1.5)	62 (1.7)
Real analysis	18 (1.7)	44 (1.7)
Linear algebra	39 (1.9)	80 (1.7)
Mathematics content for middle/high school teachers	56 (2.3)	71 (1.8)
Abstract algebra	28 (1.6)	67 (1.7)
Axiomatic geometry (Euclidean or non-Euclidean)	21 (1.6)	55 (1.7)
Analytic/Coordinate geometry	26 (1.9)	53 (1.7)
Integrated mathematics	40 (2.0)	34 (1.7)
Statistics	69 (2.1)	83 (1.5)
Probability	39 (2.2)	56 (1.7)
Number theory	32 (2.0)	54 (1.9)
Discrete mathematics	26 (1.7)	52 (1.8)
Other upper division mathematics	19 (1.5)	43 (1.5)
Computer science	61 (2.1)	77 (1.7)
Engineering	9 (1.2)	19 (1.4)
Mathematics education	87 (1.7)	87 (1.6)
Student teaching in mathematics	73 (2.1)	79 (1.6)

At the middle grades level, NCTM recommends that teachers have more extensive college coursework, including courses in number (for which "mathematics for middle school teachers" can serve as a proxy), algebra, geometry, probability, statistics, and calculus. As can be seen in Table 34, roughly half of middle grades mathematics teachers have had college courses in all or nearly all of these areas, having completed at least 4 of the 6 recommended courses.

Table 34
Middle School Mathematics Teachers' Coursework Related to NCTM Course-Background Standards

	Percent of Teachers
All 6 courses	14 (1.4)
4–5 courses	35 (2.0)
2–3 courses	31 (2.1)
1 course	15 (1.6)
No courses	6 (1.0)

Table 35 provides analogous data for high school mathematics teachers, in this case based on a total of seven courses, including number theory and discrete mathematics and omitting mathematics coursework specifically aimed at teachers. Approximately, two-thirds of high school teachers meet or come close to having taken courses in all seven areas, completing at least five.

Table 35
High School Mathematics Teachers' Coursework Related to NCTM Course-Background Standards

	Percent of Teachers
All 7 courses	26 (1.5)
5–6 courses	40 (1.6)
3–4 courses	22 (1.6)
1–2 courses	10 (1.4)
No courses	2 (0.7)

Overall, the data on college degrees and course taking indicate that a large proportion of science and mathematics teachers, particularly at the lower grade ranges, do not have strong college preparation in these disciplines. If one accepts the proposition that disciplinary content knowledge is a prerequisite for pedagogical content knowledge (PCK), these data suggest that many science and mathematics teachers are unlikely to have PCK for the topics they teach.

Another proxy for teachers' content knowledge for teaching is their feelings of preparedness to teach their discipline. The teacher questionnaires contained items asking about teachers' preparedness to teach each of a number of topics in science/mathematics. In general, data from these items mirror those from the college course taking items. As can be seen in Table 36, elementary teachers are more likely to indicate feeling very well prepared to teach life science and Earth science than they are to teach physical science. Engineering stands out as the area where elementary teachers feel least prepared, with only 4 percent indicating they are very well prepared to teach it at their grade level, and 73 percent noting that they are not adequately prepared.

In mathematics, 77 percent of elementary teachers indicate feeling very well prepared to teach number and operations, the same percentage that indicate feeling very well prepared to teach mathematics in general. The fact that markedly fewer teachers feel very well prepared to teach measurement and data representation, geometry, and early algebra suggests that elementary teachers equate teaching mathematics with teaching number and operations.

Table 36
Elementary Teachers' Perceptions of their Preparedness to Teach Various Science/Mathematics Disciplines

	Percent of Teachers†			
	Not Adequately Prepared	**Somewhat Prepared**	**Fairly Well Prepared**	**Very Well Prepared**
Science				
Life Science	4 (0.6)	21 (1.6)	46 (1.9)	29 (1.6)
Earth Science	4 (0.6)	26 (1.8)	45 (1.8)	26 (1.4)
Physical Science	8 (1.0)	33 (2.1)	42 (1.9)	17 (1.2)
Engineering	73 (1.7)	18 (1.6)	5 (0.8)	4 (0.6)
Mathematics				
Number and Operations	0 (0.1)	2 (0.4)	21 (1.3)	77 (1.4)
Measurement and Data Representation	1 (0.4)	9 (1.1)	33 (1.9)	56 (2.0)
Geometry	3 (0.6)	10 (1.0)	33 (1.7)	54 (1.9)
Early Algebra	5 (0.7)	13 (1.1)	36 (1.7)	46 (2.0)

† Includes only teachers assigned to teach mathematics, reading/language arts, science, and social studies to a single class of students in grades K–6.

Data on middle and high school science teachers' perceptions of preparedness to teach each of a number of science topics related to their randomly selected class can be seen in Tables 37 and 38. Not surprisingly, high school science teachers generally feel better prepared than middle school science teachers to teach their subject. As in the elementary grades, few middle and high school science teachers feel well prepared to teach engineering.

Table 37
Middle School Science Teachers'
Perceptions of their Preparedness to Teach Various Subjects

	Percent of Teachers†							
	Not Adequately Prepared		Somewhat Prepared		Fairly Well Prepared		Very Well Prepared	
Earth/Space Science								
Earth's features and physical processes	2	(0.4)	9	(1.7)	38	(2.6)	51	(2.9)
Climate and weather	6	(1.1)	16	(2.5)	36	(2.6)	42	(3.0)
The solar system and the universe	6	(0.9)	19	(2.6)	39	(3.0)	36	(2.6)
Biology/Life Science								
Structures and functions of organisms	5	(1.4)	11	(2.0)	32	(2.5)	52	(3.1)
Cell biology	7	(1.8)	13	(1.8)	31	(2.8)	49	(2.6)
Ecology/ecosystems	3	(1.3)	16	(2.0)	33	(2.6)	48	(2.6)
Genetics	8	(1.5)	20	(2.6)	31	(2.2)	41	(2.5)
Evolution	13	(2.2)	23	(2.2)	32	(2.4)	33	(2.5)
Chemistry								
States, classes, and properties of matter	3	(0.6)	8	(1.4)	32	(2.5)	58	(2.5)
Elements, compounds, and mixtures	6	(1.1)	16	(2.8)	26	(2.5)	53	(2.6)
The Periodic Table	5	(0.9)	16	(2.4)	30	(2.5)	49	(2.3)
Atomic structure	10	(1.9)	17	(2.4)	29	(2.2)	45	(2.4)
Properties of solutions	7	(1.3)	23	(2.4)	36	(2.6)	33	(2.3)
Chemical bonding, equations, nomenclature, and reactions	18	(2.4)	23	(2.3)	28	(2.6)	31	(2.0)
Physics								
Forces and motion	3	(0.6)	20	(2.7)	34	(2.7)	42	(2.7)
Energy transfers, transformations, and conservation	6	(1.4)	21	(2.5)	36	(2.5)	37	(2.6)
Properties and behaviors of waves	9	(1.3)	32	(2.6)	37	(2.8)	23	(2.5)
Electricity and magnetism	9	(1.4)	35	(2.7)	33	(2.6)	23	(2.5)
Modern physics (e.g., special relativity)	37	(2.8)	39	(3.0)	19	(1.7)	5	(1.3)
Engineering (e.g., nature of engineering and technology, design processes, analyzing and improving technological systems, interactions between technology and society)	46	(2.5)	34	(2.5)	14	(1.6)	5	(0.8)
Environmental and resource issues (e.g., land and water use, energy resources and consumption, sources and impacts of pollution)	5	(1.4)	28	(3.4)	33	(3.0)	35	(3.0)

† Teachers were shown only those topics related to their randomly selected class, with the exception of engineering which was presented to all teachers.

Table 38
High School Science Teachers' Perceptions of their Preparedness to Teach Various Subjects

	Percent of Teachers†							
	Not Adequately Prepared		Somewhat Prepared		Fairly Well Prepared		Very Well Prepared	
Earth/Space Science								
Earth's features and physical processes	12	(2.9)	18	(2.3)	24	(2.7)	47	(3.1)
The solar system and the universe	13	(2.2)	20	(2.8)	26	(2.9)	41	(3.2)
Climate and weather	13	(3.0)	18	(2.7)	29	(3.3)	39	(3.8)
Biology/Life Science								
Cell biology	5	(1.2)	7	(1.3)	20	(1.9)	68	(2.2)
Structures and functions of organisms	5	(1.3)	6	(1.9)	25	(2.4)	64	(2.5)
Genetics	5	(1.2)	6	(1.2)	26	(2.2)	63	(2.5)
Ecology/ecosystems	4	(1.2)	11	(1.5)	29	(2.1)	56	(2.4)
Evolution	6	(1.1)	11	(1.5)	31	(2.3)	52	(2.5)
Chemistry								
Elements, compounds, and mixtures	0	(0.3)	4	(1.9)	12	(1.7)	83	(2.2)
The Periodic Table	1	(0.4)	3	(1.9)	14	(1.7)	82	(2.2)
Atomic structure	0	(0.3)	4	(1.9)	15	(2.0)	80	(2.3)
States, classes, and properties of matter	1	(0.4)	4	(2.0)	15	(1.7)	80	(2.4)
Chemical bonding, equations, nomenclature, and reactions	0	(0.3)	7	(1.9)	16	(1.9)	77	(2.5)
Properties of solutions	1	(0.5)	9	(2.1)	24	(2.1)	66	(2.5)
Physics								
Forces and motion	2	(0.8)	6	(1.8)	21	(2.6)	71	(3.0)
Energy transfers, transformations, and conservation	2	(0.8)	8	(2.2)	27	(3.4)	62	(3.3)
Properties and behaviors of waves	4	(1.0)	11	(2.1)	34	(3.4)	51	(3.1)
Electricity and magnetism	8	(1.7)	14	(2.3)	35	(3.3)	43	(2.8)
Modern physics (e.g., special relativity)	23	(2.9)	27	(3.1)	31	(3.1)	19	(2.1)
Engineering (e.g., nature of engineering and technology, design processes, analyzing and improving technological systems, interactions between technology and society)	46	(1.6)	33	(1.6)	13	(1.1)	8	(0.8)
Environmental and resource issues (e.g., land and water use, energy resources and consumption, sources and impacts of pollution)	6	(1.4)	23	(3.6)	34	(3.7)	37	(3.8)

† Teachers were shown only those topics related to their randomly selected class, with the exception of engineering which was presented to all teachers.

Table 39 provides data on secondary mathematics teachers' perceptions of their preparedness to teach each of a number of mathematics topics. At each grade level, teachers are most likely to feel very well prepared to teach algebraic thinking and the number system and operations, and least likely to feel that level of preparedness for discrete mathematics.

Table 39
Secondary School Mathematics Teachers' Perceptions of their Preparedness to Teach Various Subjects, by Grade Range

	Percent of Teachers			
	Not Adequately Prepared	Somewhat Prepared	Fairly Well Prepared	Very Well Prepared
Middle				
The number system and operations	0 (0.2)	1 (0.4)	11 (1.3)	88 (1.4)
Algebraic thinking	0 (0.1)	3 (0.7)	21 (1.8)	76 (1.9)
Measurement	0 (0.1)	6 (1.3)	28 (2.0)	66 (2.1)
Geometry	2 (0.5)	8 (1.4)	28 (1.7)	62 (2.0)
Functions	2 (0.5)	10 (1.2)	29 (1.9)	60 (1.9)
Modeling	1 (0.4)	12 (1.5)	38 (2.2)	49 (2.3)
Statistics and probability	2 (0.5)	11 (1.1)	39 (2.0)	48 (2.2)
Discrete mathematics	17 (1.5)	27 (1.7)	38 (2.1)	18 (1.5)
High				
Algebraic thinking	0 (0.2)	1 (0.3)	7 (0.9)	91 (0.9)
The number system and operations	0 (0.2)	1 (0.3)	9 (1.0)	90 (1.1)
Functions	0 (0.2)	3 (0.9)	13 (1.1)	84 (1.5)
Measurement	0 (0.1)	4 (0.6)	17 (1.2)	79 (1.2)
Geometry	2 (0.3)	7 (0.7)	21 (1.4)	70 (1.4)
Modeling	1 (0.3)	10 (1.3)	31 (1.6)	58 (2.0)
Statistics and probability	7 (0.8)	25 (1.4)	38 (1.3)	30 (1.2)
Discrete mathematics	14 (1.1)	28 (1.4)	32 (1.3)	25 (1.2)

As with the data on college degrees and course taking, data on teachers' perceptions of preparedness to teach science/mathematics indicate that a substantial portion of the teaching force, particularly at the lower grade levels, does not have the amount of content knowledge for teaching that one would hope.

The last proxy measure included in the 2012 NSSME is teachers' perceptions of preparedness to implement a number of tasks in their most recent science/mathematics unit. As can be seen in Table 40, most science teachers feel at least fairly well prepared in each of these areas. As with the other proxy measures, these data indicate increased preparedness for teaching science as grade level increases.

Table 40
Science Classes Taught by Teachers Feeling
Prepared for Each of a Number of Tasks in the Most Recent Unit, by Grade Range

	Percent of Classes			
	Not Adequately Prepared	**Somewhat Prepared**	**Fairly Well Prepared**	**Very Well Prepared**
Elementary				
Anticipate difficulties that students will have with particular science ideas and procedures in this unit	3 (0.6)	16 (1.3)	54 (1.8)	28 (1.8)
Find out what students thought or already knew about the key science ideas	1 (0.4)	13 (1.3)	48 (1.9)	38 (1.8)
Implement the science textbook/module to be used during this unit†	1 (0.5)	8 (1.4)	52 (2.6)	39 (2.7)
Monitor student understanding during this unit	1 (0.3)	9 (1.0)	45 (2.0)	46 (2.2)
Assess student understanding at the conclusion of this unit	1 (0.4)	10 (1.3)	43 (1.8)	46 (2.2)
Middle				
Anticipate difficulties that students will have with particular science ideas and procedures in this unit	1 (0.5)	13 (1.6)	47 (2.3)	39 (2.3)
Find out what students thought or already knew about the key science ideas	1 (0.3)	15 (1.8)	43 (2.2)	41 (2.4)
Implement the science textbook/module to be used during this unit†	1 (0.4)	9 (1.8)	38 (2.9)	51 (2.9)
Monitor student understanding during this unit	0 (0.2)	6 (1.0)	42 (2.3)	51 (2.2)
Assess student understanding at the conclusion of this unit	0 (0.1)	5 (1.0)	35 (2.4)	59 (2.5)
High				
Anticipate difficulties that students will have with particular science ideas and procedures in this unit	1 (0.3)	8 (0.9)	43 (1.5)	49 (1.5)
Find out what students thought or already knew about the key science ideas	1 (0.2)	12 (1.1)	45 (1.4)	42 (1.4)
Implement the science textbook/module to be used during this unit†	1 (0.3)	8 (1.2)	39 (2.1)	52 (2.3)
Monitor student understanding during this unit	0 (0.1)	6 (0.8)	37 (1.4)	57 (1.6)
Assess student understanding at the conclusion of this unit	0 (0.1)	3 (0.6)	33 (1.6)	64 (1.6)

† Item presented only to teachers indicating that they used commercially-published textbooks/modules in their most recent unit.

Similar to science, most teachers of mathematics feel at least fairly well prepared in each of these areas (see Table 41). Unlike science though, there are not pronounced differences in the data by grade range.

Table 41
Mathematics Classes Taught by Teachers Feeling
Prepared for Each of a Number of Tasks in the Most Recent Unit, by Grade Range

	Percent of Classes							
	Not Adequately Prepared		Somewhat Prepared		Fairly Well Prepared		Very Well Prepared	
Elementary								
Anticipate difficulties that students will have with particular mathematical ideas and procedures in this unit	1	(0.3)	8	(1.1)	44	(1.8)	46	(1.8)
Find out what students thought or already knew about the key mathematical ideas	1	(0.3)	10	(1.0)	41	(1.7)	48	(1.8)
Implement the mathematics textbook/program to be used during this unit†	0	(0.2)	5	(0.8)	32	(2.0)	62	(2.0)
Monitor student understanding during this unit	0	(0.1)	4	(0.6)	34	(1.7)	62	(1.6)
Assess student understanding at the conclusion of this unit	0	(0.2)	3	(0.5)	30	(1.6)	66	(1.7)
Middle								
Anticipate difficulties that students will have with particular mathematical ideas and procedures in this unit	0	(0.1)	8	(1.0)	38	(2.2)	54	(2.4)
Find out what students thought or already knew about the key mathematical ideas	1	(0.3)	11	(1.2)	40	(1.9)	49	(2.3)
Implement the mathematics textbook/program to be used during this unit†	0	(0.2)	6	(1.0)	32	(2.4)	63	(2.3)
Monitor student understanding during this unit	0	(0.1)	3	(0.5)	35	(2.2)	62	(2.1)
Assess student understanding at the conclusion of this unit	0	(0.1)	2	(0.4)	27	(2.2)	72	(2.3)
High								
Anticipate difficulties that students will have with particular mathematical ideas and procedures in this unit	0	(0.2)	5	(0.6)	35	(1.5)	60	(1.3)
Find out what students thought or already knew about the key mathematical ideas	1	(0.2)	10	(0.8)	41	(1.5)	48	(1.5)
Implement the mathematics textbook/program to be used during this unit†	0	(0.2)	5	(0.8)	34	(1.7)	61	(1.8)
Monitor student understanding during this unit	0	---‡	2	(0.4)	34	(1.7)	65	(1.7)
Assess student understanding at the conclusion of this unit	0	(0.1)	1	(0.3)	27	(1.5)	72	(1.5)

† Item presented only to teachers indicating that they used commercially-published textbooks/programs in their most recent unit.

‡ No teachers in the sample selected this response option. Thus, it is not possible to calculate the standard error of this estimate.'

Data Collection Considerations

Collecting data on this indicator faces a number of challenges. Although there is empirical evidence that disciplinary content knowledge (DCK) is necessary for effective teaching, there is also a consensus that DCK is not sufficient. In the ideal, teachers would also have knowledge of the common trajectories students have in developing understanding, the prior conceptions they have that impact those trajectories, and strategies for effectively moving students along those trajectories. Although researchers have identified these types of knowledge in some topic areas, there is limited or no research in these areas for many topics addressed by the CCSSM and

Framework. In part because the knowledge base is not sufficiently developed, there are relatively few direct measures of content knowledge for teaching, especially in science.[8]

Consequently, the field has relied largely on proxy measures such as college degrees and course taking, which have not been consistently good predictors of student learning at the secondary level.[9] And the research about teachers' self-report of preparedness to teach various topics is insufficient to have confidence in its ability to predict actual preparation for teaching. Although teachers who report feeling unprepared likely are unprepared, it is not clear if teachers who report feeling prepared actually are (e.g., teachers with a limited understanding of a topic area may not realize what they do not know about it). Additional research into this approach would be needed to have confidence in this type of measure.

[8] The Learning Mathematics for Teacher project at the University of Michigan (http://sitemaker.umich.edu/lmt/home) has developed several of these measures in elementary and middle grades mathematics.

[9] See for example, Wilson, S.M., Floden, R.E., & Ferrini-Mundy, J. (2001). *Teacher preparation research: Current knowledge, recommendations, and priorities for the future*. Seattle, WA: Center for the Study of Teaching Policy, University of Washington.

INDICATOR 7
TEACHERS' PARTICIPATION IN STEM-SPECIFIC PROFESSIONAL DEVELOPMENT ACTIVITIES

Instrumentation

The 2012 NSSME contains several items related to teachers' participation in STEM-specific professional development activities. Items about school and/or district offered professional growth opportunities (e.g., workshops, professional learning communities or PLCs, coaching) were asked of program representatives. Program representatives were asked about the extent to which their district offers professional development based on state standards (SPQ6/MPQ6). The program questionnaire also asked whether professional development workshops in the designated discipline were offered by schools and/or districts/dioceses (SPQ39/MPQ25). Representatives who indicated that their school and/or district/diocese have offered in-service professional development in the last three years were asked about the focus of those workshops (SPQ40/MPQ26).

School science and mathematics program representatives were also asked whether their school has offered teacher study groups (e.g., professional learning communities or PLCs) in the last three years where teachers meet on a regular basis to discuss science/mathematics teaching and learning (SPQ41/MPQ27). If so, they were asked whether teachers were required to attend, if there was a specified schedule for when they meet, and the frequency and duration of the study groups (SPQ42–47/MPQ28–33). Items SPQ48–50/MPQ34–36 asked about the composition of teacher study groups, activities typically included, and the extent to which teacher study groups addressed each of a number of areas for science and mathematics respectively.

Finally, school program representatives were asked whether any teachers in their school had access to one-on-one coaching focused on improving their science/mathematics instruction (SPQ54/MPQ40). Representatives were also asked about whether teachers were required to receive one-on-one coaching focused on improving science and mathematics instruction (SPQ55–57/MPQ41–43) as well as who provided the coaching (SPQ58/MPQ44).

The teacher questionnaires included several items intended to measure individual teacher's professional development opportunities. Teachers were asked when they last participated in professional development (STQ29/MQ17). Teachers who participated in professional development in the last three years were asked about the format of those activities (STQ30/MTQ18 and STQ35/MTQ23), the total amount of time they had spent on professional development related to science/mathematics teaching (STQ31/MTQ19), and what they did during those experiences (STQ32/MTQ20). As another indicator of the extent to which science and mathematics teachers are staying current in their field, the 2012 NSSME asked teachers when they had last taken a formal course for college credit in both disciplinary content and how to teach that content (STQ33/MTQ21). Finally, teachers were asked about the emphasis (e.g., deepening their content knowledge, assessing student understanding) of their professional growth opportunities, including both professional development and college coursework (STQ34/MTQ22).

Indicator Data

At the school level, only about half of science program representatives agree or strongly agree that their district organizes professional development based on state science standards (see Table 42). In mathematics, the proportion is 66–70 percent (depending on grade level).

Table 42
Extent to which Districts/Dioceses Organize
Professional Development Based on State Standards, by Subject and Grade Range

	Percent of Schools[†]				
	Strongly Disagree	Disagree	No Opinion	Agree	Strongly Agree
Science					
Elementary	10 (2.0)	20 (2.3)	14 (2.5)	38 (2.9)	18 (2.1)
Middle	9 (2.1)	25 (2.9)	14 (1.8)	30 (2.6)	22 (3.1)
High	8 (1.3)	20 (2.0)	18 (1.7)	28 (2.7)	26 (3.3)
Mathematics					
Elementary	6 (1.9)	13 (2.2)	10 (1.8)	33 (3.1)	38 (2.9)
Middle	8 (2.4)	15 (2.7)	11 (1.8)	31 (3.0)	35 (3.2)
High	7 (1.5)	16 (1.7)	12 (1.8)	35 (2.6)	31 (3.1)

† Includes only public and Catholic schools.

Schools and districts are also more likely to offer professional development workshops in mathematics than in science (see Table 43). In both subjects, these workshops are more prevalent in elementary schools than high schools.

Table 43
Professional Development Workshops Offered
Locally in the Last Three Years, by Subject and Grade Range

	Percent of Schools		
	Elementary	Middle	High
Science	48 (2.9)	42 (3.6)	36 (4.0)
Mathematics	65 (2.8)	60 (3.3)	51 (4.3)

Respondents indicating that science/mathematics workshops were offered locally were asked about the extent to which that professional development addressed each of a number of areas. Tables 44–46 show results for science. At the elementary and middle grades, locally offered professional development tends to focus more heavily on state science standards, investigation-oriented teaching strategies, science content, and implementing instructional materials. At the high school level, the major emphasis is on the state science standards.

Table 44
Focus of Locally Offered Science Professional Development Workshops in the Last Three Years: Elementary Schools

	Percent of Schools†									
	Not at All				Somewhat				To a Great Extent	
	1		2		3		4		5	
State science standards	4	(1.5)	7	(2.2)	28	(3.7)	33	(4.1)	28	(4.3)
How to use investigation-oriented science teaching strategies	9	(2.4)	11	(2.3)	25	(3.9)	29	(4.0)	26	(3.4)
Science content	4	(1.6)	6	(2.6)	36	(4.5)	29	(3.6)	25	(4.1)
How to use particular science instructional materials (e.g., textbooks or modules)	12	(3.0)	9	(2.2)	22	(3.1)	33	(4.2)	24	(3.7)
How to use technology in science instruction	13	(2.5)	15	(3.2)	34	(4.5)	26	(3.3)	11	(2.3)
How students think about various science ideas	12	(2.6)	15	(2.7)	40	(4.0)	22	(3.0)	11	(2.5)
How to monitor student understanding during science instruction	14	(2.8)	13	(2.6)	42	(4.1)	20	(3.1)	11	(2.7)
How to adapt science instruction to address student misconceptions	16	(3.0)	19	(3.4)	34	(4.0)	20	(3.5)	11	(2.3)
How to provide alternative science learning experiences for students with special needs	34	(3.7)	26	(3.8)	30	(3.9)	4	(1.4)	6	(1.7)
How to teach science to students who are English-language learners	34	(3.7)	19	(3.2)	28	(3.5)	14	(3.2)	5	(1.7)

† Only elementary schools indicating that they and/or their district/diocese offered in-service workshops in the last three years are included in this analysis.

