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2018 NSSME+: Status of Elementary School Mathematics

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Disclaimer

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Additional Information

More details and products from the 2018 NSSME+, as well as previous iterations of the study, can be found at: http://horizon-research.com/NSSME/

TABLE OF CONTENTS

Page

LIST OF TABLES

Resources Available for Elementary Mathematics Instruction

Factors Affecting Elementary Mathematics Instruction

Introduction

In 2018, the National Science Foundation supported the sixth in a series of surveys through a grant to Horizon Research, Inc. The first survey was conducted in 1977 as part of a major assessment of science and mathematics education and consisted of a comprehensive review of the literature; case studies of 11 districts throughout the United States; and a national survey of teachers, principals, and district and state personnel. A second survey of teachers and principals was conducted in 1985–86 to identify trends since 1977. A third survey was conducted in 1993, a fourth in 2000, and a fifth in 2012. This series of studies has been known as the National Survey of Science and Mathematics Education (NSSME).

The 2018 iteration of the study included an emphasis on computer science, particularly at the high school level, which is increasingly prominent in discussions about K–12 STEM education and college and career readiness. The 2018 NSSME+ (the plus symbol reflecting the additional focus) was designed to provide up-to-date information and to identify trends in the areas of teacher background and experience, curriculum and instruction, and the availability and use of instructional resources. The research questions addressed by the study are:

1. To what extent do computer science, mathematics, and science instruction reflect what is known about effective teaching?
2. What are the characteristics of the computer science/mathematics/science teaching force in terms of race, gender, age, content background, beliefs about teaching and learning, and perceptions of preparedness?
3. What are the most commonly used textbooks/programs, and how are they used?
4. What influences teachers' decisions about content and pedagogy?
5. What formal and informal opportunities do computer science/mathematics/science teachers have for ongoing development of their knowledge and skills?
6. How are resources for computer