Table 45
Focus of Locally Offered Science Professional Development Workshops in the Last Three Years: Middle Schools

	Percent of Schools†									
	Not at All				Somewhat				To a Great Extent	
	1		2		3		4		5	
State science standards	6	(2.1)	4	(1.3)	23	(3.9)	31	(4.6)	37	(5.4)
Science content	7	(2.3)	7	(3.1)	35	(5.1)	24	(3.8)	27	(5.0)
How to use investigation-oriented science teaching strategies	13	(3.0)	8	(1.7)	28	(4.9)	30	(4.5)	22	(4.2)
How to use particular science instructional materials (e.g., textbooks or modules)	17	(3.6)	8	(1.7)	22	(3.1)	31	(5.6)	21	(3.3)
How to use technology in science instruction	9	(2.6)	13	(3.0)	35	(6.1)	25	(3.3)	17	(3.6)
How students think about various science ideas	14	(2.8)	11	(2.0)	43	(5.1)	19	(3.2)	13	(2.7)
How to monitor student understanding during science instruction	14	(3.0)	9	(1.6)	43	(5.4)	22	(3.6)	12	(2.9)
How to adapt science instruction to address student misconceptions	17	(3.0)	15	(3.7)	34	(4.7)	23	(3.4)	11	(2.7)
How to provide alternative science learning experiences for students with special needs	31	(3.8)	23	(4.7)	34	(4.5)	5	(1.4)	6	(2.0)
How to teach science to students who are English-language learners	37	(4.4)	16	(3.0)	30	(4.3)	13	(3.8)	5	(1.3)

† Only middle schools indicating that they and/or their district/diocese offered in-service workshops in the last three years are included in this analysis.

Table 46
Focus of Locally Offered Science Professional Development Workshops in the Last Three Years: High Schools

	Percent of Schools†									
	Not at All				Somewhat				To a Great Extent	
	1		2		3		4		5	
State science standards	5	(1.4)	5	(1.6)	24	(4.5)	35	(5.9)	31	(6.4)
How to use technology in science instruction	8	(2.7)	8	(1.7)	41	(7.0)	28	(4.1)	15	(3.0)
How to use particular science instructional materials (e.g., textbooks or modules)	17	(4.2)	14	(2.9)	25	(3.4)	32	(7.6)	12	(2.9)
How to use investigation-oriented science teaching strategies	12	(2.3)	13	(3.0)	35	(7.1)	30	(6.5)	11	(2.1)
Science content	7	(1.8)	15	(6.2)	45	(6.6)	22	(3.2)	11	(2.5)
How to adapt science instruction to address student misconceptions	23	(3.9)	22	(6.3)	32	(6.6)	15	(2.9)	8	(1.8)
How to monitor student understanding during science instruction	17	(3.5)	14	(2.5)	42	(6.7)	21	(3.6)	6	(1.6)
How students think about various science ideas	21	(3.6)	17	(2.8)	42	(6.9)	13	(2.4)	6	(1.7)
How to teach science to students who are English-language learners	44	(5.9)	15	(2.5)	24	(6.1)	12	(6.3)	5	(1.3)
How to provide alternative science learning experiences for students with special needs	38	(5.4)	23	(6.0)	28	(6.5)	8	(2.1)	3	(1.2)

† Only high schools indicating that they and/or their district/diocese offered in-service workshops in the last three years are included in this analysis.

Tables 47–49 show results for mathematics. Similar to science, locally offered mathematics workshops tend to emphasize state standards, implementing instructional materials, and mathematics content at the elementary and middle school levels. Opportunities at the high school level focus most heavily on state mathematics standards.

Table 47
Focus of Locally Offered Mathematics Professional Development Workshops in the Last Three Years: Elementary Schools

	Percent of Schools†									
	Not at All				Somewhat				To a Great Extent	
	1		2		3		4		5	
State mathematics standards	5	(2.0)	4	(1.5)	15	(2.6)	37	(3.8)	39	(3.7)
How to use particular mathematics instructional materials (e.g., textbooks or modules)	9	(2.3)	9	(2.4)	21	(2.8)	37	(4.0)	24	(2.8)
Mathematics content	4	(1.7)	4	(1.5)	29	(3.6)	42	(3.9)	21	(2.4)
How to monitor student understanding during mathematics instruction	11	(2.9)	14	(2.6)	28	(3.5)	31	(3.4)	16	(2.7)
How to use technology in mathematics instruction	11	(2.1)	17	(2.9)	25	(3.4)	32	(3.6)	15	(2.9)
How to use investigation-oriented mathematics teaching strategies	16	(3.1)	20	(3.2)	27	(3.0)	23	(3.6)	14	(2.5)
How students think about various mathematics ideas	10	(2.2)	12	(2.0)	36	(3.7)	28	(3.0)	13	(2.4)
How to adapt mathematics instruction to address student misconceptions	14	(2.8)	14	(2.0)	32	(3.8)	29	(3.4)	10	(2.1)
How to provide alternative mathematics learning experiences for students with special needs	26	(3.8)	23	(2.8)	26	(2.9)	17	(3.1)	9	(2.6)
How to teach mathematics to students who are English-language learners	42	(3.8)	16	(2.6)	18	(2.8)	18	(2.9)	5	(1.4)

† Only elementary schools indicating that they and/or their district/diocese offered in-service workshops in the last three years are included in this analysis.

Table 48
Focus of Locally Offered Mathematics Professional Development Workshops in the Last Three Years: Middle Schools

	Percent of Schools†									
	Not at All				Somewhat				To a Great Extent	
	1		2		3		4		5	
State mathematics standards	4	(2.4)	4	(1.8)	16	(2.2)	39	(4.5)	36	(4.4)
How to use particular mathematics instructional materials (e.g., textbooks or modules)	15	(3.2)	11	(3.4)	23	(2.9)	34	(4.5)	18	(3.2)
Mathematics content	7	(2.6)	5	(1.9)	32	(3.9)	39	(4.3)	17	(2.2)
How to use technology in mathematics instruction	10	(2.0)	16	(3.4)	28	(4.2)	30	(4.4)	16	(3.4)
How students think about various mathematics ideas	10	(2.2)	13	(2.2)	38	(4.1)	28	(4.1)	11	(2.8)
How to use investigation-oriented mathematics teaching strategies	19	(3.4)	22	(4.1)	25	(3.2)	24	(4.0)	11	(2.4)
How to monitor student understanding during mathematics instruction	11	(2.9)	17	(3.0)	30	(3.9)	33	(4.3)	10	(2.7)
How to provide alternative mathematics learning experiences for students with special needs	29	(4.6)	19	(2.3)	30	(2.9)	15	(3.5)	8	(3.2)
How to adapt mathematics instruction to address student misconceptions	14	(3.3)	16	(2.3)	30	(4.1)	32	(4.1)	7	(1.6)
How to teach mathematics to students who are English-language learners	48	(4.4)	16	(2.4)	19	(3.4)	15	(3.6)	2	(0.8)

† Only middle schools indicating that they and/or their district/diocese offered in-service workshops in the last three years are included in this analysis.

Table 49
Focus of Locally Offered Mathematics Professional Development Workshops in the Last Three Years: High Schools

	Percent of Schools†									
	Not at All				Somewhat				To a Great Extent	
	1		2		3		4		5	
State mathematics standards	2	(0.8)	3	(1.1)	18	(2.8)	41	(5.2)	36	(4.5)
How to use technology in mathematics instruction	8	(2.0)	12	(2.3)	26	(4.9)	34	(5.5)	20	(6.6)
Mathematics content	9	(2.0)	7	(1.4)	37	(6.0)	34	(5.1)	14	(2.2)
How to use particular mathematics instructional materials (e.g., textbooks or modules)	13	(2.4)	16	(4.5)	28	(3.9)	29	(5.3)	14	(4.6)
How to use investigation-oriented mathematics teaching strategies	15	(2.5)	23	(5.1)	24	(3.3)	25	(5.5)	13	(5.0)
How to provide alternative mathematics learning experiences for students with special needs	28	(3.6)	24	(3.4)	18	(2.8)	18	(5.5)	12	(6.5)
How to monitor student understanding during mathematics instruction	15	(2.7)	14	(2.3)	32	(4.9)	28	(5.9)	11	(4.9)
How students think about various mathematics ideas	12	(2.3)	19	(2.9)	31	(5.2)	27	(6.0)	10	(4.6)
How to adapt mathematics instruction to address student misconceptions	17	(2.7)	14	(2.2)	31	(4.9)	32	(6.7)	5	(1.0)
How to teach mathematics to students who are English-language learners	45	(5.6)	17	(2.3)	19	(4.7)	18	(6.6)	2	(0.7)

† Only high schools indicating that they and/or their district/diocese offered in-service workshops in the last three years are included in this analysis.

One concern about professional development workshops is that teachers may not be given adequate assistance in applying what they are learning to their own instruction. Teacher study groups (professional learning communities, lesson study, etc.) have the potential to help teachers transfer what they are learning to their instruction. School science and mathematics program representatives were asked whether their school has offered teacher study groups in the last three years where teachers meet on a regular basis to discuss science/mathematics teaching and learning. As can be seen in Table 50, mathematics-focused teacher study groups are offered in roughly half of schools across grade levels. Science-focused teacher study groups are offered in 47 percent of high schools, 43 percent of middle schools, and 32 percent of elementary schools.

Table 50
Teacher Study Groups Offered at Schools in the Last Three Years, by Subject and Grade Range

	Percent of Schools					
	Elementary		Middle		High	
Science	32	(3.0)	43	(3.7)	47	(4.4)
Mathematics	46	(3.0)	51	(3.7)	48	(4.4)

Schools that offer science-/mathematics-focused study groups are similar in terms of whether teachers are required to participate and whether the groups operate on specified schedules. Roughly three-quarters of schools require teacher participation, and about 6 in 10 specify a meeting schedule (see Table 51).

Table 51
Characteristics of Teacher Study Groups, by Subject and Grade Range

	Percent of Schools†		
	Elementary	**Middle**	**High**
Science			
Participation is required	62 (5.6)	76 (4.9)	80 (5.2)
School specifies schedule	53 (4.8)	61 (4.4)	68 (5.2)
Mathematics			
Participation is required	70 (3.5)	79 (3.5)	77 (5.1)
School specifies schedule	58 (3.8)	60 (4.1)	66 (4.6)

† Only schools offering teacher study groups in the last three years are included in this analysis.

Table 52 shows the frequency and Table 53 the duration of school-based study groups that have a specified schedule. Note that although most study groups in both science and mathematics have met for the entire school year, there is considerable variation in the frequency of study group meetings, with roughly a third meeting more than twice a month, but some meeting far less frequently.

Table 52
Duration of Science-/Mathematics-Focused Teacher Study Groups, by Grade Range

	Percent of Schools†		
	Elementary	**Middle**	**High**
Science			
The entire school year	84 (4.6)	93 (2.0)	96 (1.3)
One semester	11 (3.9)	4 (1.4)	2 (1.0)
Less than one semester	4 (2.4)	3 (1.6)	2 (0.9)
Mathematics			
The entire school year	89 (3.2)	89 (3.1)	92 (2.5)
One semester	6 (2.5)	5 (2.7)	3 (1.1)
Less than one semester	5 (2.1)	6 (1.8)	6 (2.3)

† Only schools offering teacher study groups in the last three years and indicating that they have a specified schedule for these teacher study groups are included in this analysis.

Table 53
Frequency of Science-/Mathematics-Focused Teacher Study Groups, by Grade Range

	Percent of Schools†					
	Elementary		Middle		High	
Science						
Less than once a month	35	(7.5)	19	(4.1)	16	(3.1)
Once a month	38	(6.6)	35	(4.8)	28	(5.2)
Twice a month	7	(3.1)	13	(2.6)	15	(2.4)
More than twice a month	20	(6.5)	33	(5.0)	41	(6.7)
Mathematics						
Less than once a month	24	(4.7)	17	(3.3)	14	(2.7)
Once a month	38	(4.2)	28	(4.1)	27	(4.5)
Twice a month	13	(3.7)	15	(2.4)	15	(2.4)
More than twice a month	25	(5.1)	41	(5.0)	44	(5.6)

† Only schools offering teacher study groups in the last three years and indicating that they have a specified schedule for these teacher study groups are included in this analysis.

In terms of composition of the study groups, most schools limit participation to teachers from their school, and most include teachers from multiple grade levels (see Table 54). Many study groups include school and/or district administrators. Few study groups in either subject include members from outside the school/district staff (e.g., higher education faculty, parents).

Table 54
Composition of Science-/Mathematics-Focused Teacher Study Groups, by Grade Range

	Percent of Schools†					
	Elementary		Middle		High	
Science						
Include teachers from multiple grade levels	62	(5.4)	76	(3.6)	74	(3.5)
Limited to teachers from this school	58	(6.8)	64	(5.7)	72	(7.2)
Include school and/or district/diocese administrators	52	(6.1)	43	(5.1)	38	(5.1)
Include teachers from other schools in the district/diocese‡	45	(6.6)	38	(5.2)	27	(6.0)
Organized by grade level	56	(5.4)	41	(4.3)	26	(4.7)
Include teachers from other schools outside of your district/diocese	12	(5.2)	12	(5.4)	9	(5.9)
Include higher education faculty or other “consultants”	13	(3.9)	10	(2.8)	4	(0.9)
Include parents/guardians or other community members	0	(0.1)	0	(0.2)	1	(0.4)
Mathematics						
Limited to teachers from this school	74	(4.3)	73	(4.5)	72	(6.7)
Include teachers from multiple grade levels	57	(3.6)	76	(2.7)	70	(3.5)
Include school and/or district/diocese administrators	55	(4.0)	58	(3.3)	47	(5.7)
Organized by grade level	57	(4.5)	39	(3.8)	27	(3.7)
Include teachers from other schools in the district/diocese‡	26	(4.1)	27	(3.9)	24	(5.8)
Include higher education faculty or other “consultants”	18	(3.0)	15	(2.3)	10	(1.7)
Include teachers from other schools outside of your district/diocese	4	(2.6)	5	(3.1)	10	(5.6)
Include parents/guardians or other community members	4	(1.7)	2	(1.3)	1	(0.7)

† Only schools indicating that they offered teacher study groups in the last three years are included in this analysis.
‡ Item presented only to public and Catholic schools.

Program representatives were asked about the activities typically included in teachers study groups. As can be seen in Table 55, analyzing student assessment results is by far the most common activity across subjects and grade ranges. Analyzing student instructional materials and planning lessons together occur in roughly two-thirds of study groups. Considerably fewer study groups have engaged teachers in the analysis of classroom artifacts or conducting science/mathematics investigations.

Table 55
Description of Activities in Typical
Science-/Mathematics-Focused Teacher Study Groups, by Grade Range

	Percent of Schools†		
	Elementary	**Middle**	**High**
Science			
Teachers analyze student science assessment results	65 (5.7)	82 (3.5)	87 (2.4)
Teachers plan science lessons together	64 (5.3)	67 (4.9)	65 (5.9)
Teachers analyze science instructional materials (e.g., textbooks or modules)	66 (5.6)	68 (4.6)	63 (4.6)
Teachers analyze classroom artifacts (e.g., student work samples)	34 (5.8)	40 (5.5)	40 (6.2)
Teachers engage in science investigations	28 (5.1)	27 (4.6)	21 (5.2)
Mathematics			
Teachers analyze student mathematics assessment results	81 (3.7)	85 (4.2)	81 (4.7)
Teachers analyze mathematics instructional materials (e.g., textbooks or modules)	63 (3.8)	66 (4.0)	66 (5.3)
Teachers plan mathematics lessons together	60 (4.9)	54 (4.5)	62 (5.5)
Teachers analyze classroom artifacts (e.g., student work samples)	36 (4.3)	34 (3.9)	26 (4.8)
Teachers engage in mathematics investigations	29 (3.6)	29 (4.1)	26 (5.6)

† Only schools indicating that they offered teacher study groups in the last three years are included in this analysis.

Like locally offered workshops, teacher study groups in both science and mathematics tend to focus on state standards (see Tables 56–61). Disciplinary content, use of technology, and monitoring student understanding are also relatively common foci. Teaching science and mathematics to English-language learners and students with special needs tend to not be addressed in teacher study groups.

Table 56
Focus of Locally Offered Science Teacher Study Groups in the Last Three Years: Elementary Schools

	Percent of Schools†									
	Not at All				Somewhat				To a Great Extent	
	1		2		3		4		5	
State science standards	6	(3.1)	3	(1.5)	23	(5.1)	37	(6.1)	32	(5.1)
How to use investigation-oriented science teaching strategies	10	(2.7)	10	(3.8)	26	(5.4)	32	(6.1)	22	(4.8)
Science content	7	(3.3)	6	(2.4)	30	(5.7)	36	(6.1)	20	(4.1)
How to use particular science instructional materials (e.g., textbooks or modules)	8	(2.5)	12	(4.1)	25	(5.0)	36	(4.8)	18	(3.8)
How to adapt science instruction to address student misconceptions	14	(3.6)	7	(2.0)	38	(5.4)	25	(4.5)	16	(4.3)
How students think about various science ideas	13	(4.1)	8	(2.4)	37	(5.9)	27	(5.5)	15	(3.7)
How to monitor student understanding during science instruction	13	(3.4)	5	(1.8)	32	(5.2)	36	(5.3)	14	(3.3)
How to use technology in science instruction	10	(2.8)	18	(5.0)	28	(4.9)	31	(5.7)	13	(3.0)
How to teach science to students who are English-language learners	44	(5.7)	10	(2.7)	27	(5.5)	10	(4.1)	9	(2.9)
How to provide alternative science learning experiences for students with special needs	30	(4.6)	19	(3.8)	30	(5.9)	14	(4.9)	7	(2.5)

† Only elementary schools indicating that they offered teacher study groups in the last three years are included in this analysis.

Table 57
Focus of Locally Offered Science Teacher Study Groups in the Last Three Years: Middle Schools

	Percent of Schools†									
	Not at All				Somewhat				To a Great Extent	
	1		2		3		4		5	
State science standards	7	(3.2)	3	(1.1)	22	(4.3)	36	(5.3)	33	(4.3)
How to use technology in science instruction	6	(1.6)	20	(4.8)	24	(4.5)	32	(4.7)	18	(3.8)
Science content	9	(3.2)	10	(2.7)	33	(4.8)	30	(5.3)	18	(3.4)
How to monitor student understanding during science instruction	14	(3.7)	8	(1.9)	29	(4.9)	33	(4.8)	16	(3.2)
How to adapt science instruction to address student misconceptions	13	(2.9)	11	(2.1)	32	(4.0)	28	(3.9)	16	(4.1)
How to use investigation-oriented science teaching strategies	9	(2.4)	15	(3.9)	27	(4.8)	34	(5.4)	15	(3.7)
How students think about various science ideas	14	(4.5)	11	(2.2)	33	(5.2)	28	(5.0)	14	(3.8)
How to use particular science instructional materials (e.g., textbooks or modules)	9	(2.4)	14	(4.0)	33	(4.7)	32	(5.1)	13	(2.6)
How to provide alternative science learning experiences for students with special needs	25	(4.1)	25	(3.8)	27	(5.1)	18	(4.0)	6	(1.8)
How to teach science to students who are English-language learners	44	(4.8)	15	(2.5)	25	(4.9)	10	(3.5)	5	(1.8)

† Only middle schools indicating that they offered teacher study groups in the last three years are included in this analysis.

Table 58
Focus of Locally Offered Science Teacher Study Groups in the Last Three Years: High Schools

	Percent of Schools†									
	Not at All				Somewhat				To a Great Extent	
	1		2		3		4		5	
State science standards	10	(4.7)	5	(1.4)	27	(5.5)	28	(3.7)	31	(5.2)
How to use investigation-oriented science teaching strategies	11	(1.9)	11	(2.1)	37	(5.7)	27	(4.9)	14	(4.9)
How to use technology in science instruction	9	(1.7)	15	(4.4)	29	(5.1)	35	(5.7)	12	(2.5)
How to adapt science instruction to address student misconceptions	15	(3.5)	10	(1.6)	37	(4.8)	25	(3.3)	12	(5.1)
Science content	13	(4.6)	9	(2.1)	42	(5.6)	26	(5.4)	11	(2.2)
How to monitor student understanding during science instruction	11	(2.2)	11	(1.9)	32	(5.8)	37	(5.8)	9	(2.1)
How to use particular science instructional materials (e.g., textbooks or modules)	12	(2.0)	11	(2.0)	42	(5.0)	28	(5.0)	8	(1.8)
How students think about various science ideas	13	(2.3)	13	(2.1)	33	(5.5)	34	(6.0)	7	(1.9)
How to provide alternative science learning experiences for students with special needs	31	(5.0)	23	(3.1)	26	(5.4)	16	(4.8)	4	(1.4)
How to teach science to students who are English-language learners	50	(5.9)	18	(2.8)	19	(5.1)	10	(4.9)	3	(1.2)

† Only high schools indicating that they offered teacher study groups in the last three years are included in this analysis.

Table 59
Focus of Locally Offered Mathematics Teacher Study Groups in the Last Three Years: Elementary Schools

	Percent of Schools†									
	Not At All				Somewhat				To a Great Extent	
	1		2		3		4		5	
State mathematics standards	3	(1.1)	3	(1.1)	14	(2.7)	38	(4.5)	43	(4.5)
Mathematics content	6	(2.1)	4	(1.8)	30	(3.7)	40	(4.7)	20	(4.0)
How to monitor student understanding during mathematics instruction	8	(2.3)	10	(2.8)	31	(4.2)	34	(4.7)	18	(3.7)
How to adapt mathematics instruction to address student misconceptions	11	(3.3)	12	(2.3)	33	(4.3)	27	(3.5)	16	(3.2)
How to use particular mathematics instructional materials (e.g., textbooks or modules)	9	(3.5)	8	(2.1)	28	(4.2)	40	(4.9)	15	(2.4)
How to use technology in mathematics instruction	15	(3.4)	11	(2.5)	34	(4.5)	26	(4.3)	13	(3.5)
How students think about various mathematics ideas	13	(3.6)	13	(2.4)	32	(5.0)	30	(4.9)	12	(2.6)
How to use investigation-oriented mathematics teaching strategies	15	(3.3)	12	(2.5)	33	(4.0)	30	(4.4)	10	(2.6)
How to provide alternative mathematics learning experiences for students with special needs	22	(4.3)	18	(3.1)	32	(3.8)	20	(4.4)	7	(2.4)
How to teach mathematics to students who are English-language learners	41	(4.7)	15	(2.5)	19	(3.2)	17	(3.9)	7	(2.1)

† Only elementary schools indicating that they offered teacher study groups in the last three years are included in this analysis.

Table 60
Focus of Locally Offered Mathematics Teacher Study Groups in the Last Three Years: Middle Schools

	Percent of Schools†									
	Not at All				Somewhat				To a Great Extent	
	1		2		3		4		5	
State mathematics standards	3	(1.1)	4	(1.5)	13	(2.1)	37	(4.5)	43	(4.4)
Mathematics content	10	(2.7)	6	(2.1)	29	(3.8)	33	(4.4)	22	(4.2)
How to monitor student understanding during mathematics instruction	10	(2.6)	15	(3.9)	29	(4.0)	32	(4.4)	14	(3.3)
How to adapt mathematics instruction to address student misconceptions	11	(2.9)	16	(3.1)	30	(4.6)	30	(4.0)	13	(3.2)
How to use technology in mathematics instruction	15	(4.0)	11	(2.0)	37	(4.3)	25	(4.2)	13	(3.7)
How to use particular mathematics instructional materials (e.g., textbooks or modules)	11	(3.8)	11	(2.3)	30	(4.7)	36	(5.2)	11	(2.1)
How students think about various mathematics ideas	12	(3.3)	15	(2.4)	34	(4.6)	31	(4.6)	8	(1.9)
How to provide alternative mathematics learning experiences for students with special needs	19	(4.3)	24	(3.3)	32	(3.9)	19	(4.3)	6	(2.2)
How to use investigation-oriented mathematics teaching strategies	19	(4.0)	17	(2.7)	32	(3.8)	28	(4.2)	5	(1.9)
How to teach mathematics to students who are English-language learners	46	(4.7)	18	(2.3)	17	(2.7)	14	(4.3)	5	(1.7)

† Only middle schools indicating that they offered teacher study groups in the last three years are included in this analysis.

Table 61
Focus of Locally Offered Mathematics Teacher Study Groups in the Last Three Years: High Schools

	Percent of Schools†									
	Not at All				Somewhat				To a Great Extent	
	1		2		3		4		5	
State mathematics standards	8	(2.2)	4	(1.2)	21	(3.2)	32	(5.8)	35	(5.7)
Mathematics content	10	(2.3)	7	(1.5)	36	(5.1)	27	(5.2)	19	(4.7)
How to use technology in mathematics instruction	9	(1.9)	13	(2.6)	30	(4.9)	31	(5.5)	18	(4.7)
How to adapt mathematics instruction to address student misconceptions	9	(2.1)	13	(2.9)	36	(5.5)	29	(5.6)	13	(4.7)
How to monitor student understanding during mathematics instruction	11	(2.2)	11	(2.5)	36	(5.3)	29	(5.2)	12	(4.8)
How to use particular mathematics instructional materials (e.g., textbooks or modules)	10	(2.2)	11	(2.5)	36	(6.0)	33	(5.7)	10	(1.7)
How students think about various mathematics ideas	14	(4.8)	13	(2.6)	32	(4.0)	34	(6.0)	7	(1.2)
How to use investigation-oriented mathematics teaching strategies	16	(2.9)	17	(2.8)	30	(3.4)	33	(6.3)	5	(1.1)
How to provide alternative mathematics learning experiences for students with special needs	24	(3.6)	24	(3.5)	27	(4.6)	20	(6.7)	4	(1.4)
How to teach mathematics to students who are English-language learners	47	(5.6)	21	(2.9)	13	(2.0)	16	(6.6)	3	(1.5)

† Only high schools indicating that they offered teacher study groups in the last three years are included in this analysis.

In addition to asking about workshops and teacher study groups, the program questionnaires asked about the availability of content-focused coaching in schools. As can be seen in Table 62, about 1 in 5 schools, regardless of grade range, offers one-on-one coaching in science and about 1 in 4 offers coaching in mathematics. Of those schools offering coaching, most do not require teachers to participate (see Table 63).

Table 62
Schools Providing One-on-One Science/Mathematics Coaching, by Grade Range

	Percent of Schools					
	Elementary		Middle		High	
Science	17	(1.9)	17	(2.1)	22	(2.0)
Mathematics	27	(2.3)	26	(2.6)	26	(2.4)

Table 63
Schools Requiring Participation in One-on-One Science/Mathematics Coaching, by Grade Range

	Percent of Schools		
	Elementary	Middle	High
Science	18 (5.9)	27 (7.4)	21 (4.5)
Mathematics	11 (2.8)	20 (3.6)	13 (3.2)

† Only schools indicating that teachers have access to one-on-one content-focused coaching are included in this analysis.

In schools where science/mathematics teachers have access to one-on-one coaching, program representatives were asked who provides the coaching services. As can be seen in Tables 64 and 65, at all three grade levels, coaching tends to be provided by teachers/coaches (with or without classroom teaching responsibilities) and district administrators, though the relative proportions shift across grade ranges. School-based administrators are less likely to provide coaching.

Table 64
Providers of One-on-One Science-Focused Coaching, by Grade Range

	Percent of Schools[†]									
	Not at All				Somewhat				To a Great Extent	
	1		2		3		4		5	
Elementary										
Teachers/coaches who do not have classroom teaching responsibilities	54	(6.8)	4	(2.2)	15	(6.0)	12	(3.8)	15	(4.5)
District/Diocese administrators including science supervisors/coordinators[‡]	53	(7.7)	9	(3.0)	16	(5.9)	7	(3.8)	15	(5.4)
Teachers/coaches who have full-time classroom teaching responsibilities	41	(8.2)	4	(2.4)	29	(6.8)	14	(4.6)	12	(3.9)
Teachers/coaches who have part-time classroom teaching responsibilities	60	(6.5)	4	(1.9)	16	(6.0)	12	(4.3)	8	(3.1)
The principal of your school	41	(6.2)	20	(5.5)	22	(4.8)	15	(6.5)	2	(1.6)
An assistant principal at your school	68	(6.2)	14	(4.8)	12	(3.1)	3	(1.9)	2	(1.7)
Middle										
Teachers/coaches who have full-time classroom teaching responsibilities	39	(6.6)	5	(2.2)	19	(6.5)	14	(4.8)	23	(5.1)
Teachers/coaches who do not have classroom teaching responsibilities	61	(6.1)	5	(1.6)	14	(6.6)	8	(3.3)	13	(3.4)
District/Diocese administrators including science supervisors/coordinators[‡]	49	(5.9)	13	(3.5)	20	(4.6)	10	(3.9)	8	(2.9)
Teachers/coaches who have part-time classroom teaching responsibilities	58	(6.5)	8	(2.6)	17	(6.5)	10	(5.2)	8	(3.4)
The principal of your school	42	(6.4)	19	(6.0)	19	(3.9)	16	(7.9)	4	(1.4)
An assistant principal at your school	65	(6.1)	10	(4.2)	20	(4.3)	2	(0.8)	2	(1.1)
High										
Teachers/coaches who have full-time classroom teaching responsibilities	25	(4.1)	1	(0.6)	19	(3.5)	18	(3.1)	37	(5.9)
Teachers/coaches who have part-time classroom teaching responsibilities	69	(4.1)	5	(1.8)	9	(2.7)	7	(2.7)	9	(3.2)
District/Diocese administrators including science supervisors/coordinators[‡]	56	(4.1)	7	(1.9)	21	(4.3)	8	(2.2)	7	(1.9)
Teachers/coaches who do not have classroom teaching responsibilities	74	(3.7)	4	(1.3)	11	(2.6)	5	(2.0)	6	(1.6)
An assistant principal at your school	64	(4.1)	9	(2.2)	18	(4.0)	6	(1.7)	3	(1.5)
The principal of your school	56	(4.8)	17	(3.9)	19	(3.7)	4	(1.4)	3	(1.6)

[†] Only schools indicating that teachers have access to one-on-one content-focused coaching are included in this analysis.
[‡] Item presented only to public and Catholic schools.

Table 65
Providers of One-on-One Mathematics-Focused Coaching, by Grade Range

	Percent of Schools†									
	Not at All				Somewhat				To a Great Extent	
	1		2		3		4		5	
Elementary										
Teachers/coaches who do not have classroom teaching responsibilities	40	(6.3)	7	(2.1)	11	(4.0)	16	(3.8)	27	(4.6)
District/Diocese administrators including mathematics supervisors/coordinators‡	31	(5.4)	14	(3.5)	26	(4.7)	12	(3.2)	17	(3.8)
Teachers/coaches who have full-time classroom teaching responsibilities	44	(5.3)	9	(2.9)	21	(4.5)	16	(4.2)	10	(2.6)
The principal of your school	48	(6.7)	11	(3.0)	25	(5.4)	12	(4.1)	4	(2.2)
Teachers/coaches who have part-time classroom teaching responsibilities	74	(4.8)	7	(2.7)	6	(3.6)	9	(3.0)	4	(1.6)
An assistant principal at your school	66	(5.1)	10	(2.8)	17	(4.1)	5	(2.0)	2	(1.1)
Middle										
Teachers/coaches who do not have classroom teaching responsibilities	40	(5.0)	5	(2.8)	16	(5.0)	19	(3.7)	20	(3.9)
District/Diocese administrators including mathematics supervisors/coordinators‡	33	(4.9)	11	(3.7)	24	(3.7)	14	(3.5)	18	(4.3)
Teachers/coaches who have full-time classroom teaching responsibilities	37	(5.2)	7	(2.7)	20	(4.9)	20	(5.3)	16	(3.5)
The principal of your school	44	(5.5)	11	(2.6)	27	(5.9)	13	(5.0)	6	(2.8)
Teachers/coaches who have part-time classroom teaching responsibilities	72	(5.4)	2	(1.3)	11	(4.7)	9	(2.9)	6	(1.8)
An assistant principal at your school	65	(5.1)	13	(2.5)	16	(3.8)	4	(1.6)	2	(0.9)
High										
Teachers/coaches who have full-time classroom teaching responsibilities	27	(4.9)	5	(1.9)	26	(4.0)	23	(7.4)	19	(3.9)
Teachers/coaches who do not have classroom teaching responsibilities	59	(5.6)	9	(3.8)	12	(4.4)	9	(2.8)	11	(3.0)
District/Diocese administrators including mathematics supervisors/coordinators‡	41	(4.2)	10	(2.8)	24	(2.9)	16	(3.6)	10	(2.7)
Teachers/coaches who have part-time classroom teaching responsibilities	66	(5.8)	8	(3.8)	7	(1.9)	11	(3.0)	7	(2.1)
The principal of your school	45	(5.9)	8	(2.5)	32	(8.1)	10	(4.3)	5	(2.1)
An assistant principal at your school	59	(4.9)	12	(2.7)	16	(3.6)	11	(4.2)	3	(1.2)

† Only schools indicating that teachers have access to one-on-one science-focused coaching are included in this analysis.
‡ Item presented only to public and Catholic schools.

Although understanding what professional development opportunities are offered by schools and districts is important, individual teacher experiences are likely to vary within schools. Consequently, the 2012 NSSME included several items asking teachers about their professional development experiences. As can be seen in Table 66, more than 80 percent of middle and high school science teachers, and mathematics teachers at each grade range, have participated in discipline-focused professional development (i.e., focused on science/mathematics content or the teaching of science/mathematics) within the last three years. Elementary teachers stand out for the relative paucity of professional development in science or science teaching, with only 59 percent having participated in the last three years.

Table 66
Teachers' Most Recent Participation in
Discipline-Focused† Professional Development, by Grade Range

	Percent of Teachers					
	Elementary		Middle		High	
Science						
In the last 3 years	59	(2.0)	82	(2.3)	85	(1.3)
4–6 years ago	16	(1.4)	6	(1.2)	7	(0.7)
7–10 years ago	5	(0.8)	3	(1.0)	2	(0.3)
More than 10 years ago	5	(0.8)	4	(1.3)	1	(0.4)
Never	15	(1.4)	6	(1.4)	5	(1.0)
Mathematics						
In the last 3 years	87	(1.3)	89	(1.6)	88	(1.0)
4–6 years ago	7	(0.9)	4	(0.7)	6	(0.6)
7–10 years ago	1	(0.4)	1	(0.5)	2	(0.4)
More than 10 years ago	1	(0.3)	2	(0.6)	1	(0.3)
Never	3	(0.7)	4	(1.0)	4	(0.7)

† Includes professional development focused on science/mathematics or science/mathematics teaching.

Data about the format of teachers' professional development activities are shown in Table 67. In each subject and grade range, workshops are the most prevalent activity, with 84–92 percent of teachers who had participated in professional development activities in the last three years indicating they had attended a workshop. Roughly three-fourths of middle and high school mathematics and science teachers, but fewer of their elementary school colleagues, report participating in professional learning communities or other types of teacher study groups. Middle and high school teachers also attend science/mathematics teacher association meetings at a higher rate than do elementary teachers, likely a reflection of the fact that elementary teachers are responsible for teaching, and keeping up with, multiple disciplines. Finally, not only are elementary science teachers less likely to have participated recently in professional development, they are far less likely to have received feedback on their teaching from a mentor/coach than any other group.

Table 67
Teachers Participating in Various Professional Development Activities in the Last Three Years, by Subject and Grade Range

	Percent of Teachers					
	Elementary		Middle		High	
Science						
Attended a workshop on science or science teaching	84	(1.8)	91	(1.7)	90	(1.2)
Participated in a professional learning community/lesson study/teacher study group focused on science or science teaching	55	(2.4)	75	(2.5)	73	(1.6)
Received feedback about your science teaching from a mentor/coach formally assigned by the school/district/diocese†	24	(2.5)	47	(3.5)	54	(2.4)
Attended a national, state, or regional science teacher association meeting	8	(1.2)	35	(2.8)	44	(1.7)
Mathematics						
Attended a workshop on mathematics or mathematics teaching	91	(1.0)	92	(1.4)	89	(1.0)
Participated in a professional learning community/lesson study/teacher study group focused on mathematics or mathematics teaching	66	(1.7)	76	(2.2)	73	(2.1)
Received feedback about your mathematics teaching from a mentor/coach formally assigned by the school/district/diocese†	46	(2.2)	57	(3.0)	54	(2.2)
Attended a national, state, or regional mathematics teacher association meeting	10	(1.0)	32	(2.5)	38	(1.5)

† This item was asked of all teachers whether or not they had participated in professional development in the last three years.

Although some involvement in professional development may be better than none, a brief exposure of a few hours over several years is not likely to be sufficient to enhance teachers' knowledge and skills in meaningful ways. Consequently, teachers were asked about the total amount of time they had spent on professional development related to science/mathematics teaching. As can be seen in Table 68, roughly 30 percent of middle and high school science and mathematics teachers, and far fewer of their elementary colleagues, participated in more than 35 hours of science-/mathematics-focused professional development in the last three years.

Table 68
Time Spent on Professional Development in the Last Three Years, by Subject and Grade Range

	Percent of Teachers					
	Elementary		Middle		High	
Science						
Less than 6 hours	65	(1.9)	30	(2.6)	23	(1.6)
6–15 hours	22	(1.7)	24	(1.8)	20	(1.1)
16–35 hours	8	(0.9)	20	(2.0)	21	(1.4)
More than 35 hours	4	(0.7)	27	(2.0)	36	(1.1)
Mathematics						
Less than 6 hours	35	(2.1)	22	(2.1)	23	(1.5)
6–15 hours	35	(1.6)	24	(2.1)	24	(1.4)
16–35 hours	20	(1.5)	23	(1.6)	22	(1.1)
More than 35 hours	11	(1.0)	31	(1.9)	32	(1.5)

The emerging consensus about effective professional development suggests that teachers need opportunities to work with colleagues who face similar challenges, including other teachers from their school and those who have similar teaching assignments. Other recommendations include engaging teachers in investigations, both to learn disciplinary content and to experience inquiry-oriented learning; to examine student work and other classroom artifacts for evidence of what students do and do not understand; and to apply what they have learned in their classrooms and subsequently discuss how it went.[10]

As can be seen in Tables 69–71, science teachers' professional development experiences varied widely in regards to these features. For example, only about a third of elementary teachers had a substantial (a rating of 4 or 5) opportunity to work closely with other science teachers at their school, compared more than half of secondary teachers. And only about a third of science teachers at all grade levels have had substantial opportunities to examine classroom artifacts in their professional development.

Table 69
Characteristics of Elementary School Science Teachers' Science-Focused† Professional Development in the Last Three Years

	Percent of Teachers‡				
	Not at All		Somewhat		To a Great Extent
	1	2	3	4	5
You had opportunities to engage in science investigations	15 (2.5)	7 (1.6)	30 (3.2)	23 (2.8)	25 (2.7)
You worked closely with other science teachers who taught the same grade and/or subject whether or not they were from your school	25 (3.0)	14 (2.7)	24 (2.4)	17 (2.7)	20 (2.5)
You worked closely with other science teachers from your school	21 (2.8)	18 (2.4)	26 (2.8)	15 (2.6)	20 (2.6)
You had opportunities to try out what you learned in your classroom and then talk about it as part of the professional development	24 (3.1)	16 (2.0)	26 (3.1)	16 (2.6)	18 (2.7)
You had opportunities to examine classroom artifacts (e.g., student work samples)	20 (3.1)	15 (2.6)	34 (3.3)	17 (2.7)	15 (2.5)
The professional development was a waste of your time	58 (3.5)	21 (2.7)	14 (2.6)	5 (1.6)	3 (1.3)

† Includes professional development focused on science or science teaching.
‡ Only elementary school teachers indicating that they participated in professional development in the last three years are included in this analysis.

[10] Elmore, R. F. (2002). *Bridging the gap between standards and achievement: The imperative for professional development in education.* Washington, DC: Albert Shanker Institute.

Garet, M. S., Porter, A. C., Desimone, L., Birman, B. F., & Yoon, K. S. (2001). What makes professional development effective? Results from a national sample of teachers. *American Educational Research Journal 38*(4), 915–945.

Table 70
Characteristics of Middle School Science Teachers' Science-Focused† Professional Development in the Last Three Years

	Percent of Teachers‡									
	Not at All				Somewhat				To a Great Extent	
	1		2		3		4		5	
You worked closely with other science teachers from your school	8	(3.0)	6	(1.9)	24	(3.3)	24	(2.6)	37	(2.9)
You worked closely with other science teachers who taught the same grade and/or subject whether or not they were from your school	9	(2.3)	12	(2.3)	26	(3.1)	23	(2.8)	31	(3.2)
You had opportunities to engage in science investigations	8	(1.3)	7	(1.7)	33	(3.2)	25	(3.4)	27	(3.2)
You had opportunities to try out what you learned in your classroom and then talk about it as part of the professional development	14	(3.0)	11	(1.7)	24	(3.9)	29	(3.6)	22	(3.3)
You had opportunities to examine classroom artifacts (e.g., student work samples)	14	(2.1)	14	(1.9)	32	(3.6)	23	(3.4)	17	(3.4)
The professional development was a waste of your time	60	(3.0)	22	(2.7)	13	(2.0)	4	(1.0)	1	(0.5)

† Includes professional development focused on science or science teaching.

‡ Only middle school teachers indicating that they participated in professional development in the last three years are included in this analysis.

Table 71
Characteristics of High School Science Teachers' Science-Focused† Professional Development in the Last Three Years

	Percent of Teachers‡									
	Not at All				Somewhat				To a Great Extent	
	1		2		3		4		5	
You worked closely with other science teachers from your school	10	(1.8)	8	(1.5)	20	(1.8)	25	(2.1)	37	(2.6)
You worked closely with other science teachers who taught the same grade and/or subject whether or not they were from your school	9	(1.9)	11	(1.7)	22	(2.1)	32	(2.5)	26	(1.9)
You had opportunities to try out what you learned in your classroom and then talk about it as part of the professional development	11	(1.8)	15	(2.1)	27	(2.2)	28	(2.1)	19	(1.6)
You had opportunities to engage in science investigations	16	(2.1)	12	(1.3)	28	(2.3)	25	(2.7)	19	(1.9)
You had opportunities to examine classroom artifacts (e.g., student work samples)	15	(1.7)	18	(1.9)	34	(2.2)	20	(1.9)	13	(1.6)
The professional development was a waste of your time	52	(2.3)	23	(2.1)	17	(1.8)	4	(0.8)	3	(0.8)

† Includes professional development focused on science or science teaching.

‡ Only high school teachers indicating that they participated in professional development in the last three years are included in this analysis.

The data on mathematics teachers tell a similar story—there is a great deal of variation in the extent to which teachers' professional development has had these features (see Tables 72–74).

Table 72
Characteristics of Elementary School Mathematics Teachers' Mathematics-Focused† Professional Development in the Last Three Years

	Percent of Teachers‡									
	Not at All 1		2		Somewhat 3		4		To a Great Extent 5	
You worked closely with other mathematics teachers from your school	8	(1.3)	9	(1.4)	28	(2.3)	29	(2.2)	25	(2.0)
You worked closely with other mathematics teachers who taught the same grade and/or subject whether or not they were from your school	14	(1.8)	13	(1.5)	24	(2.3)	29	(2.2)	21	(2.1)
You had opportunities to engage in mathematics investigations	8	(1.3)	7	(1.3)	40	(2.4)	26	(1.8)	20	(1.7)
You had opportunities to try out what you learned in your classroom and then talk about it as part of the professional development	14	(1.8)	12	(1.7)	28	(2.5)	28	(2.6)	18	(1.9)
You had opportunities to examine classroom artifacts (e.g., student work samples)	14	(1.6)	13	(1.5)	30	(2.2)	26	(2.0)	18	(1.8)
The professional development was a waste of your time	56	(2.1)	21	(1.7)	18	(1.6)	4	(0.9)	1	(0.5)

† Includes professional development focused on mathematics or mathematics teaching.
‡ Only elementary school teachers indicating that they participated in professional development in the last three years are included in this analysis.

Table 73
Characteristics of Middle School Mathematics Teachers' Mathematics-Focused† Professional Development in the Last Three Years

	Percent of Teachers‡									
	Not at All				Somewhat				To a Great Extent	
	1		2		3		4		5	
You worked closely with other mathematics teachers from your school	7	(2.2)	7	(1.3)	16	(2.1)	26	(3.3)	44	(3.1)
You worked closely with other mathematics teachers who taught the same grade and/or subject whether or not they were from your school	14	(2.8)	8	(1.5)	20	(2.0)	23	(2.9)	35	(3.4)
You had opportunities to engage in mathematics investigations	9	(1.8)	10	(1.7)	31	(2.6)	32	(3.0)	19	(2.7)
You had opportunities to try out what you learned in your classroom and then talk about it as part of the professional development	11	(2.4)	13	(2.1)	25	(2.4)	34	(2.6)	17	(1.9)
You had opportunities to examine classroom artifacts (e.g., student work samples)	13	(2.3)	13	(2.3)	30	(2.9)	28	(3.0)	17	(2.2)
The professional development was a waste of your time	56	(3.4)	25	(2.9)	15	(2.3)	3	(1.0)	1	(0.3)

† Includes professional development focused on mathematics or mathematics teaching.
‡ Only middle school teachers indicating that they participated in professional development in the last three years are included in this analysis.

Table 74
Characteristics of High School Mathematics Teachers' Mathematics-Focused† Professional Development in the Last Three Years

	Percent of Teachers‡									
	Not at All				Somewhat				To a Great Extent	
	1		2		3		4		5	
You worked closely with other mathematics teachers from your school	6	(1.7)	7	(1.3)	19	(1.6)	30	(2.3)	38	(2.1)
You worked closely with other mathematics teachers who taught the same grade and/or subject whether or not they were from your school	10	(2.1)	12	(1.6)	22	(1.6)	31	(2.3)	25	(1.7)
You had opportunities to try out what you learned in your classroom and then talk about it as part of the professional development	13	(1.9)	14	(1.8)	27	(2.1)	29	(2.1)	17	(1.8)
You had opportunities to engage in mathematics investigations	10	(1.8)	10	(1.3)	38	(2.3)	26	(1.7)	16	(1.3)
You had opportunities to examine classroom artifacts (e.g., student work samples)	11	(1.8)	18	(2.0)	34	(1.9)	24	(1.9)	12	(1.3)
The professional development was a waste of your time	48	(2.4)	23	(1.8)	21	(2.0)	5	(0.7)	2	(0.6)

† Includes professional development focused on mathematics or mathematics teaching.
‡ Only high school teachers indicating that they participated in professional development in the last three years are included in this analysis.

College courses have the potential to address content in more depth than may be possible in other professional development venues, such as workshops. As an indicator of teachers staying relevant in their field, the survey asked teachers when they last took a college course in science/mathematics and in the teaching of science/mathematics. As can be seen in Table 75, 52 percent of elementary science teachers, 39 percent at the middle school level, and 31 percent at the high school level have not taken a course for college credit in either science or the teaching of science in the last 10 years, including a handful of teachers who indicated they have never had coursework in these areas. In mathematics, 45 percent of elementary teachers, 37 percent of middle grades teachers, and 41 percent of high school teachers have not taken coursework in mathematics or the teaching of mathematics in the last 10 years (see Table 76).

Table 75
Science Teachers' Most Recent
College Coursework in Field, by Grade Range

	Percent of Teachers		
	Elementary	**Middle**	**High**
Science			
In the last 3 years	8 (0.9)	22 (2.4)	24 (1.2)
4–6 years ago	17 (1.6)	14 (1.4)	19 (1.1)
7–10 years ago	17 (1.4)	19 (2.1)	18 (1.2)
More than 10 years ago	57 (2.0)	44 (2.7)	38 (1.2)
Never	1 (0.3)	1 (0.5)	1 (0.5)
The Teaching of Science			
In the last 3 years	11 (1.1)	21 (2.1)	25 (1.4)
4–6 years ago	15 (1.5)	14 (1.3)	16 (1.1)
7–10 years ago	14 (1.4)	16 (1.8)	14 (1.1)
More than 10 years ago	49 (1.9)	38 (2.6)	29 (1.2)
Never	11 (1.1)	11 (1.7)	16 (1.4)
Science or the Teaching of Science			
In the last 3 years	12 (1.2)	27 (2.6)	33 (1.4)
4–6 years ago	19 (1.5)	16 (1.5)	19 (1.0)
7–10 years ago	16 (1.4)	17 (2.0)	16 (1.1)
More than 10 years ago	52 (2.0)	39 (2.8)	31 (1.2)
Never	1 (0.3)	1 (0.5)	1 (0.5)

Table 76
Mathematics Teachers' Most Recent
College Coursework in Field, by Grade Range

	Percent of Teachers					
	Elementary		Middle		High	
Mathematics						
In the last 3 years	12	(1.1)	19	(1.4)	18	(1.1)
4–6 years ago	17	(1.4)	20	(1.5)	19	(1.1)
7–10 years ago	20	(1.3)	18	(1.6)	15	(1.0)
More than 10 years ago	50	(1.7)	43	(1.8)	48	(1.8)
Never	1	(0.3)	1	(0.4)	0	(0.1)
The Teaching of Mathematics						
In the last 3 years	14	(1.3)	19	(1.5)	20	(1.1)
4–6 years ago	17	(1.4)	17	(1.4)	15	(1.0)
7–10 years ago	18	(1.2)	16	(1.5)	13	(0.9)
More than 10 years ago	46	(1.7)	35	(2.2)	40	(1.5)
Never	5	(0.7)	13	(1.7)	13	(1.6)
Mathematics or the Teaching of Mathematics						
In the last 3 years	16	(1.4)	23	(1.6)	26	(1.3)
4–6 years ago	19	(1.3)	22	(1.6)	19	(1.1)
7–10 years ago	19	(1.4)	17	(1.6)	14	(1.0)
More than 10 years ago	45	(1.8)	37	(1.9)	41	(1.7)
Never	1	(0.3)	1	(0.4)	0	(0.1)

Finally, teachers were asked to what extent their growth opportunities, including both professional development and coursework, emphasized a number of areas. There are a number of interesting findings in science (see Tables 77–79). For example, despite their self-reported lack of content preparation in science, deepening their science content knowledge has not been a heavy emphasis (defined as a rating of 4 or 5) for elementary teachers. Across the grade bands, planning differentiated instruction is a relatively common emphasis. In addition, assessing student understanding during or at the end of instruction tends to receive more emphasis at all three grade ranges.

Table 77
Extent to which Elementary School Science Teachers' Professional Development/Coursework in the Last Three Years Emphasized Various Areas

	Percent of Teachers†									
	Not at All				Somewhat				To a Great Extent	
	1		2		3		4		5	
Implementing the science textbook/module to be used in your classroom	21	(2.3)	14	(2.3)	25	(3.3)	22	(2.7)	18	(2.4)
Planning instruction so students at different levels of achievement can increase their understanding of the ideas targeted in each activity	9	(2.0)	14	(2.5)	29	(2.6)	31	(3.0)	16	(2.1)
Assessing student understanding at the conclusion of instruction on a topic	8	(1.8)	12	(1.8)	33	(2.7)	31	(2.5)	16	(2.6)
Monitoring student understanding during science instruction	9	(1.8)	13	(2.1)	33	(2.7)	29	(2.5)	16	(2.5)
Finding out what students think or already know about the key science ideas prior to instruction on those ideas	12	(2.2)	12	(2.0)	35	(2.9)	29	(2.9)	12	(2.1)
Deepening your own science content knowledge	9	(1.7)	11	(2.0)	43	(3.0)	26	(2.5)	11	(2.0)
Providing enrichment experiences for gifted students	21	(2.4)	19	(2.4)	28	(2.4)	22	(2.4)	10	(1.8)
Teaching science to English-language learners	38	(2.8)	20	(2.2)	22	(2.5)	12	(2.0)	9	(1.6)
Learning how to use hands-on activities/manipulatives for science instruction	19	(2.4)	15	(2.2)	35	(3.1)	25	(2.4)	6	(1.3)
Providing alternative science learning experiences for students with special needs	28	(2.8)	21	(2.5)	29	(2.7)	17	(2.4)	5	(1.3)

† Only elementary school teachers indicating that they participated in professional development or that they took a college course in "Science" or "How to teach science" in the last three years are included in this analysis.

Table 78
Extent to which Middle School Science Teachers' Professional Development/Coursework in the Last Three Years Emphasized Various Areas

	Percent of Teachers[†]									
	Not at All				Somewhat				To a Great Extent	
	1		2		3		4		5	
Planning instruction so students at different levels of achievement can increase their understanding of the ideas targeted in each activity	2	(0.7)	6	(1.8)	29	(3.6)	38	(3.9)	25	(3.0)
Monitoring student understanding during science instruction	5	(1.4)	14	(3.3)	27	(2.6)	33	(3.1)	21	(2.5)
Deepening your own science content knowledge	6	(1.7)	14	(3.2)	29	(3.9)	32	(4.1)	19	(2.5)
Assessing student understanding at the conclusion of instruction on a topic	3	(1.1)	13	(3.1)	29	(3.6)	37	(3.2)	17	(2.2)
Finding out what students think or already know about the key science ideas prior to instruction on those ideas	4	(0.9)	12	(2.7)	38	(3.8)	31	(3.2)	15	(2.3)
Learning how to use hands-on activities/manipulatives for science instruction	7	(2.0)	18	(3.7)	32	(3.3)	29	(2.8)	14	(1.8)
Implementing the science textbook/module to be used in your classroom	17	(2.6)	23	(3.2)	30	(3.4)	17	(2.1)	14	(2.4)
Providing enrichment experiences for gifted students	15	(3.3)	26	(3.7)	29	(3.9)	20	(2.7)	10	(1.2)
Providing alternative science learning experiences for students with special needs	15	(2.5)	27	(3.9)	31	(3.8)	16	(1.9)	9	(1.7)
Teaching science to English-language learners	44	(3.9)	20	(2.6)	19	(3.2)	12	(2.0)	6	(1.3)

[†] Only middle school teachers indicating that they participated in professional development or that they took a college course in "Science" or "How to teach science" in the last three years are included in this analysis.

Table 79
Extent to which High School Science Teachers' Professional Development/Coursework in the Last Three Years Emphasized Various Areas

	Percent of Teachers[†]									
	Not at All				Somewhat				To a Great Extent	
	1		2		3		4		5	
Assessing student understanding at the conclusion of instruction on a topic	7	(1.1)	7	(0.9)	29	(1.8)	32	(1.8)	26	(2.1)
Planning instruction so students at different levels of achievement can increase their understanding of the ideas targeted in each activity	5	(1.1)	11	(1.8)	29	(1.5)	32	(1.9)	24	(1.9)
Deepening your own science content knowledge	11	(1.5)	12	(1.4)	29	(2.0)	24	(1.7)	24	(1.8)
Monitoring student understanding during science instruction	9	(2.0)	11	(1.3)	26	(1.8)	33	(2.4)	22	(1.9)
Learning how to use hands-on activities/ manipulatives for science instruction	7	(2.0)	13	(1.5)	31	(2.2)	32	(2.2)	18	(1.9)
Finding out what students think or already know about the key science ideas prior to instruction on those ideas	9	(2.0)	15	(1.5)	33	(2.1)	29	(2.0)	15	(1.7)
Implementing the science textbook/module to be used in your classroom	24	(1.7)	20	(1.6)	27	(1.8)	17	(1.6)	12	(1.4)
Providing enrichment experiences for gifted students	21	(2.3)	18	(1.8)	29	(2.1)	22	(2.0)	11	(1.3)
Providing alternative science learning experiences for students with special needs	23	(2.2)	22	(1.7)	27	(2.0)	20	(1.9)	9	(1.2)
Teaching science to English-language learners	43	(2.5)	23	(1.9)	16	(1.7)	11	(1.5)	7	(1.0)

† Only high school teachers indicating that they participated in professional development or that they took a college course in "Science" or "How to teach science" in the last three years are included in this analysis.

Tables 80–82 contain comparable data for mathematics. A large proportion of mathematics teachers, especially at the elementary level, report that their professional growth opportunities in the last three years had a heavy emphasis on learning how to use hands-on activities/ manipulatives. Other areas with a relatively heavy emphasis across the grade ranges included planning instruction so students at different levels of achievement can increase their understanding of targeted ideas, learning about difficulties that students may have with particular ideas and procedures, monitoring student understanding during instruction, and assessing student understanding at the end of instruction on a topic.

Table 80
Extent to which Elementary School Mathematics Teachers' Professional Development/Coursework in the Last Three Years Emphasized Various Areas

	Percent of Teachers†									
	Not at All				Somewhat				To a Great Extent	
	1		2		3		4		5	
Learning how to use hands-on activities/ manipulatives for mathematics instruction	1	(0.6)	2	(0.9)	16	(2.0)	40	(2.6)	40	(2.6)
Implementing the mathematics textbook/ program to be used in your classroom	10	(1.9)	10	(1.5)	25	(2.3)	30	(2.3)	25	(2.6)
Monitoring student understanding during mathematics instruction	3	(0.9)	8	(1.5)	33	(2.4)	33	(2.3)	24	(2.4)
Planning instruction so students at different levels of achievement can increase their understanding of the ideas targeted in each activity	3	(0.9)	8	(1.4)	30	(2.4)	36	(2.5)	23	(2.4)
Assessing student understanding at the conclusion of instruction on a topic	3	(1.0)	9	(1.4)	29	(2.3)	38	(2.7)	20	(2.2)
Deepening your own mathematics content knowledge	10	(1.5)	11	(1.3)	36	(2.5)	26	(2.3)	17	(1.7)
Learning about difficulties that students may have with particular mathematical ideas and procedures	4	(1.1)	12	(1.7)	35	(2.5)	32	(2.6)	16	(2.2)
Finding out what students think or already know about the key mathematical ideas prior to instruction on those ideas	5	(1.1)	15	(1.5)	38	(2.3)	31	(2.3)	11	(1.8)
Providing enrichment experiences for gifted students	13	(1.8)	22	(2.2)	29	(2.4)	26	(2.5)	11	(1.7)
Providing alternative mathematics learning experiences for students with special needs	11	(1.7)	24	(2.3)	31	(2.6)	23	(2.2)	10	(1.5)
Teaching mathematics to English-language learners	33	(3.0)	23	(2.4)	24	(2.3)	13	(1.7)	7	(1.6)

† Only elementary schoolteachers indicating that they participated in professional development or that they took a college course in "Mathematics" or "How to teach mathematics" in the last three years are included in this analysis.

Table 81
Extent to which Middle School Mathematics Teachers' Professional Development/Coursework in the Last Three Years Emphasized Various Areas

	Percent of Teachers†									
	Not at All				Somewhat				To a Great Extent	
	1		2		3		4		5	
Learning how to use hands-on activities/ manipulatives for mathematics instruction	2	(0.6)	5	(1.0)	25	(3.2)	38	(3.0)	29	(3.1)
Planning instruction so students at different levels of achievement can increase their understanding of the ideas targeted in each activity	3	(1.0)	7	(1.5)	25	(3.1)	40	(3.1)	24	(2.9)
Assessing student understanding at the conclusion of instruction on a topic	5	(1.1)	12	(2.3)	27	(3.4)	37	(3.4)	20	(2.4)
Monitoring student understanding during mathematics instruction	5	(1.3)	9	(1.9)	32	(3.2)	34	(3.2)	20	(2.5)
Implementing the mathematics textbook/ program to be used in your classroom	21	(2.6)	18	(2.0)	23	(2.8)	20	(2.5)	19	(2.9)
Learning about difficulties that students may have with particular mathematical ideas and procedures	5	(1.2)	10	(1.7)	34	(3.2)	34	(2.8)	17	(2.1)
Deepening your own mathematics content knowledge	14	(2.6)	11	(1.6)	31	(3.5)	26	(2.9)	17	(2.3)
Providing alternative mathematics learning experiences for students with special needs	14	(2.1)	19	(2.8)	28	(2.5)	25	(3.0)	14	(2.0)
Providing enrichment experiences for gifted students	15	(2.4)	23	(2.5)	32	(2.8)	19	(2.4)	12	(2.3)
Finding out what students think or already know about the key mathematical ideas prior to instruction on those ideas	7	(1.9)	18	(2.6)	38	(3.5)	26	(3.0)	11	(2.0)
Teaching mathematics to English-language learners	39	(3.3)	23	(2.8)	19	(2.4)	12	(1.7)	8	(1.5)

† Only middle school teachers indicating that they participated in professional development or that they took a college course in "Mathematics" or "How to teach mathematics" in the last three years are included in this analysis.

Table 82
Extent to which High School Mathematics Teachers' Professional Development/Coursework in the Last Three Years Emphasized Various Areas

	Percent of Teachers†									
	Not at All				Somewhat				To a Great Extent	
	1		2		3		4		5	
Learning how to use hands-on activities/ manipulatives for mathematics instruction	6	(0.9)	9	(1.3)	30	(2.1)	33	(2.0)	23	(1.8)
Planning instruction so students at different levels of achievement can increase their understanding of the ideas targeted in each activity	6	(0.9)	10	(1.1)	31	(2.1)	36	(2.2)	18	(1.5)
Monitoring student understanding during mathematics instruction	5	(0.8)	13	(1.3)	33	(1.7)	34	(1.9)	15	(1.3)
Deepening your own mathematics content knowledge	15	(1.4)	15	(1.5)	36	(2.1)	19	(1.5)	15	(1.5)
Assessing student understanding at the conclusion of instruction on a topic	7	(1.3)	12	(1.6)	32	(1.6)	35	(2.2)	14	(1.5)
Learning about difficulties that students may have with particular mathematical ideas and procedures	6	(0.9)	16	(1.7)	33	(2.0)	32	(2.1)	14	(1.5)
Implementing the mathematics textbook/ program to be used in your classroom	20	(1.9)	21	(1.8)	27	(1.7)	21	(1.8)	11	(1.1)
Finding out what students think or already know about the key mathematical ideas prior to instruction on those ideas	9	(1.3)	21	(1.4)	38	(1.8)	24	(1.6)	8	(1.1)
Providing alternative mathematics learning experiences for students with special needs	16	(1.3)	25	(1.5)	29	(1.6)	22	(1.7)	8	(1.1)
Providing enrichment experiences for gifted students	22	(1.8)	28	(2.0)	29	(2.0)	15	(1.5)	6	(1.2)
Teaching mathematics to English-language learners	42	(2.0)	23	(1.6)	17	(1.7)	13	(1.6)	4	(0.6)

† Only high school teachers indicating that they participated in professional development or that they took a college course in "Mathematics" or "How to teach mathematics" in the last three years are included in this analysis.

Data Collection Considerations

The challenges associated with collecting data about teachers' professional development experiences are similar to those associated with classroom instruction. Questionnaire methodology is a cost-efficient method for collecting data at a large scale about well-operationalized constructs for which a common vocabulary exists in the target population. For professional development, the implications are that features such as number of hours, topics addressed, and types of activities can be easily and accurately measured. Data about the quality of professional development, other than teachers' perceptions of the quality, are not currently measurable with validity via questionnaires. Clearly, this is another area ripe for research.

In addition, although the 2012 NSSME collected a great deal of information about teachers' professional development opportunities, the study only touched upon their experiences with PLCs and coaching. However, this limitation was largely due to response burden considerations;

items like those asked on the program questionnaire should be easily modifiable to collect data about an individual teacher's experiences, including aspects such as their extent of participation and characteristics of the meetings.

SUMMARY

The 2012 National Survey of Science and Mathematics Education provides high-quality, nationally representative data that can be used to inform several of the indicators for monitoring the status of K–12 STEM education. For example, the 2012 NSSME offers reliable data on the amount of instructional time allotted to science in grades K–5 (Indicator 2). The survey also collected data about a number of science-related learning opportunities in elementary schools (Indicator 3). For indicator 4, the 2012 NSSME collected data about the instructional materials used by science and mathematics teachers, identifying the most commonly used textbooks/ programs in each subject and grade range. Although the 2012 NSSME did not directly measure science and mathematics teachers' content knowledge for teaching (Indicator 6), it did include a number of proxy measures such as college degrees, college courses taken, and teachers' perceived preparedness to teach particular topics. In addition, the NSSME collected extensive information about teachers' STEM-specific professional development opportunities (Indicator 7).

There are aspects of the indicators, however, for which the 2012 NSSME does not provide complete data, in some cases because no individual survey can collect all data, and in some cases because additional research on how to measure the indicator is needed. For example collecting accurate information regarding STEM schools and programs (Indicator 1) will be challenging until a widely accepted definition of what constitutes a STEM school/program is established. The 2012 NSSME found that coordinators at participating schools were confused about what constitutes a STEM-focused school. To fully address Indicator 4, the instructional materials identified by the 2012 NSSME would need to be analyzed to determine the extent to which they embody the content and practices described in the CCSSM/Framework. For Indicator 5, the NSSME was not designed to collect data specifically on classroom coverage of content and practices in the CCSSM/Framework, due in part to response burden and in part because cognitive interviews with teachers found that they interpreted items about the practices in diverse ways. Other surveys, designed specifically to collect data about content coverage, are better suited to provide information about this indicator.

Lessons from the 2012 NSSME also highlight a number of challenges in creating a system for monitoring the status of the nation's K–12 STEM education system. One is the balance between collecting meaningful, complete data versus response burden; it is unlikely that a single data collection event will be able to fully address the indicators. Another is that measuring aspects of a complex system is inherently messy, and there may be diminishing returns in terms of precision when refining data collection methodology. For example, additional data could be collected to gain a more precise estimate of the amount of instructional time devoted to science in grades K–5. However, the added cost and burden required will likely not be proportional to the improvement in data. Finally, the 2012 NSSME has helped identify gaps in what types of information are being gathered with existing survey methodology, pointing to a number of areas, such as the implementation of the practices in classrooms, in which further research and development will be needed to create valid new measures.

APPENDIX

Survey Questionnaires

School Coordinator Questionnaire

Science Program Questionnaire

Mathematics Program Questionnaire

Science Teacher Questionnaire

Mathematics Teacher Questionnaire

2012 National Survey of Science and Mathematics Education
School Coordinator Questionnaire

If you make a mistake while completing the web-based questionnaire and are unable to correct it, please email Kiira Campbell at nssme@horizon-research.com or call her toll-free at 877-297-6829.

1. How many students are currently enrolled in each of the following grades in your school?

	Number of Students
Pre-Kindergarten	
Kindergarten	
1st grade	
2nd grade	
3rd grade	
4th grade	
5th grade	
6th grade	
7th grade	
8th grade	
9th grade	
10th grade	
11th grade	
12th grade	
Ungraded	

2. Please indicate the number of students in this school in each of the following categories: (Please count each student only once.)

	Number of Students
American Indian or Alaska Native	
Asian	
Black or African American	
Hispanic/Latino	
Native Hawaiian or Other Pacific Islander	
White	
Two or more races	

3. How many…

	Number
a. students in your school are eligible for free or reduced-price lunch?	
b. students in this school have an Individualized Education Plan (IEP)?	
c. students in your school receive special education services for learning disabilities?	
d. students in your school are classified as English-language learners?	
e. languages other than English are spoken by families of students in this school?	

4. ***[Presented only to public schools]***

Which of the following best describes your school?

○	A regular school (not including magnet or charter school) ***[Skip to Q7]***
○	A charter school (a school that is in accordance with an enabling state statute, has been granted a charter exempting it from selected state or local rules and regulations)
○	A special program school or magnet school (such as a foreign language immersion school)

5. ***[Presented only to public schools]***

Does your school have a special focus on one or more of the STEM fields: science, technology, engineering, mathematics?

○	Yes
○	No ***[Skip to Q7]***

6. ***[Presented only to public schools]***

On which of the following is your school's special program or magnet focused? [Select all that apply.]

□	Engineering.
□	Mathematics.
□	Science, including health professions.
□	Technology, including Tech Prep.

7. Does your school use block scheduling (class periods scheduled to create extended blocks of instructional time) to organize most classes?

○	Yes
○	No

8. Does your school have one or more computer labs?

○	Yes
○	No ***[Skip to Q10]***

9. How many computers are in the computer lab(s) (do not include computers that do not work)? (If there is more than one lab, enter the total across all labs. Do not include computers that do not work.)

1–5	6–10	11 – 15	16–20	21–25	26–30	31+
○	○	○	○	○	○	○

10. Does your school have… [Select one on each row.]

	Yes	**No**
a. laptop carts available for teachers to use with their classes?	○	○
b. Wi-Fi?	○	○

Thank You!

2012 National Survey of Science and Mathematics Education
Science Program Questionnaire

This questionnaire asks a number of questions about "science teachers." In responding, unless otherwise specified, consider ALL teachers of science in your school, including self-contained teachers who teach science and other subjects to the same group of students.

1. Which of the following describe your position? [Select all that apply.]

□	Science department chair
□	Science lead teacher or coach
□	Regular classroom teacher
□	Principal
□	Assistant principal
□	Other (please specify: _______________)

School Programs and Practices

2. ***[Presented only to schools that include self-contained teachers]***

Indicate whether each of the following programs and/or practices is currently being implemented in your school. [Select one on each row.]

	Yes	No
a. Students in self-contained classes receive science instruction from a science specialist *instead of* their regular teacher.	○	○
b. Students in self-contained classes receive science instruction from a science specialist *in addition* to their regular teacher.	○	○
c. Students in self-contained classes pulled out for remedial instruction in science.	○	○
d. Students in self-contained classes pulled out for enrichment in science.	○	○
e. Students in self-contained classes pulled out from science instruction for additional instruction in other content areas.	○	○

3. ***[Presented only to schools that include any grades 9–12]***

Indicate whether each of the following programs and/or practices is currently being implemented in your school. [Select one on each row.]

	Yes	No
a. Physics courses offered this school year or in alternating years, on or off site	○	○
b. Students go to a Career and Technical Education (CTE) Center for science and/or engineering instruction.	○	○
c. Science and/or engineering courses offered by telecommunications.	○	○
d. Students go to another K–12 school for science and/or engineering courses.	○	○
e. Students go to a college or university for science and/or engineering courses.	○	○

4. Which of the following are provided to teachers considered in need of special assistance in science teaching (for example: new teachers)? [Select all that apply.]

□	Seminars, classes, and/or study groups
□	Guidance from a formally designated mentor or coach
□	A higher level of supervision than for other teachers

5. Indicate whether your school does each of the following to enhance students' interest and/or achievement in science and/or engineering. [Select one on each row.]

	Yes	No
a. Holds family science and/or engineering nights	○	○
b. Offers after-school help in science and/or engineering (for example: tutoring)	○	○
c. Offers formal after-school programs for enrichment in science and/or engineering	○	○
d. Offers one or more science clubs	○	○
e. Offers one or more engineering clubs	○	○
f. Participates in a local or regional science and/or engineering fair	○	○
g. Has one or more teams participating in science competitions (for example: Science Olympiad)	○	○
h. Has one or more teams participating in engineering competitions (for example: Robotics)	○	○
i. Encourages students to participate in science and/or engineering summer programs or camps offered by community colleges, universities, museums, or science centers	○	○
j. Sponsors visits to business, industry, and/or research sites related to science and/or engineering	○	○
k. Sponsors meetings with adult mentors who work in science and/or engineering fields	○	○

Your State Standards

6. Please provide your opinion about each of the following statements in regard to your current state standards for science. [Select one on each row.]

	Strongly Disagree	Disagree	No Opinion	Agree	Strongly Agree
a. State science standards have been thoroughly discussed by science teachers in this school	①	②	③	④	⑤
b. There is a school-wide effort to align science instruction with the state science standards	①	②	③	④	⑤
c. Most science teachers in this school teach to the state standards	①	②	③	④	⑤
d. Your district/diocese organizes science professional development based on state standards ***[Not presented to non-Catholic private schools]***	①	②	③	④	⑤

Science Courses Offered in Your School

7. ***[Presented only to schools that include grade 6]***
What types of science courses are offered to 6th grade classes in your school?

○	Single-discipline science courses (for example: life science)
○	Coordinated or Integrated science courses
○	Both single-discipline and coordinated or integrated science courses

8. ***[Presented only to schools that include grade 7]***
What types of science courses are offered to 7^{th} grade classes in your school?

○	Single-discipline science courses (for example: life science)
○	Coordinated or Integrated science courses
○	Both single-discipline and coordinated or integrated science courses

9. ***[Presented only to schools that include grade 8]***
What types of science courses are offered to 8^{th} grade classes in your school?

○	Single-discipline science courses (for example: life science)
○	Coordinated or Integrated science courses
○	Both single-discipline and coordinated or integrated science courses

10. ***[Presented only to schools that include any grades 9–12]***
Approximately how many grades 9–12 students in this school will **not** take a science course this year? [Enter your response as a whole number (for example: 1500); do not use a comma.]

____

Science Courses Offered in Your School

[Questions 11–27 presented only to schools that include any grades 9–12; schools that do not include any of these grades skip to Q31]

This next set of questions asks about the number of sections and level of science courses offered in grades 9–12 in your school this year in each of the following categories:

- Coordinated or Integrated Science (including General Science and Physical Science)
- Earth/Space Science
- Life Sciences/Biology
- Environmental Science/Ecology (as a separate course)
- Chemistry
- Physics
- Engineering

11. Does your school offer one or more courses in Coordinated or Integrated science (including General Science and Physical Science) this school year in any of the grades 9–12?

○	Yes
○	No ***[Skip to Q13]***

12. How many sections of Coordinated or Integrated science courses (including General Science and Physical Science) are offered in your school this year at each of the following levels? [Enter each response as a whole number (for example: 15).]

a. Non-college prep ______
b. College prep, including honors ______

13. Does your school offer one or more courses in Earth/Space Science this school year in any of the grades 9–12?

○	Yes
○	No ***[Skip to Q15]***

14. How many sections of Earth/Space Science courses are offered in your school this year at each of the following levels? [Enter each response as a whole number (for example: 15).]

a. Non-college prep ______
b. 1st year college prep, including honors ______
c. 2nd year advanced, including Advanced Placement, International Baccalaureate, and concurrent college and high school credit/dual enrollment courses _____

15. Does your school offer one or more courses in Life Science/Biology this school year in any of the grades 9–12?

○	Yes
○	No ***[Skip to Q17]***

16. How many sections of Life Science/Biology courses are offered in your school this year at each of the following levels? [Enter each response as a whole number (for example: 15).]

a. Non-college prep ______
b. 1st year college prep, including honors _____
c. 2nd year advanced, including Advanced Placement, International Baccalaureate, and concurrent college and high school credit/dual enrollment courses _____

17. Does your school offer one or more courses in Environmental Science/Ecology this school year in any of the grades 9–12?

○	Yes
○	No ***[Skip to Q19]***

18. How many sections of Environmental Science/Ecology courses are offered in your school this year at each of the following levels? [Enter each response as a whole number (for example: 15).]

a. Non-college prep ______
b. 1st year college prep, including honors ______
c. 2nd year advanced, including Advanced Placement, International Baccalaureate, and concurrent college and high school credit/dual enrollment courses _____

19. Does your school offer one or more courses in Chemistry this school year in any of the grades 9–12?

○	Yes
○	No ***[Skip to Q21]***

20. How many sections of Chemistry courses are offered in your school this year at each of the following levels? [Enter each response as a whole number (for example: 15).]

a. Non-college prep ______
b. 1st year college prep, including honors ______
c. 2nd year advanced, including Advanced Placement, International Baccalaureate, and concurrent college and high school credit/dual enrollment courses _____

21. Does your school offer one or more courses in Physics this school year in any of the grades 9–12?

○	Yes
○	No ***[Skip to Q23]***

22. How many sections of Physics courses are offered in your school this year at each of the following levels? [Enter each response as a whole number (for example: 15).]

a. Non-college prep ______
b. 1st year college prep, including honors ______
c. 2nd year advanced, including Advanced Placement, International Baccalaureate, and concurrent college and high school credit/dual enrollment courses ____

23. Does your school offer one or more courses in Engineering this school year in any of the grades 9–12? Count courses that address such things as the nature of engineering, engineering design processes, technological systems, and technology and society. Do not include career-technical education (CTE) courses that cover such things as automotive repair, audio/video production, etc.

○	Yes
○	No ***[Skip to Q25]***

24. How many sections of Engineering courses are offered in your school this year at each of the following levels? [Enter each response as a whole number (for example: 15).]

a. Non-college prep ______
b. 1st year college prep, including honors ______
c. 2nd year advanced, including concurrent college and high school credit/dual enrollment courses _____

25. Does your school offer each of the following types of science courses that might qualify for college credit? (Include both courses that are offered every year and those offered in alternating years.) [Select one on each row.]

	Yes	**No**
a. Advanced Placement (AP) science courses	○	○
b. International Baccalaureate (IB) science courses	○	○
c. Concurrent college and high school credit/dual enrollment science courses	○	○

26. ***[Presented only to schools that answered "Yes" to Q25c]***
When are concurrent college and high school credit/dual enrollment science courses offered in this school?

○	Not offered this school year, but offered in alternating years
○	Offered this school year

27. ***[Q27a–e presented only to schools that answered "Yes" to Q25a; Q27f–h presented only to schools that answered "Yes" to Q25b]***
Is each of the following science courses offered in this school? [Select one on each row.]

	Not offered at all	Not offered this school year, but offered in alternating years	Offered this school year
a. AP Biology	○	○	○
b. AP Chemistry	○	○	○
c. AP Physics B	○	○	○
d. AP Physics C	○	○	○
e. AP Environmental Science	○	○	○
f. IB Biology	○	○	○
g. IB Chemistry	○	○	○
h. IB Physics	○	○	○

Science Requirements

28. ***[Presented only to schools that include grade 12]***
In order to graduate from this high school, how many years of grades 9–12 science are students required to take?

1 year	2 years	3 years	4 years
○	○	○	○

29. ***[Presented only to schools that include grade 12 and answered "Yes" to Q23]***
Does participation in Engineering courses count towards students' high school graduation requirements for science?

○	Yes
○	No

30. ***[Presented only to schools that include grade 12]***
How many years of science are required for entry into a four-year college or university in your state university system? If your state university system has multiple tiers, answer for the lowest tier that awards four-year degrees, not including community colleges that might include four-year programs.

1 year	2 years	3 years	4 years
○	○	○	○

Budget for Science Instruction

31. For this school, how much money was spent on each of the following during the most recently completed budget year? (If you don't know the exact amounts, please provide your best estimates.) [Enter each response as a whole dollar amount (for example: 1500); do not include commas or dollar signs.]

a. Consumable science supplies (for example: chemicals, living organisms, batteries) __________
b. Science equipment (non-consumable, non-perishable items such as microscopes, scales, etc., but not computers) __________
c. Software for science instruction __________

Influences on Science Instruction

32. Please rate the effect of each of the following on the quality of science instruction in your school. [Select one on each row.]

	Inhibits effective instruction		Neutral or mixed		Promotes effective instruction	N/A or Don't Know
a. District/Diocese science professional development policies and practices ***[Not presented to non-Catholic private schools]***	①	②	③	④	⑤	○
b. Time provided for teacher professional development in science	①	②	③	④	⑤	○
c. Importance that the school places on science	①	②	③	④	⑤	○
d. Public attitudes toward science instruction	①	②	③	④	⑤	○
e. Conflict between efforts to improve science instruction and other school and/or district/diocese initiatives	①	②	③	④	⑤	○
f. How science instructional resources are managed (for example: distributing and refurbishing materials)	①	②	③	④	⑤	○

33. In your opinion, how great a problem is each of the following for science instruction **in your school as a whole**? [Select one on each row.]

	Not a significant problem	Somewhat of a problem	Serious problem
a. Lack of science facilities (for example: lab tables, electric outlets, faucets and sinks in classrooms)	○	○	○
b. Inadequate funds for purchasing science equipment and supplies	○	○	○
c. Inadequate supply of science textbooks/modules	○	○	○
d. Inadequate materials for individualizing science instruction	○	○	○
e. Low student interest in science	○	○	○
f. Low student reading abilities	○	○	○
g. Lack of teacher interest in science	○	○	○
h. Inadequate teacher preparation to teach science	○	○	○
i. Insufficient time to teach science	○	○	○
j. Lack of opportunities for science teachers to share ideas	○	○	○
k. Inadequate science-related professional development opportunities	○	○	○
l. Interruptions for announcements, assemblies, and other school activities	○	○	○
m. Large class sizes	○	○	○
n. High student absenteeism	○	○	○
o. Inappropriate student behavior	○	○	○
p. Lack of parental support for science education	○	○	○
q. Community resistance to the teaching of "controversial" issues in science (for example: evolution, climate change)	○	○	○

Science Teacher Turnover

34. ***[Presented only to schools that include any grades 6–12]***

How many middle and/or high school science teachers who taught in your school last year (2010–11) did not return to teach science in your school this year (2011–12)? [Enter your response as a whole number (for example: 15). Please enter "0" if all teachers who taught science returned this school year.] __________ ***[If "0" Skip to Q36]***

35. ***[Presented only to schools that include any grades 6–12]***

How many of those teachers did not return for each of the following reasons? [Enter each response as a whole number (for example: 15). Please enter "0" for categories in which there were not any science teachers who did not return for that reason.]

a. Left voluntarily, including science teachers who moved to another department or school, left the profession, or retired __________
b. Were reassigned to another position, department, or school in the district/diocese __________
c. Were dismissed or not rehired for poor performance ________
d. Were dismissed or not rehired because of budget constraints __________

36. ***[Presented only to schools that include any grades 6–12]***

For the 2011–12 school year, how difficult was it to fill middle and/or high school science teacher vacancies in your school with fully qualified teachers?

○	There were no vacancies for science teachers ***[Skip to Q39]***
○	Easy
○	Somewhat difficult
○	Very difficult
○	Could not fill the vacancies

37. ***[Presented only to schools that include any grades 9–12]***

For the 2011–12 school year, were there particular science disciplines for which it was more difficult to fill vacancies with fully qualified teachers than others?

○	Yes
○	No ***[Skip to Q39]***

38. ***[Presented only to schools that include any grades 9–12]***

For the 2011–12 school year, how difficult was it to fill vacancies with fully qualified teachers of: [Select one on each row.]

	There were no vacancies for this discipline	Easy	Somewhat difficult	Very difficult	Could not fill the vacancies
a. Biology/Life science?	○	○	○	○	○
b. Chemistry?	○	○	○	○	○
c. Earth/Space science?	○	○	○	○	○
d. Physics?	○	○	○	○	○
e. A combination of science disciplines?	○	○	○	○	○

Science Professional Development Opportunities

39. This question is about in-service (professional development) programs offered by your school and/or district/diocese, possibly in conjunction with other organizations (for example: other school districts/dioceses, colleges or universities, museums, professional associations, commercial vendors).

In the last three years, has your school and/or district/diocese offered in-service **workshops** specifically focused on science or science teaching?

○	Yes
○	No ***[Skip to Q41]***

40. Please indicate the extent to which in-service **workshops** offered by your school and/or district/diocese **in the last three years** addressed deepening teacher understanding of each of the following: [Select one on each row.]

	Not at all		**Somewhat**		**To a great extent**
a. Science content	①	②	③	④	⑤
b. State science standards	①	②	③	④	⑤
c. How to use particular science instructional materials (for example: textbooks or modules)	①	②	③	④	⑤
d. How students think about various science ideas	①	②	③	④	⑤
e. How to monitor student understanding during science instruction	①	②	③	④	⑤
f. How to adapt science instruction to address student misconceptions	①	②	③	④	⑤
g. How to use technology in science instruction	①	②	③	④	⑤
h. How to use investigation-oriented science teaching strategies	①	②	③	④	⑤
i. How to teach science to students who are English language learners	①	②	③	④	⑤
j. How to provide alternative science learning experiences for students with special needs	①	②	③	④	⑤

41. In the last three years, has your school offered **teacher study groups** where teachers meet on a regular basis to discuss teaching and learning of science, and possibly other content areas as well (sometimes referred to as Professional Learning Communities, PLCs, or lesson study)?

○	Yes
○	No ***[Skip to Q53]***

42. ***[Presented only to schools that include any grades K–5]***
Are teachers of grades K-5 science classes required to participate in these science-focused **teacher study groups**?

○	Yes
○	No

43. ***[Presented only to schools that include any grades 6–8]***
Are teachers of grades 6-8 science classes required to participate in these science-focused **teacher study groups**?

○	Yes
○	No

44. ***[Presented only to schools that include any grades 9–12]***
Are teachers of grades 9-12 science classes required to participate in these science-focused **teacher study groups**?

○	Yes
○	No

45. Has your school specified a schedule for when these science-focused **teacher study groups** are expected to meet?

○	Yes
○	No ***[Skip to Q48]***

46. Over what period of time were these science-focused **teacher study groups** typically expected to meet?

○	The entire school year
○	One semester
○	Less than one semester

47. How often have these science-focused **teacher study groups** typically been expected to meet?

○	Less than once a month
○	Once a month
○	Twice a month
○	More than twice a month

48. Which of the following describe the typical science-focused **teacher study groups** in this school? [Select all that apply.]

□	Organized by grade level
□	Include teachers from multiple grade levels
□	Limited to teachers from this school
□	Include teachers from other schools in the district/diocese ***[Not presented to non-Catholic private schools]***
□	Include teachers from other schools outside of your district/diocese
□	Include school and/or district/diocese administrators
□	Include parents/guardians or other community members
□	Include higher education faculty or other “consultants”

49. Which of the following describe the typical science-focused **teacher study groups** in this school? [Select all that apply.]

□	Teachers engage in science investigations.
□	Teachers plan science lessons together.
□	Teachers analyze student science assessment results.
□	Teachers analyze classroom artifacts (for example: student work samples).
□	Teachers analyze science instructional materials (for example: textbooks or modules).

50. To what extent have these science-focused **teacher study groups** addressed deepening teacher understanding of each of the following? [Select one on each row.]

	Not at all		Somewhat		To a great extent
a. Science content	①	②	③	④	⑤
b. State science standards	①	②	③	④	⑤
c. How to use particular science instructional materials (for example: textbooks or modules)	①	②	③	④	⑤
d. How students think about various science ideas	①	②	③	④	⑤
e. How to monitor student understanding during science instruction	①	②	③	④	⑤
f. How to adapt science instruction to address student misconceptions	①	②	③	④	⑤
g. How to use technology in science instruction	①	②	③	④	⑤
h. How to use investigation-oriented science teaching strategies	①	②	③	④	⑤
i. How to teach science to students who are English language learners	①	②	③	④	⑤
j. How to provide alternative science learning experiences for students with special needs	①	②	③	④	⑤

51. Have there been designated leaders for these science-focused **teacher study groups**?

○	Yes
○	No ***[Skip to Q53]***

52. The designated leaders of these science-focused **teacher study groups** were from: [Select all that apply.]

□	This school
□	Elsewhere in this district/diocese ***[Not presented to non-Catholic private schools]***
□	College or University
□	External consultants
□	Other (please specify: ____________________)

53. Thinking about last school year, which of the following were used to provide teachers in this school with time for in-service (professional development) workshops/teacher study groups *that included a focus on science content and/or science instruction*, regardless of whether they were offered by your school and/or district/diocese? [Select all that apply.]

□	Early dismissal and/or late start for students
□	Professional days/teacher work days during the students' school year
□	Professional days/teacher work days before and/or after the students' school year
□	Common planning time for teachers
□	Substitute teachers to cover teachers' classes while they attend professional development
□	None of the above

54. Do any teachers in your school have access to one-on-one "coaching" focused on improving their science instruction?

○	Yes
○	No ***[Skip to End]***

55. ***[Presented only to schools that include any grades K–5]***
Are teachers of grades K-5 science classes required to receive one-on-one science-focused coaching?

○	Yes
○	No

56. ***[Presented only to schools that include any grades 6–8]***
Are teachers of grades 6-8 science classes required to receive one-on-one science-focused coaching?

○	Yes
○	No

57. ***[Presented only to schools that include any grades 9–12]***
Are teachers of grades 9-12 science classes required to receive one-on-one science-focused coaching?

○	Yes
○	No

58. To what extent is science-focused one-on-one coaching in your school provided by each of the following? [Select one on each row.]

	Not at all		**Somewhat**		**To a great extent**
a. The principal of your school	①	②	③	④	⑤
b. An assistant principal at your school	①	②	③	④	⑤
c. District/Diocese administrators including science supervisors/coordinators ***[Not presented to non-Catholic private schools]***	①	②	③	④	⑤
d. Teachers/coaches who do not have classroom teaching responsibilities	①	②	③	④	⑤
e. Teachers/coaches who have part-time classroom teaching responsibilities	①	②	③	④	⑤
f. Teachers/coaches who have full-time classroom teaching responsibilities	①	②	③	④	⑤

Thank you!

2012 National Survey of Science and Mathematics Education
Mathematics Program Questionnaire

This questionnaire asks a number of questions about "mathematics teachers." In responding, unless otherwise specified, consider ALL teachers of mathematics in your school, including self-contained teachers who teach mathematics and other subjects to the same group of students.

1. Which of the following describe your position? [Select all that apply.]

□	Mathematics department chair
□	Mathematics lead teacher or coach
□	Regular classroom teacher
□	Principal
□	Assistant principal
□	Other (please specify: _______________)

School Programs and Practices

2. ***[Presented only to schools that include self-contained teachers]***
Indicate whether each of the following programs and/or practices is currently being implemented in your school. [Select one on each row.]

		Yes	No
a.	Students in self-contained classes receive mathematics instruction from a mathematics specialist *instead of* their regular teacher.	○	○
b.	Students in self-contained classes receive mathematics instruction from a mathematics specialist *in addition* to their regular teacher.	○	○
c.	Students in self-contained classes pulled out for remedial instruction in mathematics.	○	○
d.	Students in self-contained classes pulled out for enrichment in mathematics.	○	○
e.	Students in self-contained classes pulled out from mathematics instruction for additional instruction in other content areas.	○	○

3. ***[Presented only to schools that include any grades 9–12]***
Indicate whether each of the following programs and/or practices is currently being implemented in your school. [Select one on each row.]

		Yes	No
a.	Algebra 1 course offered over two years or as two separate block courses (for example: Algebra A and Algebra B)	○	○
b.	Calculus courses (beyond pre-Calculus) offered this school year or in alternating years, on or off site	○	○
c.	Students go to a Career and Technical Education (CTE) Center for mathematics instruction	○	○
d.	Mathematics courses offered by telecommunications	○	○
e.	Students go to another K–12 school for mathematics courses	○	○
f.	Students go to a college or university for mathematics courses	○	○

4. Which of the following are provided to teachers considered in need of special assistance in mathematics teaching (for example: new teachers)? [Select all that apply.]

□	Seminars, classes, and/or study groups
□	Guidance from a formally designated mentor or coach
□	A higher level of supervision than for other teachers

5. Indicate whether your school does each of the following to enhance students' interest and/or achievement in mathematics. [Select one on each row.]

	Yes	**No**
a. Holds family math nights	○	○
b. Offers after-school help in mathematics (for example: tutoring)	○	○
c. Offers formal after-school programs for enrichment in mathematics	○	○
d. Offers one or more mathematics clubs	○	○
e. Participates in a local or regional mathematics fair	○	○
f. Has one or more teams participating in mathematics competitions (for example: Math Counts)	○	○
g. Encourages students to participate in mathematics summer programs or camps offered by community colleges, universities, museums or mathematics centers	○	○
h. Sponsors visits to business, industry, and/or research sites related to mathematics	○	○
i. Sponsors meetings with adult mentors who work in mathematics fields	○	○

Your State Standards

6. Please provide your opinion about each of the following statements in regard to your current state standards for mathematics. [Select one on each row.]

	Strongly Disagree	**Disagree**	**No Opinion**	**Agree**	**Strongly Agree**
a. State mathematics standards have been thoroughly discussed by mathematics teachers in this school	①	②	③	④	⑤
b. There is a school-wide effort to align mathematics instruction with the state mathematics standards	①	②	③	④	⑤
c. Most mathematics teachers in this school teach to the state standards	①	②	③	④	⑤
d. Your district/diocese organizes mathematics professional development based on state standards ***[Not presented to non-Catholic private schools]***	①	②	③	④	⑤

Student Enrollment in Mathematics Courses

7. ***[Presented only to schools that include grade 8]***
Approximately how many of this year's 8th grade students will have completed Algebra 1 prior to 9th grade? [Enter your response as a whole number (for example: 15).] ______________________

8. ***[Presented only to schools that include grade 8]***
Approximately how many of this year's 8th grade students will have completed Geometry prior to 9th grade? [Enter your response as a whole number (for example: 15).] ____________________

9. ***[Presented only to schools that include any grades 9–12]***
Approximately how many grades 9-12 students in this school will **not** take a mathematics course this year? [Enter your response as a whole number (for example: 1500); do not use a comma.]

____

Mathematics Courses Offered in Your School

[Questions 10–16 presented only to schools that include any grades 9–12; schools that do not include any of these grades skip to Q19]

10. What types of mathematics courses are offered in your school this year? [Select all that apply.]

□	Single-subject mathematics courses (for example: Algebra, Geometry)
□	Integrated mathematics courses

11. How many sections of courses in each of the following categories will be offered to grades 9-12 students in this school this year? [Enter each response as a whole number (for example: 15).]

	Number of sections
a. Non-college prep mathematics courses *Example courses*: Developmental Math; High School Arithmetic; Remedial Math; General Math; Vocational Math; Consumer Math; Basic Math; Business Math; Career Math; Practical Math; Essential Math; Pre-Algebra; Introductory Algebra; Algebra 1 Part 1; Algebra 1A; Math A; Basic Geometry; Informal Geometry; Practical Geometry	
b. Formal/College-prep Mathematics Level 1 courses *Example courses:* Algebra 1; Integrated Math 1; Unified Math I; Algebra 1 Part 2; Algebra 1B; Math B	
c. Formal/College-prep Mathematics Level 2 courses *Example courses:* Geometry; Plane Geometry; Solid Geometry; Integrated Math 2; Unified Math II; Math C	
d. Formal/College-prep Mathematics Level 3 courses *Example courses:* Algebra 2; Intermediate Algebra; Algebra and Trigonometry; Advanced Algebra; Integrated Math 3; Unified Math III	
e. Formal/College-prep Mathematics Level 4 courses *Example courses:* Algebra 3; Trigonometry; Pre-Calculus; Analytic/Advanced Geometry; Elementary Functions; Integrated Math 4, Unified Math IV; Calculus (not including college level/AP); any other College Prep Senior Math with Algebra 2 as a prerequisite	
f. Mathematics courses that might qualify for college credit *Example courses:* Advanced Placement Calculus (AB, BC); Advanced Placement Statistics; IB Mathematics standard level; IB Mathematics higher level; concurrent college and high school credit/dual enrollment	

12. Does this school offer one or more courses focused specifically on probability and/or statistics? (Include both courses that are offered every year and those offered in alternating years.)

○	Yes
○	No ***[Skip to Q14]***

13. What probability and/or statistics courses does this school offer? [Select all that apply.]

□	Probability and Statistics combined
□	Probability
□	Statistics

14. Does your school offer each of the following types of mathematics courses that might qualify for college credit? (Include both courses that are offered every year and those offered in alternating years.) [Select one on each row.]

	Yes	No
a. Advanced Placement (AP) mathematics courses	○	○
b. International Baccalaureate (IB) mathematics courses	○	○
c. Concurrent college and high school credit/dual enrollment mathematics courses	○	○

15. ***[Presented only to schools that answered "Yes" to Q14c]***
When are concurrent college and high school credit/dual enrollment mathematics courses offered in this school?

○	Not offered this school year, but offered in alternating years
○	Offered this school year

16. ***[Q16a–c presented only to schools that answered "Yes" to Q14a; Q16d–g presented only to schools that answered "Yes" to Q14b]***
Is each of the following mathematics courses offered in this school? [Select one on each row.]

	Not offered at all	Not offered this school year, but offered in alternating years	Offered this school year
a. AP Calculus AB	○	○	○
b. AP Calculus BC	○	○	○
c. AP Statistics	○	○	○
d. IB Mathematical studies standard level	○	○	○
e. IB Mathematics standard level	○	○	○
f. IB Mathematics higher level	○	○	○
g. IB Further mathematics standard level	○	○	○

Mathematics Requirements

17. ***[Presented only to schools that include grade 12]***
In order to graduate from this high school, how many years of grades 9–12 mathematics are students required to take?

1 year	2 years	3 years	4 years
○	○	○	○

18. ***[Presented only to schools that include grade 12]***
How many years of mathematics are required for entry into a four-year college or university in your state university system? If your state university system has multiple tiers, answer for the lowest tier that awards four-year degrees, not including community colleges that might include four-year programs.

1 year	2 years	3 years	4 years
○	○	○	○

Budget for Mathematics Instruction

19. For this school, how much money was spent on each of the following during the most recently completed budget year? (If you don't know the exact amount, please provide your best estimates.) [Enter each response as a whole dollar amount (for example: 1500); do not include commas or dollar signs.]

a. Consumable supplies for mathematics instruction (for example: graph paper) _____
b. Non-consumable items for mathematics instruction such as calculators, protractors, manipulatives, etc. (Do not include computers) _____
c. Software specific to mathematics instruction (for example: dynamic geometry software) _____

Influences on Mathematics Instruction

20. Please rate the effect of each of the following on the quality of mathematics instruction in your school. [Select one on each row.]

	Inhibits effective instruction		**Neutral or mixed**		**Promotes effective instruction**	**N/A or Don't Know**
a. District/Diocese mathematics professional development policies and practices ***[Not presented to non-Catholic private schools]***	①	②	③	④	⑤	○
b. Time provided for teacher professional development in mathematics	①	②	③	④	⑤	○
c. Importance that the school places on mathematics	①	②	③	④	⑤	○
d. Public attitudes toward mathematics instruction	①	②	③	④	⑤	○
e. Conflict between efforts to improve mathematics instruction and other school and/or district/diocese initiatives	①	②	③	④	⑤	○
f. Equipment and supplies and/or manipulatives for teaching mathematics (for example: materials for students to draw, cut and build in order to make sense of problems)	①	②	③	④	⑤	○

21. In your opinion, how great a problem is each of the following for mathematics instruction **in your school as a whole**? [Select one on each row.]

	Not a significant problem	**Somewhat of a problem**	**Serious problem**
a. Inadequate funds for purchasing mathematics equipment and supplies	○	○	○
b. Inadequate supply of mathematics textbooks/programs	○	○	○
c. Inadequate materials for individualizing mathematics instruction	○	○	○
d. Low student interest in mathematics	○	○	○
e. Low student reading abilities	○	○	○
f. Lack of teacher interest in mathematics	○	○	○
g. Inadequate teacher preparation to teach mathematics	○	○	○
h. Insufficient time to teach mathematics	○	○	○
i. Lack of opportunities for mathematics teachers to share ideas	○	○	○
j. Inadequate mathematics-related professional development opportunities	○	○	○
k. Interruptions for announcements, assemblies, and other school activities	○	○	○
l. Large class sizes	○	○	○
m. High student absenteeism	○	○	○
n. Inappropriate student behavior	○	○	○
o. Lack of parental support for mathematics education	○	○	○

Mathematics Teacher Turnover

22. ***[Presented only to schools that include any grades 6–12]***
How many middle and/or high school mathematics teachers who taught in your school last year (2010–11) did not return to teach mathematics in your school this year (2011–12)? [Enter your response as a whole number (for example: 15). Please enter "0" if all teachers who taught mathematics returned this school year.] __________ ***[If "0" Skip to Q24]***

23. ***[Presented only to schools that include any grades 6–12]***
How many of those teachers did not return for each of the following reasons? [Enter each response as a whole number (for example: 15). Please enter "0" for categories in which there were not any mathematics teachers who did not return for that reason.]

e. Left voluntarily, including mathematics teachers who moved to another department or school, left the profession, or retired __________
f. Were reassigned to another position, department, or school in the district/diocese ________
g. Were dismissed or not rehired for poor performance ________
h. Were dismissed or not rehired because of budget constraints __________

24. ***[Presented only to schools that include any grades 6–12]***
For the 2011–12 school year, how difficult was it to fill middle and/or high school mathematics teacher vacancies in your school with fully qualified teachers?

○	There were no vacancies for mathematics teachers
○	Easy
○	Somewhat difficult
○	Very difficult
○	Could not fill the vacancies

Mathematics Professional Development Opportunities

25. This question is about in-service (professional development) programs offered by your school and/or district/diocese, possibly in conjunction with other organizations (for example: other school districts/dioceses, colleges or universities, museums, professional associations, commercial vendors).

In the last three years, has your school and/or district/diocese offered in-service **workshops** specifically focused on mathematics or mathematics teaching?

○	Yes
○	No ***[Skip to Q27]***

26. Please indicate the extent to which in-service **workshops** offered by your school and/or district/diocese **in the last three years** addressed deepening teacher understanding of each of the following: [Select one on each row.]

	Not at all		**Somewhat**		**To a great extent**
a. Mathematics content	①	②	③	④	⑤
b. State mathematics standards	①	②	③	④	⑤
c. How to use particular mathematics instructional materials (for example: textbooks or programs)	①	②	③	④	⑤
d. How students think about various mathematical ideas	①	②	③	④	⑤
e. How to monitor student understanding during mathematics instruction	①	②	③	④	⑤
f. How to adapt mathematics instruction to address student misconceptions	①	②	③	④	⑤
g. How to use technology in mathematics instruction	①	②	③	④	⑤
h. How to use investigation-oriented tasks in mathematics instruction	①	②	③	④	⑤
i. How to teach mathematics to students who are English language learners	①	②	③	④	⑤
j. How to provide alternative mathematics learning experiences for students with special needs	①	②	③	④	⑤

27. In the last three years, has your school offered **teacher study groups** where teachers meet on a regular basis to discuss teaching and learning of mathematics, and possibly other content areas as well (sometimes referred to as Professional Learning Communities, PLCs, or lesson study)?

○	Yes
○	No *[Skip to Q39]*

28. ***[Presented only to schools that include any grades K–5]***
Are teachers of grades K-5 mathematics classes required to participate in these mathematics-focused **teacher study groups**?

○	Yes
○	No

29. ***[Presented only to schools that include any grades 6–8]***
Are teachers of grades 6-8 mathematics classes required to participate in these mathematics-focused **teacher study groups**?

○	Yes
○	No

30. ***[Presented only to schools that include any grades 9–12]***
Are teachers of grades 9-12 mathematics classes required to participate in these mathematics - focused **teacher study groups**?

○	Yes
○	No

31. Has your school specified a schedule for when these mathematics-focused **teacher study groups** are expected to meet?

○	Yes
○	No *[Skip to Q34]*

32. Over what period of time were these mathematics-focused **teacher study groups** typically expected to meet?

○	The entire school year
○	One semester
○	Less than one semester

33. How often have these mathematics-focused **teacher study groups** typically been expected to meet?

○	Less than once a month
○	Once a month
○	Twice a month
○	More than twice a month

34. Which of the following describe the typical mathematics-focused **teacher study groups** in this school? [Select all that apply.]

□	Organized by grade level
□	Include teachers from multiple grade levels
□	Limited to teachers from this school
□	Include teachers from other schools in the district/diocese ***[Not presented to non-Catholic private schools]***
□	Include teachers from other schools outside of your district/diocese
□	Include school and/or district/diocese administrators
□	Include parents/guardians or other community members
□	Include higher education faculty or other "consultants"

35. Which of the following describe the typical mathematics-focused **teacher study groups** in this school? [Select all that apply.]

□	Teachers engage in mathematics investigations.
□	Teachers plan mathematics lessons together.
□	Teachers analyze student mathematics assessment results.
□	Teachers analyze classroom artifacts (for example: student work samples).
□	Teachers analyze mathematics instructional materials (for example: textbooks or programs).

36. To what extent have these mathematics-focused **teacher study groups** addressed deepening teacher understanding of each of the following? [Select one on each row.]

	Not at all		**Somewhat**		**To a great extent**
a. Mathematics content	①	②	③	④	⑤
b. State mathematics standards	①	②	③	④	⑤
c. How to use particular mathematics instructional materials (for example: textbooks or programs)	①	②	③	④	⑤
d. How students think about various mathematical ideas	①	②	③	④	⑤
e. How to monitor student understanding during mathematics instruction	①	②	③	④	⑤
f. How to adapt mathematics instruction to address student misconceptions	①	②	③	④	⑤
g. How to use technology in mathematics instruction	①	②	③	④	⑤
h. How to use investigation-oriented tasks in mathematics instruction	①	②	③	④	⑤
i. How to teach mathematics to students who are English language learners	①	②	③	④	⑤
j. How to provide alternative mathematics learning experiences for students with special needs	①	②	③	④	⑤

37. Have there been designated leaders for these mathematics-focused **teacher study groups**?

○	Yes
○	No ***[Skip to Q39]***

38. The designated leaders of these mathematics-focused **teacher study groups** were from: [Select all that apply.]

□	This school
□	Elsewhere in this district/diocese ***[Not presented to non-Catholic private schools]***
□	College or University
□	External consultants
□	Other (please specify: ____________________)

39. Thinking about last school year, which of the following were used to provide teachers in this school with time for in-service (professional development) workshops/teacher study groups *that included a focus on mathematics content and/or mathematics instruction*, regardless of whether they were offered by your school and/or district/diocese? [Select all that apply.]

□	Early dismissal and/or late start for students
□	Professional days/teacher work days during the students' school year
□	Professional days/teacher work days before and/or after the students' school year
□	Common planning time for teachers
□	Substitute teachers to cover teachers' classes while they attend professional development
□	None of the above

40. Do any teachers in your school have access to one-on-one "coaching" focused on improving their mathematics instruction?

○	Yes
○	No ***[Skip to End]***

41. ***[Presented only to schools that include any grades K–5]***
Are teachers of grades K-5 mathematics classes required to receive one-on-one mathematics-focused coaching?

○	Yes
○	No

42. ***[Presented only to schools that include any grades 6–8]***
Are teachers of grades 6-8 mathematics classes required to receive one-on-one mathematics-focused coaching?

○	Yes
○	No

43. ***[Presented only to schools that include any grades 9–12]***
Are teachers of grades 9-12 mathematics classes required to receive one-on-one mathematics-focused coaching?

○	Yes
○	No

44. To what extent is one-on-one mathematics-focused coaching in your school provided by each of the following? [Select one on each row.]

	Not at all		**Somewhat**		**To a great extent**
a. The principal of your school	①	②	③	④	⑤
b. An assistant principal at your school	①	②	③	④	⑤
c. District/Diocese administrators including mathematics supervisors/coordinators ***[Not presented to non-Catholic private schools]***	①	②	③	④	⑤
d. Teachers/coaches who do not have classroom teaching responsibilities	①	②	③	④	⑤
e. Teachers/coaches who have part-time classroom teaching responsibilities	①	②	③	④	⑤
f. Teachers/coaches who have full-time classroom teaching responsibilities	①	②	③	④	⑤

Thank you!

2012 NATIONAL SURVEY OF SCIENCE AND MATHEMATICS EDUCATION
SCIENCE TEACHER QUESTIONNAIRE

Section A. Teacher Background and Opinions

1. How many years have you taught prior to this school year: [Enter each response as a whole number (for example: 15).]
   a. any subject at the K–12 level? _____
   b. science at the K–12 level? _____
   c. at this school, any subject? _____

2. At what grade levels do you currently teach science? [Select all that apply.]

□	K–5
□	6–8
□	9–12
□	You do not currently teach science

3. ***[Presented to self-contained teachers only]***
Which best describes the science instruction provided to the entire class?
- Do not consider pull-out instruction that some students may receive for remediation or enrichment.
- Do not consider instruction provided to individual or small groups of students, for example by an English-language specialist, special educator, or teacher assistant.

○	This class receives science instruction ***only*** from you. ***[Presented only to teachers who answered in Q2 that they teach science]***
○	This class receives science instruction from you and another teacher (for example: a science specialist or a teacher you team with). ***[Presented only to teachers who answered in Q2 that they teach science]***

4. ***[Presented to self-contained teachers only]***
Which best describes your science teaching?

○	I teach science all or most days, every week of the year.
○	I teach science every week, but typically three or fewer days each week.
○	I teach science some weeks, but typically not every week. ***[Skip to Q6]***

5. ***[Presented to self-contained teachers only]***
In a typical week, how many days do you teach lessons on each of the following subjects and how many minutes per week are spent on each subject? [Enter each response as a whole number (for example: 5, 150).]

	Number of days per week	**Total number of minutes per week**
a. Mathematics		
b. Science		
c. Social Studies		
d. Reading/Language Arts		

6. ***[Presented to self-contained teachers only]***
In a typical year, how many weeks do you teach lessons on each of the following subjects and how many minutes per week are spent on each subject? [Enter each response as a whole number (for example: 36, 150).]

	Number of weeks per year	**Average number of minutes per week when taught**
a. Mathematics		
b. Science		
c. Social Studies		
d. Reading/Language Arts		

7. ***[Presented to non-self-contained teachers only]***
In a typical week, how many different classes of each of the following do you teach?

- If you meet with the *same class of students* multiple times per week, count that class only once.
- If you teach the *same science or engineering course* to multiple classes of students, count each class separately.
- Select one on each row.

	0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Science (may include some engineering content)	○	○	○	○	○	○	○	○	○	○	○
Engineering (may include some science content)	○	○	○	○	○	○	○	○	○	○	○

8. ***[Presented to non-self-contained teachers only]***
For each science class you teach, select the course type and enter the number of students enrolled. Enter the classes in the order that you teach them. For teachers on an alternating day block schedule, please order your classes starting with the first class you teach this week. [Select one course type on each row and enter the number of students as a whole number (for example: 25).]

Class	**Course Type**	**Number of Students**
Your 1st science class:		
Your 2nd science class:		
…		
Your Nth science class:		

Course Type List	
1	Science (Grades K–5)
2	Life Science (Grades 6–8)
3	Earth Science (Grades 6–8)
4	Physical Science (Grades 6–8)
5	General or Integrated Science (Grades 6–8)
6	Coordinated or Integrated Science including General Science and Physical Science (Grades 9–12)
7	Earth/Space Science (Grades 9–12)
8	Life Science/Biology (Grades 9–12)
9	Environmental Science/Ecology (Grades 9–12)
10	Chemistry (Grades 9–12)
11	Physics (Grades 9–12)

9. ***[Presented to non-self-contained grades 9–12 teachers only]***

For each grades 9–12 science class you teach, select the level that best describes the content addressed in that class.

- Use the descriptions below to help identify the level.
- Select one on each row.

Level	**Description**
Non-college Prep	A course that does not count towards the entrance requirements of a 4-year college. For example: Life Science.
1st Year College Prep, Including Honors	The first course in a discipline that counts towards the entrance requirements of a 4-year college. For example: Biology, Chemistry I.
2nd Year Advanced	A course typically taken after a 1st year college prep course. For example: Anatomy and Physiology, Advanced Chemistry, Physics II. Include Advanced Placement, International Baccalaureate, and concurrent college and high school credit/dual enrollment.

Class	**Course Type**	**Non-college Prep**	**1st Year College Prep, Including Honors**	**2nd Year Advanced**
Your 1st science class:	[*course type(s) teacher selected in Q8*]	○	○	○
Your 2nd science class:		○	○	○
…				
Your Nth science class:		○	○	○

10. ***[Presented to non-self-contained teachers only]***

Later in this questionnaire, we will ask you questions about your randomly selected science class, which you indicated was [*level and course type teacher selected in Q8/9*]. What is your school's title for this course? ________________________________

11. Have you been awarded one or more bachelor's and/or graduate degrees in the following fields? (With regard to bachelor's degrees, count only areas in which you majored.) [Select one on each row.]

	Yes	**No**
a. Education, including science education	○	○
b. Natural Sciences and/or Engineering	○	○
c. Other, please specify ____________________	○	○

12. ***[Presented only to teachers that answered "Yes" to Q11a]***

What type of education degree do you have? (With regard to bachelor's degrees, count only areas in which you majored.) [Select all that apply.]

□	Elementary Education
□	Mathematics Education
□	Science Education
□	Other Education, please specify. ___________

13. ***[Presented only to teachers that answered "Yes" to Q11b]***
What type of natural science and/or engineering degree do you have? (With regard to bachelor's degrees, count only areas in which you majored.) [Select all that apply.]

□	Biology/Life Science
□	Chemistry
□	Earth/Space Science
□	Engineering
□	Environmental Science/Ecology
□	Physics
□	Other natural science, please specify ________________

14. Did you complete any of the following types of biology/life science courses at the undergraduate or graduate level? [Select one on each row.]

	Yes	No
a. General/introductory biology/life science courses (for example: Biology I, Introduction to Biology)	○	○
b. Biology/life science courses beyond the general/introductory level	○	○
c. Biology/life science education courses	○	○

15. ***[Presented only to teachers that answered "Yes" to Q14b]***
Please indicate which of the following biology/life science courses you completed (beyond a general/introductory course) at the undergraduate or graduate level. [Select all that apply.]

□	Anatomy/Physiology
□	Biochemistry
□	Botany
□	Cell Biology
□	Ecology
□	Evolution
□	Genetics
□	Microbiology
□	Zoology
□	Other biology/life science beyond the general/introductory level

16. Did you complete any of the following types of chemistry courses at the undergraduate or graduate level? [Select one on each row.]

	Yes	No
a. General/introductory chemistry courses (for example: Chemistry I, Introduction to Chemistry)	○	○
b. Chemistry courses beyond the general/introductory level	○	○
c. Chemistry education courses	○	○

17. ***[Presented only to teachers that answered "Yes" to Q16b]***
Please indicate which of the following chemistry courses you completed (beyond a general/introductory course) at the undergraduate or graduate level. [Select all that apply.]

□	Analytical Chemistry
□	Biochemistry
□	Inorganic Chemistry
□	Organic Chemistry
□	Physical Chemistry
□	Quantum Chemistry
□	Other chemistry beyond the general/introductory level

18. Did you complete any of the following types of physics courses at the undergraduate or graduate level? [Select one on each row.]

	Yes	No
a. General/introductory physics courses (for example: Physics I, Introduction to Physics)	○	○
b. Physics courses beyond the general/introductory level	○	○
c. Physics education courses	○	○

19. ***[Presented only to teachers that answered "Yes" to Q18b]***
Please indicate which of the following physics courses you completed (beyond a general/introductory course) at the undergraduate or graduate level. [Select all that apply.]

□	Electricity and Magnetism
□	Heat and Thermodynamics
□	Mechanics
□	Modern or Quantum Physics
□	Nuclear Physics
□	Optics
□	Other physics beyond the general/introductory level

20. Did you complete any of the following types of Earth/space science courses at the undergraduate or graduate level? [Select one on each row.]

	Yes	No
a. General/introductory Earth/space science courses (for example: Earth Science I, Introduction to Earth Science)	○	○
b. Earth/space science courses beyond the general/introductory level	○	○
c. Earth/space science education courses	○	○

21. ***[Presented only to teachers that answered "Yes" to Q20b]***
Please indicate which of the following Earth/space science courses you completed (beyond a general/introductory course) at the undergraduate or graduate level. [Select all that apply.]

□	Astronomy
□	Geology
□	Meteorology
□	Oceanography
□	Physical Geography
□	Other Earth/space science beyond the general/introductory level

22. Did you complete any of the following types of environmental science courses at the undergraduate or graduate level? [Select one on each row.]

	Yes	No
a. General/introductory environmental science courses (for example: Environmental Science I, Introduction to Environmental Science)	○	○
b. Environmental science courses beyond the general/introductory level	○	○
c. Environmental science education courses	○	○

23. ***[Presented only to teachers that answered "Yes" to Q22b]***
Please indicate which of the following environmental science courses you completed (beyond a general/introductory course) at the undergraduate or graduate level. [Select all that apply.]

□	Conservation Biology
□	Ecology
□	Forestry
□	Hydrology
□	Oceanography
□	Toxicology
□	Other environmental science beyond the general/introductory level

24. Did you complete one or more engineering courses at the undergraduate or graduate level?

○	Yes
○	No

25. ***[Presented only to teachers that answered "Yes" to Q24b]***
Please indicate which of the following types of engineering courses you completed at the undergraduate or graduate level. [Select all that apply.]

□	Aerospace Engineering
□	Bioengineering/Biomedical Engineering
□	Chemical Engineering
□	Civil Engineering
□	Computer Engineering
□	Electrical Engineering
□	Industrial/Manufacturing Engineering
□	Mechanical Engineering
□	Other types of engineering courses

26. For each of the following areas, indicate the number of semester and/or quarter courses you completed.

- Count *courses* **not** credit hours.
- Include courses taken at the graduate or undergraduate level, as well as courses for which you received college credit while you were in high school.
- Count each course taken in high school for college credit as a one semester college course.
- Count courses that lasted multiple semesters or quarters as multiple courses.
- If your transcripts are not available, provide your best estimates.
- Enter your responses as whole numbers (for example: 3). You may either enter 0 (zero) or leave the box empty wherever applicable.

	Number of SEMESTER college courses	**Number of QUARTER college courses**
a. Interdisciplinary science (a single course that addresses content across ***multiple*** science subjects, such as biology, chemistry, physics and/or Earth science)		
b. Biology/Life science		
c. Chemistry		
d. Physics		
e. Earth/Space science		
f. Environmental science		
g. Engineering		
h. Mathematics		

27. How many of the undergraduate and graduate level science courses you completed were taken at each of the following types of institutions? (Please do not include science education courses.) [Enter each response as a whole number (for example: 15).]

a. Two-year college, community college, and/or technical school _______

b. Four-year college and/or university _______

28. Which of the following best describes your teacher certification program?

○	An undergraduate program leading to a bachelor's degree and a teaching credential
○	A post-baccalaureate credentialing program (no master's degree awarded)
○	A master's program that also awarded a teaching credential
○	You did not have any formal teacher preparation

29. When did you **last participate** in professional development (sometimes called in-service education) focused on science or science teaching? (Include attendance at professional meetings, workshops, and conferences, as well as professional learning communities/lesson studies/teacher study groups. **Do not** include formal courses for which you received college credit or time you spent **providing** professional development for other teachers.)

○	In the last 3 years	
○	4–6 years ago	*Skip to 33*
○	7–10 years ago	*Skip to 33*
○	More than 10 years ago	*Skip to 33*
○	Never	*Skip to 33*

30. In the last 3 years have you… [Select one on each row.]

	Yes	No
a. attended a workshop on science or science teaching?	○	○
b. attended a national, state, or regional science teacher association meeting?	○	○
c. participated in a professional learning community/lesson study/teacher study group focused on science or science teaching?	○	○

31. What is the **total** amount of time you have spent on professional development in science or science teaching **in the last 3 years**? (Include attendance at professional meetings, workshops, and conferences, as well as professional learning communities/lesson studies/teacher study groups. **Do not** include formal courses for which you received college credit or time you spent **providing** professional development for other teachers.)

○	Less than 6 hours
○	6–15 hours
○	16–35 hours
○	More than 35 hours

32. Thinking about all of your science-related professional development **in the last 3 years**, to what extent does each of the following describe your experiences? [Select one on each row.]

	Not at all		Somewhat		To a great extent
a. You had opportunities to engage in science investigations.	①	②	③	④	⑤
b. You had opportunities to examine classroom artifacts (for example: student work samples).	①	②	③	④	⑤
c. You had opportunities to try out what you learned in your classroom ***and*** then talk about it as part of the professional development.	①	②	③	④	⑤
d. You worked closely with other science teachers from your school.	①	②	③	④	⑤
e. You worked closely with other science teachers who taught the same grade and/or subject whether or not they were from your school.	①	②	③	④	⑤
f. The professional development was a waste of your time.	①	②	③	④	⑤

33. When did you last take a formal course for **college credit** in each of the following areas? Do not count courses for which you received only Continuing Education Units. [Select one on each row.]

	In the last 3 years	4 – 6 years ago	7 – 10 years ago	More than 10 years ago	Never
a. Science	○	○	○	○	○
b. How to teach science	○	○	○	○	○
c. Student teaching in science	○	○	○	○	○
d. Student teaching in other subjects	○	○	○	○	○

34. ***[Presented only to teachers that have participated in professional development in the last three years as indicated in Q29, OR took a course in "Science" or "How to teach science" in the last three years as indicated in q33a/b]***

Considering all the opportunities to learn about science or the teaching of science (professional development and coursework) **in the last 3 years**, how much was each of the following emphasized? [Select one on each row.]

	Not at all		Somewhat		To a great extent
a. Deepening your own science content knowledge	①	②	③	④	⑤
b. Learning about difficulties that students may have with particular science ideas and procedures	①	②	③	④	⑤
c. Finding out what students think or already know about the key science ideas prior to instruction on those ideas	①	②	③	④	⑤
d. Implementing the science textbook/module to be used in your classroom	①	②	③	④	⑤
e. Planning instruction so students at different levels of achievement can increase their understanding of the ideas targeted in each activity	①	②	③	④	⑤
f. Monitoring student understanding during science instruction	①	②	③	④	⑤
g. Providing enrichment experiences for gifted students	①	②	③	④	⑤
h. Providing alternative science learning experiences for students with special needs	①	②	③	④	⑤
i. Teaching science to English-language learners	①	②	③	④	⑤
j. Assessing student understanding at the conclusion of instruction on a topic	①	②	③	④	⑤

35. In the last 3 years have you… [Select one on each row.]

	Yes	No
a. received feedback about your science teaching from a mentor/coach **formally assigned** by the school or district/diocese?	○	○
b. served as a **formally-assigned** mentor/coach for science teaching? (Please do not include supervision of student teachers.)	○	○
c. supervised a student teacher in your classroom?	○	○
d. taught in-service workshops on science or science teaching?	○	○
e. led a professional learning community/lesson study/teacher study group focused on science or science teaching?	○	○

36. ***[Presented only to grades K–5 teachers; sub-items e, f, and g for self-contained teachers only]***
Many teachers feel better prepared to teach some subject areas than others. How well prepared do you feel to teach each of the following subjects **at the grade level(s) you teach**, whether or not they are currently included in your teaching responsibilities? [Select one on each row.]

	Not adequately prepared	Somewhat prepared	Fairly well prepared	Very well prepared
a. Life Science	①	②	③	④
b. Earth Science	①	②	③	④
c. Physical Science	①	②	③	④
d. Engineering	①	②	③	④
e. Mathematics	①	②	③	④
f. Reading/Language Arts	①	②	③	④
g. Social Studies	①	②	③	④

37. ***[Presented only to grades 6–12 teachers; non-self-contained teachers shown only topics related to their randomly selected class and engineering; self-contained teachers shown all topics]***
Within science many teachers feel better prepared to teach some topics than others. How well prepared do you feel to teach each of the following topics **at the grade level(s) you teach**, whether or not they are currently included in your teaching responsibilities? [Select one on each row.]

	Not adequately prepared	Somewhat prepared	Fairly well prepared	Very well prepared
a. Earth/Space Science				
i. Earth's features and physical processes	①	②	③	④
ii. The solar system and the universe	①	②	③	④
iii. Climate and weather	①	②	③	④
b. Biology/Life Science				
i. Cell biology	①	②	③	④
ii. Structures and functions of organisms	①	②	③	④
iii. Ecology/ecosystems	①	②	③	④
iv. Genetics	①	②	③	④
v. Evolution	①	②	③	④
c. Chemistry				
i. Atomic structure	①	②	③	④
ii. Chemical bonding, equations, nomenclature, and reactions	①	②	③	④
iii. Elements, compounds, and mixtures	①	②	③	④
iv. The Periodic Table	①	②	③	④
v. Properties of solutions	①	②	③	④
vi. States, classes, and properties of matter	①	②	③	④
d. Physics				
i. Forces and motion	①	②	③	④
ii. Energy transfers, transformations, and conservation	①	②	③	④
iii. Properties and behaviors of waves	①	②	③	④
iv. Electricity and magnetism	①	②	③	④
v. Modern physics (for example: special relativity)	①	②	③	④
e. Engineering (for example: nature of engineering and technology, design processes, analyzing and improving technological systems, interactions between technology and society)	①	②	③	④
f. Environmental and resource issues (for example: land and water use, energy resources and consumption, sources and impacts of pollution)	①	②	③	④

38. How well prepared do you feel to do each of the following in your science instruction? [Select one on each row.]

	Not adequately prepared	Somewhat prepared	Fairly well prepared	Very well prepared
a. Plan instruction so students at different levels of achievement can increase their understanding of the ideas targeted in each activity	①	②	③	④
b. Teach science to students who have learning disabilities	①	②	③	④
c. Teach science to students who have physical disabilities	①	②	③	④
d. Teach science to English-language learners	①	②	③	④
e. Provide enrichment experiences for gifted students	①	②	③	④
f. Encourage students' interest in science and/or engineering	①	②	③	④
g. Encourage participation of females in science and/or engineering	①	②	③	④
h. Encourage participation of racial or ethnic minorities in science and/or engineering	①	②	③	④
i. Encourage participation of students from low socioeconomic backgrounds in science and/or engineering	①	②	③	④
j. Manage classroom discipline	①	②	③	④

39. Please provide your opinion about each of the following statements. [Select one on each row.]

	Strongly Disagree	Disagree	No Opinion	Agree	Strongly Agree
a. Students learn science best in classes with students of similar abilities.	①	②	③	④	⑤
b. Inadequacies in students' science background can be overcome by effective teaching.	①	②	③	④	⑤
c. It is better for science instruction to focus on ideas in depth, even if that means covering fewer topics.	①	②	③	④	⑤
d. Students should be provided with the purpose for a lesson as it begins.	①	②	③	④	⑤
e. At the beginning of instruction on a science idea, students should be provided with definitions for new scientific vocabulary that will be used.	①	②	③	④	⑤
f. Teachers should explain an idea to students before having them consider evidence that relates to the idea.	①	②	③	④	⑤
g. Most class periods should include some review of previously covered ideas and skills.	①	②	③	④	⑤
h. Most class periods should provide opportunities for students to share their thinking and reasoning.	①	②	③	④	⑤
i. Hands-on/laboratory activities should be used primarily to reinforce a science idea that the students have already learned.	①	②	③	④	⑤
j. Students should be assigned homework most days.	①	②	③	④	⑤
k. Most class periods should conclude with a summary of the key ideas addressed.	①	②	③	④	⑤

Section B. Your Science Instruction

The rest of this questionnaire is about your science instruction in this class.

40. ***[Presented to non-self-contained teachers only]***
On average, how many minutes per week does this class meet? [Enter your response as a whole number (for example: 300).] _________

41. Enter the number of students for each grade represented in this class. [Enter each response as a whole number (for example: 15).]

Kindergarten	
1st grade	
2nd grade	
3rd grade	
4th grade	
5th grade	
6th grade	
7th grade	
8th grade	
9th grade	
10th grade	
11th grade	
12th grade	

42. For the students in this class, indicate the number of males and females in this class in each of the following categories of race/ethnicity. [Enter each response as a whole number (for example: 15).]

	Males	Females
a. American Indian or Alaska Native		
b. Asian		
c. Black or African American		
d. Hispanic/Latino		
e. Native Hawaiian or Other Pacific Islander		
f. White		
g. Two or more races		

43. Which of the following best describes the prior science achievement levels of the students in this class relative to other students in this school?

○	Mostly low achievers
○	Mostly average achievers
○	Mostly high achievers
○	A mixture of levels

44. How much control do you have over each of the following aspects of science instruction in this class? [Select one on each row.]

	No Control		Moderate Control		Strong Control
a. Determining course goals and objectives	①	②	③	④	⑤
b. Selecting textbooks/modules	①	②	③	④	⑤
c. Selecting content, topics, and skills to be taught	①	②	③	④	⑤
d. Selecting teaching techniques	①	②	③	④	⑤
e. Determining the amount of homework to be assigned	①	②	③	④	⑤
f. Choosing criteria for grading student performance	①	②	③	④	⑤

45. Think about your plans for this class for the entire course/year. By the end of the course/year, how much emphasis will each of the following student objectives receive? [Select one on each row.]

	None	Minimal emphasis	Moderate emphasis	Heavy emphasis
a. Memorizing science vocabulary and/or facts	①	②	③	④
b. Understanding science concepts	①	②	③	④
c. Learning science process skills (for example: observing, measuring)	①	②	③	④
d. Learning about real-life applications of science	①	②	③	④
e. Increasing students' interest in science	①	②	③	④
f. Preparing for further study in science	①	②	③	④
g. Learning test taking skills/strategies	①	②	③	④

46. How often do you do each of the following in your science instruction in this class? [Select one on each row.]

	Never	Rarely (for example: A few times a year)	Sometimes (for example: Once or twice a month)	Often (for example: Once or twice a week)	All or almost all science lessons
a. Explain science ideas to the whole class	①	②	③	④	⑤
b. Engage the whole class in discussions	①	②	③	④	⑤
c. Have students work in small groups	①	②	③	④	⑤
d. Do hands-on/laboratory activities	①	②	③	④	⑤
e. Engage the class in project-based learning (PBL) activities	①	②	③	④	⑤
f. Have students read from a science textbook, module, or other science-related material in class, either aloud or to themselves	①	②	③	④	⑤
g. Have students represent and/or analyze data using tables, charts, or graphs	①	②	③	④	⑤
h. Require students to supply evidence in support of their claims	①	②	③	④	⑤
i. Have students make formal presentations to the rest of the class (for example: on individual or group projects)	①	②	③	④	⑤
j. Have students write their reflections (for example: in their journals) in class or for homework	①	②	③	④	⑤
k. Give tests and/or quizzes that are predominantly short-answer (for example: multiple choice, true /false, fill in the blank)	①	②	③	④	⑤
l. Give tests and/or quizzes that include constructed-response/open-ended items	①	②	③	④	⑤
m. Focus on literacy skills (for example: informational reading or writing strategies)	①	②	③	④	⑤
n. Have students practice for standardized tests	①	②	③	④	⑤
o. Have students attend presentations by guest speakers focused on science and/or engineering in the workplace	①	②	③	④	⑤

47. Which best describes the availability of each of the following for small group (4-5 students) work in this class? [Select one on each row.]

	Do not have one per group available	At least one per group available upon request or in another room	At least one per group located in your classroom
a. Personal computers, including laptops	○	○	○
b. Hand-held computers (for example: PDAs, tablets, smartphones, iPads)	○	○	○
c. Internet access	○	○	○
d. Graphing calculators	○	○	○
e. Other calculators	○	○	○
f. Probes for collecting data (for example: motion sensors, temperature probes)	○	○	○
g. Microscopes	○	○	○
h. Classroom response system or "Clickers" (handheld devices used to respond electronically to questions in class)	○	○	○

48. For each of the following, are students expected to provide their own for use in this science class? [Select one on each row.]

	Yes	No
a. Laptop computers	○	○
b. Hand-held computers	○	○
c. Graphing calculators	○	○
d. Other calculators	○	○

49. How often do students use each of the following instructional technologies in this science class? [Select one on each row.]

	Never	Rarely (for example: A few times a year)	Sometimes (for example: Once or twice a month)	Often (for example: Once or twice a week)	All or almost all science lessons
a. Personal computers, including laptops	①	②	③	④	⑤
b. Hand-held computers	①	②	③	④	⑤
c. Internet	①	②	③	④	⑤
d. Calculators ***[Presented to grades K–5 teachers only]***	①	②	③	④	⑤
e. Graphing calculators ***[Presented to grades 6–12 teachers only]***	①	②	③	④	⑤
f. Probes for collecting data	①	②	③	④	⑤
g. Classroom response system or "Clickers"	①	②	③	④	⑤

50. Please indicate the availability of each of the following for your science instruction in this class. [Select one on each row.]

	Not available	Available in another room	Located in your classroom
a. Lab tables	○	○	○
b. Electric outlets	○	○	○
c. Faucets and sinks	○	○	○
d. Gas for burners ***[Presented to grades 9–12 teachers only]***	○	○	○
e. Fume hoods ***[Presented to grades 9–12 teachers only]***	○	○	○

51. How often are students in this class required to take science tests that you did not develop yourself, for example state assessments or district benchmarks? (Do not include Advanced Placement or International Baccalaureate exams or students retaking a test because of failure.)

○	Never
○	Once a year
○	Twice a year
○	Three or four times a year
○	Five or more times a year

52. How much science homework do you assign to this class in a typical **week**? (Do not include time that the class spends getting started on homework during class.)

○	Fewer than 15 minutes per week
○	15–30 minutes per week
○	31–60 minutes per week
○	61–90 minutes per week
○	91–120 minutes per week
○	2–3 hours per week
○	3–4 hours per week
○	More than 4 hours per week

53. Which best describes the instructional materials students **most frequently** use in this class?

Mainly commercially-published textbook(s)	
○	One textbook
○	Multiple textbooks
Mainly commercially-published modules	
○	Modules from a single publisher
○	Modules from multiple publishers
Other	
○	A roughly equal mix of commercially-published textbooks and commercially-published modules most of the time
○	Non-commercially-published materials most of the time ***[Skip to Q58]***

54. Please indicate the title, author, most recent copyright year, and ISBN code of the textbook/module used by the students in this class.

- The 10- or 13-character ISBN code can be found on the copyright page and/or the back cover of the textbook/module.
- Do not include the dashes when entering the ISBN.
- An example of the location of the ISBN is shown to the right.

Title:
First Author:
Year:
ISBN:

55. How would you rate the overall quality of this textbook/the modules used from this publisher?

○	Very poor
○	Poor
○	Fair
○	Good
○	Very good
○	Excellent

56. ***[Presented only to teachers who indicated using one commercially-published textbook or modules from a single publisher in Q53]***
Over the course of the school year, approximately what percentage of the science **instructional time** will students in this class spend using this textbook/these modules?

○	Less than 25%
○	25–49%
○	50–74%
○	75–90%
○	More than 90%

57. ***[Presented only to teachers who indicated using one commercially-published textbook in Q53]***
Approximately what percentage of the chapters in this textbook will students in this class engage with during the school year?

○	Less than 25%
○	25–49%
○	50–74%
○	75–90%
○	More than 90%

58. Science courses may benefit from the availability of particular kinds of ***equipment*** (for example: microscopes, beakers, photogate timers, Bunsen burners). How adequate is the ***equipment*** you have available for teaching this science class?

○	Not adequate
○	
○	Somewhat adequate
○	
○	Adequate

59. Science courses may benefit from the availability of particular kinds of ***instructional technology*** (for example: calculators, computers, probes/sensors). How adequate is the ***instructional technology*** you have available for teaching this science class?

○	Not adequate
○	
○	Somewhat adequate
○	
○	Adequate

60. Science courses may benefit from the availability of particular kinds of ***consumable supplies*** (for example: chemicals, living organisms, batteries). How adequate are the ***consumable supplies*** you have available for teaching this science class?

○	Not adequate
○	
○	Somewhat adequate
○	
○	Adequate

61. Science courses may benefit from the availability of particular kinds of ***facilities*** (for example: lab tables, electric outlets, faucets and sinks). How adequate are the ***facilities*** you have available for teaching this science class?

○	Not adequate
○	
○	Somewhat adequate
○	
○	Adequate

62. In your opinion, how great a problem is each of the following for your science instruction in this class? [Select one on each row.]

	Not a significant problem	**Somewhat of a problem**	**Serious problem**
a. Lack of access to computers	○	○	○
b. Old age of computers	○	○	○
c. Lack of access to the Internet	○	○	○
d. Unreliability of the Internet connection	○	○	○
e. Slow speed of the Internet connection	○	○	○
f. Lack of availability of appropriate computer software	○	○	○
g. Lack of availability of technology support	○	○	○

63. Please rate the effect of each of the following on your science instruction in this class. [Select one on each row.]

	Inhibits effective instruction		**Neutral or Mixed**		**Promotes effective instruction**	**N/A or Don't Know**
a. Current state standards	①	②	③	④	⑤	○
b. District/Diocese curriculum frameworks ***[Not presented to non-Catholic private schools]***	①	②	③	④	⑤	○
c. District/Diocese and/or school pacing guides	①	②	③	④	⑤	○
d. State testing/accountability policies ***[Not presented to non-Catholic private schools]***	①	②	③	④	⑤	○
e. District/Diocese testing/accountability policies ***[Not presented to non-Catholic private schools]***	①	②	③	④	⑤	○
f. Textbook/module selection policies	①	②	③	④	⑤	○
g. Teacher evaluation policies	①	②	③	④	⑤	○
h. College entrance requirements ***[Presented to grades 9–12 teachers only]***	①	②	③	④	⑤	○
i. Students' motivation, interest, and effort in science	①	②	③	④	⑤	○
j. Students' reading abilities	①	②	③	④	⑤	○
k. Community views on science instruction	①	②	③	④	⑤	○
l. Parent expectations and involvement	①	②	③	④	⑤	○
m. Principal support	①	②	③	④	⑤	○
n. Time for you to plan, individually and with colleagues	①	②	③	④	⑤	○
o. Time available for your professional development	①	②	③	④	⑤	○

Section C. Your Most Recently Completed Science Unit in this Class

The questions in this section are about the most recently completed science unit in this class.

- Depending on the structure of your class and the instructional materials you use, a unit may range from a few to many class periods.
- Do not be concerned if this unit was not typical of your instruction.

64. How many class periods were devoted to instruction on the **most recently completed science unit**?
[Enter your response as a whole number (for example: 15).] ____________________

65. Which of the following best describes the content of this unit?

○	Earth/Space Science
○	Life Science/Biology
○	Environmental Science/Ecology
○	Chemistry
○	Physics
○	Engineering

66. What science ideas and/or skills were addressed in this unit? ________________________________

67. ***[Presented only to teachers who indicated using commercially-published textbooks/modules in Q53]***
Was this unit based primarily on the commercially-published textbook/modules you described earlier as the one used most often in this class?

○	Yes ***[Skip to Q70]***
○	No

68. Was this unit based on a commercially-published textbook/module?

○	Yes
○	No ***[Skip to Q74]***

69. Please indicate the title, author, most recent copyright year, and ISBN code of that textbook/module.

- The 10- or 13-character ISBN code can be found on the copyright page and/or the back cover of the textbook/module.
- Do not include the dashes when entering the ISBN.
- An example of the location of the ISBN is shown to the right.

Title:
First Author:
Year:
ISBN:

70. Please indicate the extent to which you did each of the following while teaching this unit. [Select one on each row.]

	Not at all		Somewhat		To a great extent
a. You used the textbook/module to guide the overall structure and content emphasis of the unit.	①	②	③	④	⑤
b. You followed the textbook/module to guide the detailed structure and content emphasis of the unit.	①	②	③	④	⑤
c. You picked what is important from the textbook/module and skipped the rest.	①	②	③	④	⑤
d. You incorporated activities (for example: problems, investigations, readings) from other sources to supplement what the textbook/module was lacking.	①	②	③	④	⑤

71. ***[Presented only to teachers who answered "2–5" in Q70c]***
During this unit, when you skipped activities (for example: problems, investigations, readings) in your textbook/module, how much was each of the following a factor in your decisions? [Select one on each row.]

	Not a factor	A minor factor	A major factor
a. The science ideas addressed in the activities you skipped are not included in your pacing guide and/or current state standards.	①	②	③
b. You did not have the materials needed to implement the activities you skipped.	①	②	③
c. The activities you skipped were too difficult for your students.	①	②	③
d. Your students already knew the science ideas or were able to learn them without the activities you skipped.	①	②	③
e. You have different activities for those science ideas that work better than the ones you skipped.	①	②	③

72. ***[Presented only to teachers who answered "2–5" in Q70d]***
During this unit, when you supplemented the textbook/module with additional activities, how much was each of the following a factor in your decisions? [Select one on each row.]

	Not a factor	A minor factor	A major factor
a. Your pacing guide indicated that you should use supplemental activities.	①	②	③
b. Supplemental activities were needed to prepare students for standardized tests.	①	②	③
c. Supplemental activities were needed to provide students with additional practice.	①	②	③
d. Supplemental activities were needed so students at different levels of achievement could increase their understanding of the ideas targeted in each activity.	①	②	③

73. How well prepared did you feel to do each of the following as part of your instruction on this particular unit? [Select one on each row.]

	Not adequately prepared	Somewhat prepared	Fairly well prepared	Very well prepared
a. Anticipate difficulties that students may have with particular science ideas and procedures in this unit	①	②	③	④
b. Find out what students thought or already knew about the key science ideas	①	②	③	④
c. Implement the science textbook/module to be used during this unit ***[Presented only to teachers who indicated using commercially-published textbooks/modules in Q67/68]***	①	②	③	④
d. Monitor student understanding during this unit	①	②	③	④
e. Assess student understanding at the conclusion of this unit	①	②	③	④

74. Which of the following did you do during this unit? [Select all that apply.]

□	Administered an assessment, task, or probe at the beginning of the unit to find out what students thought or already knew about the key science ideas
□	Questioned individual students during class activities to see if they were "getting it"
□	Used information from informal assessments of the entire class (for example: asking for a show of hands, thumbs up/thumbs down, clickers, exit tickets) to see if students were "getting it"
□	Reviewed student work (for example: homework, notebooks, journals, portfolios, projects) to see if they were "getting it"
□	Administered one or more quizzes and/or tests to see if students were "getting it"
□	Had students use rubrics to examine their own or their classmates' work
□	Assigned grades to student work (for example: homework, notebooks, journals, portfolios, projects)
□	Administered one or more quizzes and/or tests to assign grades
□	Went over the correct answers to assignments, quizzes, and/or tests with the class as a whole

Section D. Your Most Recent Science Lesson in this Class

The next three questions refer to the most recent science lesson in this class, whether or not that instruction was part of the unit you've just been describing. Do not be concerned if this lesson included activities and/or interruptions that are not typical (for example: a test, students working on projects, a fire drill).

75. How many minutes was that lesson? [Enter your response as a non-zero whole number (for example: 50).] __________

76. Of these minutes, how many were spent on the following: [Enter each response as a whole number (for example: 15).]

a. Non-instructional activities (for example: attendance taking, interruptions) ____
b. Whole class activities (for example: lectures, explanations, discussions)____
c. Small group work ___
d. Students working individually (for example: reading textbooks, completing worksheets, taking a test or quiz) ___

77. Which of the following activities took place during that science lesson? [Select all that apply.]

□	Teacher explaining a science idea to the whole class
□	Whole class discussion
□	Students completing textbook/worksheet problems
□	Teacher conducting a demonstration while students watched
□	Students doing hands-on/laboratory activities
□	Students reading about science
□	Students using instructional technology
□	Practicing for standardized tests
□	Test or quiz
□	None of the above

Section E. Demographic Information

78. Indicate your sex:

○	Male
○	Female

79. Are you of Hispanic or Latino origin?

○	Yes
○	No

80. What is your race? [Select all that apply.]

□	American Indian or Alaska Native
□	Asian
□	Black or African American
□	Native Hawaiian or Other Pacific Islander
□	White

81. In what year were you born? [Enter your response as a whole number (for example: 1969). Do not use commas.] __________

Thank you!

2012 National Survey of Science and Mathematics Education
Mathematics Teacher Questionnaire

Section A. Teacher Background and Opinions

1. How many years have you taught prior to this school year: [Enter each response as a whole number (for example: 15).]

a. any subject at the K–12 level? _____
b. mathematics at the K–12 level? _____
c. at this school, any subject? _____

2. At what grade levels do you currently teach mathematics? [Select all that apply.]

□	K–5
□	6–8
□	9–12
□	You do not currently teach mathematics

3. ***[Presented to self-contained teachers only]***
Which best describes the mathematics instruction provided to the entire class?

- Do not consider pull-out instruction that some students may receive for remediation or enrichment.
- Do not consider instruction provided to individual or small groups of students, for example by an English-language specialist, special educator, or teacher assistant.

○	This class receives mathematics instruction ***only*** from you. ***[Presented only to teachers who answered in Q2 that they teach mathematics]***
○	This class receives mathematics instruction from you and another teacher (for example: a mathematics specialist or a teacher you team with). ***[Presented only to teachers who answered in Q2 that they teach mathematics]***

4. ***[Presented to self-contained teachers only]***
Which best describes your mathematics teaching?

○	I teach mathematics all or most days, every week of the year.
○	I teach mathematics every week, but typically three or fewer days each week.
○	I teach mathematics some weeks, but typically not every week.

5. ***[Presented to self-contained teachers only]***
Which best describes your science teaching?

○	I teach science all or most days, every week of the year.
○	I teach science every week, but typically three or fewer days each week.
○	I teach science some weeks, but typically not every week. ***[Skip to Q7]***
○	I do not teach science.

6. ***[Presented to self-contained teachers only]***
In a typical week, how many days do you teach lessons on each of the following subjects and how many minutes per week are spent on each subject? [Enter each response as a whole number (for example: 5, 150).]

	Number of days per week	**Total number of minutes per week**
a. Mathematics		
b. Science		
c. Social Studies		
d. Reading/Language Arts		

[SKIP to Q8]

7. ***[Presented to self-contained teachers only]*** In a typical year, how many weeks do you teach lessons on each of the following subjects and how many minutes per week are spent on each subject? [Enter each response as a whole number (for example: 36, 150).]

	Number of weeks per year	**Average number of minutes per week when taught**
a. Mathematics		
b. Science		
c. Social Studies		
d. Reading/Language Arts		

8. ***[Presented to non-self-contained teachers only]***
I***n a typical week***, how many different mathematics classes do you teach?

- If you meet with the *same class of students* multiple times per week, count that class only once.
- If you teach the *same mathematics course* to multiple classes of students, count each class separately.

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
○	○	○	○	○	○	○	○	○	○

9. ***[Presented to non-self-contained teachers only]***

For each mathematics class you teach, select the course type and enter the number of students enrolled in the class.

Grades 9–12 Course Type	Example Courses
Non-college prep mathematics courses	Developmental Math; High School Arithmetic; Remedial Math; General Math; Vocational Math; Consumer Math; Basic Math; Business Math; Career Math; Practical Math; Essential Math; Pre-Algebra; Introductory Algebra; Algebra 1 Part 1; Algebra 1A; Math A; Basic Geometry; Informal Geometry; Practical Geometry
Formal/College-prep Mathematics Level 1 courses	Algebra 1; Integrated Math 1; Unified Math I; Algebra 1 Part 2; Algebra 1B; Math B
Formal/College-prep Mathematics Level 2 courses	Geometry; Plane Geometry; Solid Geometry; Integrated Math 2; Unified Math II; Math C
Formal/College-prep Mathematics Level 3 courses	Algebra 2; Intermediate Algebra; Algebra and Trigonometry; Advanced Algebra; Integrated Math 3; Unified Math III
Formal/College-prep Mathematics Level 4 courses	Algebra 3; Trigonometry; Pre-Calculus; Analytic/Advanced Geometry; Elementary Functions; Integrated Math 4; Unified Math IV; Calculus (not including college level/AP); any other College Prep Senior Math with Algebra 2 as a prerequisite
Mathematics courses that might qualify for college credit	Advanced Placement Calculus (AB, BC); Advanced Placement Statistics; IB Mathematics standard level; IB Mathematics higher level; concurrent college and high school credit/dual enrollment

Class	Course Type	Number of Students
Your 1st mathematics class:		
Your 2nd mathematics class:		
…		
Your Nth mathematics class:		

Course Type List	
1	Mathematics (Grades K–5)
2	Remedial Mathematics 6
3	Regular Mathematics 6
4	Accelerated/Pre-Algebra Mathematics 6
5	Remedial Mathematics 7
6	Regular Mathematics 7
7	Accelerated Mathematics 7
8	Remedial Mathematics 8
9	Regular Mathematics 8
10	Accelerated Mathematics 8
11	Algebra 1, Grade 7 or 8
12	Non-college prep mathematics course (Grades 9–12)
13	Formal/College-prep Mathematics Level 1 course (Grades 9–12)
14	Formal/College-prep Mathematics Level 2 course (Grades 9–12)
15	Formal/College-prep Mathematics Level 3 course (Grades 9–12)
16	Formal/College-prep Mathematics Level 4 course (Grades 9–12)
17	Mathematics course that might qualify for college credit (Grades 9–12)

10. ***[Presented to non-self-contained teachers only]***
Later in this questionnaire, we will ask you questions about your randomly selected mathematics class, which you indicated was [*course type teacher selected in Q9*]. What is your school's title for this course? ________________

11. Have you been awarded one or more bachelor's and/or graduate degrees in the following fields? (With regard to bachelor's degrees, count only areas in which you majored.) [Select one on each row.]

	Yes	**No**
a. Education, including mathematics education	○	○
b. Mathematics	○	○
c. Computer Science	○	○
d. Engineering	○	○
e. Other, please specify.____________	○	○

12. ***[Presented only to teachers that answered "Yes" to Q11a]***
What type of education degree do you have? (With regard to bachelor's degrees, count only areas in which you majored.) [Select all that apply.]

□	Elementary Education
□	Mathematics Education
□	Science Education
□	Other Education, please specify. ____________

13. For each of the following areas, indicate the number of semester and/or quarter mathematics courses you completed.

- Count *courses* **not** credit hours.
- Include courses taken at the graduate or undergraduate level, as well as courses for which you received college credit while you were in high school.
- Count each course taken in high school for college credit as a one semester college course.
- Count courses that lasted multiple semesters or quarters as multiple courses.
- If your transcripts are not available, provide your best estimates.
- Enter your responses as whole numbers (for example: 3). You may either enter 0 (zero) or leave the box empty wherever applicable.

	Number of SEMESTER college courses	**Number of QUARTER college courses**
a. Mathematics content for elementary school teachers		
b. Mathematics content for middle school teachers		
c. Mathematics content for high school teachers		
d. Integrated mathematics (a single course that addresses content across ***multiple*** mathematics subjects, such as algebra and geometry)		
e. College algebra/trigonometry/functions		
f. Abstract algebra (for example: groups, rings, ideals, fields) ***[Presented to grades 6–12 teachers only]***		
g. Linear algebra (for example: vectors, matrices, eigenvalues) ***[Presented to grades 6–12 teachers only]***		
h. Calculus		
i. Advanced calculus ***[Presented to grades 6–12 teachers only]***		
j. Real analysis ***[Presented to grades 6–12 teachers only]***		
k. Differential equations ***[Presented to grades 6–12 teachers only]***		
l. Analytic/Coordinate Geometry (for example: transformations or isometries, conic sections) ***[Presented to grades 6–12 teachers only]***		
m. Axiomatic Geometry (Euclidean or non-Euclidean) ***[Presented to grades 6–12 teachers only]***		
n. College geometry ***[Presented to grades K–5 teachers only]***		
o. Probability		
p. Statistics		
q. Number theory (for example: divisibility theorems, properties of prime numbers) ***[Presented to grades 6–12 teachers only]***		
r. Discrete mathematics (for example: combinatorics, graph theory, game theory)		
s. Other upper division mathematics		

14. For each of the following areas, indicate the number of semester and/or quarter courses you completed.

- Count *courses* **not** credit hours.
- Include courses taken at the graduate or undergraduate level, as well as courses for which you received college credit while you were in high school.
- Count each course taken in high school for college credit as a one semester college course.
- Count courses that lasted multiple semesters or quarters as multiple courses.
- If your transcripts are not available, provide your best estimates.
- Enter your responses as whole numbers (for example: 3). You may either enter 0 (zero) or leave the box empty wherever applicable.

	Number of SEMESTER college courses	**Number of QUARTER college courses**
a. Computer science		
b. Engineering		
c. Science		

15. How many of the undergraduate and graduate level mathematics courses you completed were taken at each of the following types of institutions? (Please do not include mathematics education courses.) [Enter each response as a whole number (for example: 15).]

a. Two-year college, community college, and/or technical school _______

b. Four-year college and/or university _______

16. Which of the following best describes your teacher certification program?

○	An undergraduate program leading to a bachelor's degree and a teaching credential
○	A post-baccalaureate credentialing program (no master's degree awarded)
○	A master's program that also awarded a teaching credential
○	You do not have any formal teacher preparation

17. When did you **last participate** in professional development (sometimes called in-service education) focused on mathematics or mathematics teaching? (Include attendance at professional meetings, workshops, and conferences, as well as professional learning communities/lesson studies/teacher study groups. **Do not** include formal courses for which you received college credit or time spent **providing** professional development for other teachers.)

○	In the last 3 years	
○	4–6 years ago	*Skip to Q21*
○	7–10 years ago	*Skip to Q21*
○	More than 10 years ago	*Skip to Q21*
○	Never	*Skip to Q21*

18. In the last 3 years have you… [Select one on each row.]

	Yes	**No**
a. attended a workshop on mathematics or mathematics teaching?	○	○
b. attended a national, state, or regional mathematics teacher association meeting?	○	○
c. participated in a professional learning community/lesson study/teacher study group focused on mathematics or mathematics teaching?	○	○

19. What is the **total** amount of time you have spent on professional development in mathematics or mathematics teaching **in the last 3 years**? (Include attendance at professional meetings, workshops, and conferences, as well as professional learning communities/lesson studies/teacher study groups. **Do not** include formal courses for which you received college credit or time spent **providing** professional development for other teachers.)

○	Less than 6 hours
○	6–15 hours
○	16–35 hours
○	More than 35 hours

20. Thinking about all of your mathematics-related professional development **in the last 3 years**, to what extent does each of the following describe your experiences? [Select one on each row.]

	Not at all		**Somewhat**		**To a great extent**
a. You had opportunities to engage in mathematics investigations.	①	②	③	④	⑤
b. You had opportunities to examine classroom artifacts (for example: student work samples).	①	②	③	④	⑤
c. You had opportunities to try out what you learned in your classroom ***and*** then talk about it as part of the professional development.	①	②	③	④	⑤
d. You worked closely with other mathematics teachers from your school.	①	②	③	④	⑤
e. You worked closely with other mathematics teachers who taught the same grade and/or subject whether or not they were from your school.	①	②	③	④	⑤
f. The professional development was a waste of your time.	①	②	③	④	⑤

21. When did you last take a formal course for **college credit** in each of the following areas? Do not count courses for which you received only Continuing Education Units. [Select one on each row.]

	In the last 3 years	**4 – 6 years ago**	**7 – 10 years ago**	**More than 10 years ago**	**Never**
a. Mathematics	○	○	○	○	○
b. How to teach mathematics	○	○	○	○	○
c. Student teaching in mathematics	○	○	○	○	○
d. Student teaching in other subjects	○	○	○	○	○

22. ***[Presented only to teachers that have participated in professional development in the last three years as indicated in Q17, OR took a course in "Mathematics" or "How to teach mathematics" in the last three years as indicated in q21a/b]***

Considering all the opportunities to learn about mathematics or the teaching of mathematics (professional development and coursework) **in the last 3 years**, how much was each of the following emphasized? [Select one on each row.]

	Not at all		**Somewhat**		**To a great extent**
a. Deepening your own mathematics content knowledge	①	②	③	④	⑤
b. Learning how to use hands-on activities/manipulatives for mathematics instruction	①	②	③	④	⑤
c. Learning about difficulties that students may have with particular mathematical ideas and procedures	①	②	③	④	⑤
d. Finding out what students think or already know about the key mathematical ideas prior to instruction on those ideas	①	②	③	④	⑤
e. Implementing the mathematics textbook/program to be used in your classroom	①	②	③	④	⑤
f. Planning instruction so students at different levels of achievement can increase their understanding of the ideas targeted in each activity	①	②	③	④	⑤
g. Monitoring student understanding during mathematics instruction	①	②	③	④	⑤
h. Providing enrichment experiences for gifted students	①	②	③	④	⑤
i. Providing alternative mathematics learning experiences for students with special needs	①	②	③	④	⑤
j. Teaching mathematics to English-language learners	①	②	③	④	⑤
k. Assessing student understanding at the conclusion of instruction on a topic	①	②	③	④	⑤

23. In the last 3 years have you… [Select one on each row.]

	Yes	**No**
a. received feedback about your mathematics teaching from a mentor/coach **formally assigned** by the school or district/diocese?	○	○
b. served as a **formally assigned** mentor/coach for mathematics teaching? (Please do not include supervision of student teachers.)	○	○
c. supervised a student teacher in your classroom?	○	○
d. taught in-service workshops on mathematics or mathematics teaching ?	○	○
e. led a professional learning community/lesson study/teacher study group focused on mathematics or mathematics teaching?	○	○

24. ***[Presented to self-contained teachers only]***

Many teachers feel better prepared to teach some subjects/topics than others. How well prepared do you feel to teach each of the following **at the grade level(s) you teach**, whether or not they are currently included in your teaching responsibilities? [Select one on each row.]

	Not adequately prepared	Somewhat prepared	Fairly well prepared	Very well prepared
a. Number and Operations	①	②	③	④
b. Early Algebra	①	②	③	④
c. Geometry	①	②	③	④
d. Measurement and Data Representation	①	②	③	④
e. Science	①	②	③	④
f. Reading/Language Arts	①	②	③	④
g. Social Studies	①	②	③	④

25. ***[Presented to non-self-contained teachers only]***

Within mathematics many teachers feel better prepared to teach some topics than others. How prepared do you feel to teach each of the following topics **at the grade level(s) you teach**, whether or not they are currently included in your curriculum? [Select one on each row.]

	Not adequately prepared	Somewhat prepared	Fairly well prepared	Very well prepared
a. The number system and operations	①	②	③	④
b. Algebraic thinking	①	②	③	④
c. Functions	①	②	③	④
d. Modeling	①	②	③	④
e. Measurement	①	②	③	④
f. Geometry	①	②	③	④
g. Statistics and probability	①	②	③	④
h. Discrete mathematics	①	②	③	④

26. How well prepared do you feel to do each of the following in your mathematics instruction? [Select one on each row.]

	Not adequately prepared	Somewhat prepared	Fairly well prepared	Very well prepared
a. Plan instruction so students at different levels of achievement can increase their understanding of the ideas targeted in each activity	①	②	③	④
b. Teach mathematics to students who have learning disabilities	①	②	③	④
c. Teach mathematics to students who have physical disabilities	①	②	③	④
d. Teach mathematics to English-language learners	①	②	③	④
e. Provide enrichment opportunities for gifted students	①	②	③	④
f. Encourage students' interest in mathematics	①	②	③	④
g. Encourage participation of females in mathematics	①	②	③	④
h. Encourage participation of racial or ethnic minorities in mathematics	①	②	③	④
i. Encourage participation of students from low socioeconomic backgrounds in mathematics	①	②	③	④
j. Manage classroom discipline	①	②	③	④

27. Please provide your opinion about each of the following statements. [Select one on each row.]

	Strongly Disagree	Disagree	No Opinion	Agree	Strongly Agree
a. Students learn mathematics best in classes with students of similar abilities.	①	②	③	④	⑤
b. Inadequacies in students' mathematics background can be overcome by effective teaching.	①	②	③	④	⑤
c. It is better for mathematics instruction to focus on ideas in depth, even if that means covering fewer topics.	①	②	③	④	⑤
d. Students should be provided with the purpose for a lesson as it begins.	①	②	③	④	⑤
e. At the beginning of instruction on a mathematical idea, students should be provided with definitions for new vocabulary that will be used.	①	②	③	④	⑤
f. Teachers should explain an idea to students before having them investigate the idea.	①	②	③	④	⑤
g. Most class periods should include some review of previously covered ideas and skills.	①	②	③	④	⑤
h. Most class periods should provide opportunities for students to share their thinking and reasoning.	①	②	③	④	⑤
i. Hands-on activities/manipulatives should be used primarily to reinforce a mathematical idea that the students have already learned.	①	②	③	④	⑤
j. Students should be assigned homework most days.	①	②	③	④	⑤
k. Most class periods should conclude with a summary of the key ideas addressed.	①	②	③	④	⑤

Section B. Your Mathematics Instruction

The rest of this questionnaire is about your mathematics instruction in this class.

28. ***[Presented to non-self-contained teachers only]***
On average, how many minutes per week does this class meet? [Enter your response as a whole number (for example: 300).] __________

29. Enter the number of students for each grade represented in this class. [Enter each response as a whole number (for example: 15).]

Kindergarten	
1st grade	
2nd grade	
3rd grade	
4th grade	
5th grade	
6th grade	
7th grade	
8th grade	
9th grade	
10th grade	
11th grade	
12th grade	

30. For the students in this class, indicate the number of males and females in each of the following categories of race/ethnicity. [Enter each response as a whole number (for example: 15).]

	Males	**Females**
a. American Indian or Alaska Native		
b. Asian		
c. Black or African American		
d. Hispanic/Latino		
e. Native Hawaiian or Other Pacific Islander		
f. White		
g. Two or more races		

31. Which of the following best describes the prior mathematics achievement levels of the students in this class relative to other students in this school?

○	Mostly low achievers
○	Mostly average achievers
○	Mostly high achievers
○	A mixture of levels

32. How much control do you have over each of the following aspects of mathematics instruction in this class? [Select one on each row.]

	No Control		**Moderate Control**		**Strong Control**
a. Determining course goals and objectives	①	②	③	④	⑤
b. Selecting textbooks/modules	①	②	③	④	⑤
c. Selecting content, topics, and skills to be taught	①	②	③	④	⑤
d. Selecting teaching techniques	①	②	③	④	⑤
e. Determining the amount of homework to be assigned	①	②	③	④	⑤
f. Choosing criteria for grading student performance	①	②	③	④	⑤

33. Think about your plans for this class for the entire course/year. By the end of the course/year, how much emphasis will each of the following student objectives receive? [Select one on each row.]

	None	**Minimal emphasis**	**Moderate emphasis**	**Heavy emphasis**
a. Learning mathematical procedures and/or algorithms	①	②	③	④
b. Learning to perform computations with speed and accuracy	①	②	③	④
c. Understanding mathematical ideas	①	②	③	④
d. Learning mathematical practices (for example: considering how to approach a problem, justifying solutions)	①	②	③	④
e. Learning about real-life applications of mathematics	①	②	③	④
f. Increasing students' interest in mathematics	①	②	③	④
g. Preparing for further study in mathematics	①	②	③	④
h. Learning test taking skills/strategies	①	②	③	④

34. How often do you do each of the following in your mathematics instruction in this class? [Select one on each row.]

	Never	Rarely (for example: a few times a year)	Sometimes (for example: once or twice a month)	Often (for example: once or twice a week)	All or almost all mathematics lessons
a. Explain mathematical ideas to the whole class	①	②	③	④	⑤
b. Engage the whole class in discussions	①	②	③	④	⑤
c. Have students work in small groups	①	②	③	④	⑤
d. Provide manipulatives for students to use in problem-solving/investigations	①	②	③	④	⑤
e. Have students read from a mathematics textbook/program or other mathematics-related material in class, either aloud or to themselves	①	②	③	④	⑤
f. Have students consider multiple representations in solving a problem (for example: numbers, tables, graphs, pictures)	①	②	③	④	⑤
g. Have students explain and justify their method for solving a problem	①	②	③	④	⑤
h. Have students compare and contrast different methods for solving a problem	①	②	③	④	⑤
i. Have students develop mathematical proofs	①	②	③	④	⑤
j. Have students present their solution strategies to the rest of the class	①	②	③	④	⑤
k. Have students write their reflections (for example: in their journals) in class or for homework	①	②	③	④	⑤
l. Give tests and/or quizzes that are predominantly short-answer (for example: multiple choice, true/false, fill in the blank)	①	②	③	④	⑤
m. Give tests and/or quizzes that include constructed-response/open-ended items	①	②	③	④	⑤
n. Focus on literacy skills (for example: informational reading or writing strategies)	①	②	③	④	⑤
o. Have students practice for standardized tests	①	②	③	④	⑤
p. Have students attend presentations by guest speakers focused on mathematics in the workplace	①	②	③	④	⑤

35. Which best describes the availability of each of the following for small group (4-5 students) work in this class? [Select one on each row.]

	Do not have one per group available	**At least one per group available upon request or in another room**	**At least one per group located in your classroom**
a. Personal computers, including laptops	○	○	○
b. Hand-held computers (for example: PDAs, tablets, smartphones, iPads)	○	○	○
c. Internet access	○	○	○
d. Four-function calculators	○	○	○
e. Scientific calculators	○	○	○
f. Graphing calculators	○	○	○
g. Probes for collecting data (for example: motion sensors, temperature probes)	○	○	○
h. Classroom response system or "Clickers" (handheld devices used to respond electronically to questions in class)	○	○	○

36. For each of the following, are students expected to provide their own for use in this mathematics class? [Select one on each row.]

	Yes	**No**
a. Laptop computers	○	○
b. Hand-held computers	○	○
c. Four-function calculators	○	○
d. Scientific calculators	○	○
e. Graphing calculators	○	○

37. How often do students use each of the following instructional technologies in this mathematics class? [Select one on each row.]

	Never	**Rarely (for example: A few times a year)**	**Sometimes (for example: once or twice a month)**	**Often (for example: once or twice a week)**	**All or almost all mathematics lessons**
a. Personal computers, including laptops	①	②	③	④	⑤
b. Hand-held computers	①	②	③	④	⑤
c. Internet	①	②	③	④	⑤
d. Four-function calculators	①	②	③	④	⑤
e. Scientific calculators	①	②	③	④	⑤
f. Graphing calculators	①	②	③	④	⑤
g. Probes for collecting data	①	②	③	④	⑤
h. Classroom response system or “Clickers”	①	②	③	④	⑤

38. How often are students in this class required to take mathematics tests that you did **not** develop yourself, for example state assessments or district benchmarks? Do **not** include Advanced Placement or International Baccalaureate exams or students retaking a test because of failure.

○	Never
○	Once a year
○	Twice a year
○	Three or four times a year
○	Five or more times a year

39. How much mathematics homework do you assign to this class in a typical **week**? (Do not include time that the class spends getting started on homework during class.)

○	Fewer than 15 minutes per week
○	15–30 minutes per week
○	31–60 minutes per week
○	61–90 minutes per week
○	91–120 minutes per week
○	2–3 hours per week
○	3–4 hours per week
○	More than 4 hours per week

40. Which best describes the instructional materials students **most frequently** use in this class?

○	One commercially-published textbook or program most of the time
○	Multiple commercially-published textbooks/programs most of the time ***[Skip to Q42]***
○	Non-commercially-published instructional materials most of the time ***[Skip to Q46]***

41. Please indicate the title, author, most recent copyright year, and ISBN code of the textbook/program used by the students in this class.

- The 10- or 13-character ISBN code can be found on the copyright page and/or the back cover of your textbook/program.
- Do not include the dashes when entering the ISBN.
- An example of the location of the ISBN is shown to the right.

Title:
First Author:
Year:
ISBN:
[Skip to Q43]

42. Please indicate the title, author, most recent copyright year, and ISBN code of the commercially-published textbook/program used most often by the students in this class.

- The 10- or 13-character ISBN code can be found on the copyright page and/or the back cover of your textbook/program.
- Do not include the dashes when entering the ISBN.
- An example of the location of the ISBN is shown to the right.

Title:
First Author:
Year:
ISBN:

43. How would you rate the overall quality of this textbook/program?

○	Very poor
○	Poor
○	Fair
○	Good
○	Very good
○	Excellent

44. ***[Presented only to teachers who indicated using one commercially-published textbook/program in Q40]***
Over the course of the school year, approximately what percentage of the mathematics **instructional time** will students in this class spend using this textbook/program?

○	Less than 25%
○	25–49%
○	50–74%
○	75–90%
○	More than 90%

45. ***[Presented only to teachers who indicated using one commercially-published textbook/program in Q40]***
Approximately what percentage of the chapters/units in this textbook/program will students in this class engage with during the school year?

○	Less than 25%
○	25–49%
○	50–74%
○	75–90%
○	More than 90%

46. Mathematics courses may benefit from the availability of particular resources. Considering what you have available, how adequate is each of the following for teaching this mathematics class? [Select one on each row.]

	Not Adequate		**Somewhat Adequate**		**Adequate**
a. Instructional technology (for example: calculators, computers, probes/sensors)	①	②	③	④	⑤
b. Measurement tools (for example: protractors, rulers)	①	②	③	④	⑤
c. Manipulatives (for example: pattern blocks, algebra tiles)	①	②	③	④	⑤
d. Consumable supplies (for example: graphing paper, batteries)	①	②	③	④	⑤

47. In your opinion, how great a problem is each of the following for your mathematics instruction in this class? [Select one on each row.]

	Not a significant problem	**Somewhat of a problem**	**Serious problem**
a. Lack of access to computers	○	○	○
b. Old age of computers	○	○	○
c. Lack of access to the Internet	○	○	○
d. Unreliability of the Internet connection	○	○	○
e. Slow speed of the Internet connection	○	○	○
f. Lack of availability of appropriate computer software	○	○	○
g. Lack of availability of technology support	○	○	○

48. Please rate the effect of each of the following on your mathematics instruction in this class. [Select one on each row.]

	Inhibits effective instruction		**Neutral or Mixed**		**Promotes effective instruction**	**N/A or Don't Know**
a. Current state standards	①	②	③	④	⑤	○
b. District/Diocese curriculum frameworks ***[Not presented to non-Catholic private schools]***	①	②	③	④	⑤	○
c. District/Diocese and/or school pacing guides	①	②	③	④	⑤	○
d. State testing/accountability policies ***[Not presented to non-Catholic private schools]***	①	②	③	④	⑤	○
e. District/Diocese testing/accountability policies ***[Not presented to non-Catholic private schools]***	①	②	③	④	⑤	○
f. Textbook/program selection policies	①	②	③	④	⑤	○
g. Teacher evaluation policies	①	②	③	④	⑤	○
h. College entrance requirements ***[Presented to grades 9–12 teachers only]***	①	②	③	④	⑤	○
i. Students' motivation, interest, and effort in mathematics	①	②	③	④	⑤	○
j. Students' reading abilities	①	②	③	④	⑤	○
k. Community views on mathematics instruction	①	②	③	④	⑤	○
l. Parent expectations and involvement	①	②	③	④	⑤	○
m. Principal support	①	②	③	④	⑤	○
n. Time for you to plan, individually and with colleagues	①	②	③	④	⑤	○
o. Time available for your professional development	①	②	③	④	⑤	○

Section C. Your Most Recently Completed Mathematics Unit in this Class

The questions in this section are about the most recently completed mathematics unit in this class.

- Depending on the structure of your class and the instructional materials you use, a unit may range from a few to many class periods.
- Do not be concerned if this unit was not typical of your instruction.

49. How many class periods were devoted to instruction on the **most recently completed mathematics unit**? [Enter your response as a whole number (for example: 15).] ____________

50. Which of the following best describes the content focus of this unit?

○	Number and Operations
○	Measurement and Data Representation
○	Algebra
○	Geometry
○	Probability
○	Statistics
○	Trigonometry
○	Calculus

51. What mathematical ideas and/or skills were addressed in this unit? ____________________

52. ***[Presented only to teachers who indicated using commercially-published textbooks/programs in Q40]***
Was this unit based primarily on the commercially-published textbook/program you described earlier as the one most used in this class?

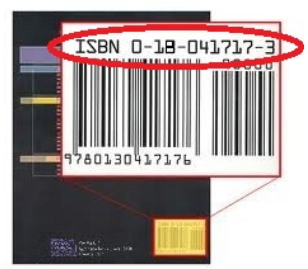
○	Yes ***[Skip to Q55]***
○	No

53. Was this unit based on a commercially-published textbook/program?

○	Yes
○	No ***[Skip to Q59]***

54. Please indicate the title, author, most recent copyright year, and ISBN code of that textbook/ program.

- The 10- or 13-character ISBN code can be found on the copyright page and/or the back cover of the textbook/module.
- Do not include the dashes when entering the ISBN.
- An example of the location of the ISBN is shown to the right.



Title:
First Author:
Year:
ISBN:

55. Please indicate the extent to which you did each of the following while teaching this unit. [Select one on each row.]

	Not at all		Somewhat		To a great extent
a. You used the textbook/program to guide the overall structure and content emphasis of the unit.	①	②	③	④	⑤
b. You followed the textbook/program to guide the detailed structure and content emphasis of the unit.	①	②	③	④	⑤
c. You picked what is important from the textbook/program and skipped the rest.	①	②	③	④	⑤
d. You incorporated activities (for example: problems, investigations, readings) from other sources to supplement what the textbook/program was lacking.	①	②	③	④	⑤

56. ***[Presented only to teachers who answered "2–5" in Q55c]***
During this unit, when you skipped activities (for example: problems, investigations, readings) in your textbook/program, how much was each of the following a factor in your decisions? [Select one on each row.]

	Not a factor	A minor factor	A major factor
a. The mathematical ideas addressed in the activities you skipped are not included in your pacing guide and/or current state standards.	①	②	③
b. You did not have the materials needed to implement the activities you skipped.	①	②	③
c. The activities you skipped were too difficult for your students.	①	②	③
d. Your students already knew the mathematical ideas or were able to learn them without the activities you skipped.	①	②	③
e. You have different activities for those mathematical ideas that work better than the ones you skipped.	①	②	③

57. ***[Presented only to teachers who answered "2–5" in Q55d]***
During this unit, when you supplemented the textbook/program with additional activities, how much was each of the following a factor in your decisions? [Select one on each row.]

	Not a factor	A minor factor	A major factor
a. Your pacing guide indicated that you should use supplemental activities.	①	②	③
b. Supplemental activities were needed to prepare students for standardized tests.	①	②	③
c. Supplemental activities were needed to provide students with additional practice.	①	②	③
d. Supplemental activities were needed so students at different levels of achievement could increase their understanding of the ideas targeted in each activity.	①	②	③

58. How well prepared did you feel to do each of the following as part of your instruction on this particular unit? [Select one on each row.]

	Not adequately prepared	Somewhat prepared	Fairly well prepared	Very well prepared
a. Anticipate difficulties that students will have with particular mathematical ideas and procedures in this unit	①	②	③	④
b. Find out what students thought or already knew about the key mathematical ideas	①	②	③	④
c. Implement the mathematics textbook/ program to be used during this unit ***[Presented only to teachers who indicated using a commercially-published textbook/program in Q52/53]***	①	②	③	④
d. Monitor student understanding during this unit	①	②	③	④
e. Assess student understanding at the conclusion of this unit	①	②	③	④

59. Which of the following did you do during this unit? [Select all that apply.]

□	Administered an assessment, task, or probe at the beginning of the unit to find out what students thought or already knew about the key mathematical ideas
□	Questioned individual students during class activities to see if they were "getting it"
□	Used information from informal assessments of the entire class (for example: asking for a show of hands, thumbs up/thumbs down, clickers, exit tickets) to see if students were "getting it"
□	Reviewed student work (for example: homework, notebooks, journals, portfolios, projects) to see if they were "getting it"
□	Administered one or more quizzes and/or tests to see if students were "getting it"
□	Had students use rubrics to examine their own or their classmates' work
□	Assigned grades to student work (for example: homework, notebooks, journals, portfolios, projects)
□	Administered one or more quizzes and/or tests to assign grades
□	Went over the correct answers to assignments, quizzes, and/or tests with the class as a whole

Section D. Your Most Recent Mathematics Lesson in this Class

The next three questions refer to the most recent mathematics lesson in this class, whether or not that instruction was part of the unit you've just been describing. Do not be concerned if this lesson included activities and/or interruptions that are not typical (for example: a test, students working on projects, a fire drill).

60. How many minutes was that lesson? [Enter your response as a non-zero whole number (for example: 50).] ____________________

61. Of these minutes, how many were spent on the following: [Enter each response as a whole number (for example: 15).]

a. Non-instructional activities (for example: attendance taking, interruptions) ____
b. Whole class activities (for example: lectures, explanations, discussions) ____
c. Small group work ___
d. Students working individually (for example: reading textbooks, completing worksheets, taking a test or quiz) ___

62. Which of the following activities took place during that mathematics lesson? [Select all that apply.]

□	Teacher explaining a mathematical idea to the whole class
□	Whole class discussion
□	Students completing textbook/worksheet problems
□	Teacher conducting a demonstration while students watched
□	Students doing hands-on/manipulative activities
□	Students reading about mathematics
□	Students using instructional technology
□	Practicing for standardized tests
□	Test or quiz
□	None of the above

Section E. Demographic Information

63. Indicate your sex:

○	Male
○	Female

64. Are you of Hispanic or Latino origin?

○	Yes
○	No

65. What is your race? [Select all that apply.]

□	American Indian or Alaska Native
□	Asian
□	Black or African American
□	Native Hawaiian or Other Pacific Islander
□	White

66. In what year were you born? [Enter your response as a whole number (for example: 1969). Do not use commas.] __________

Thank you!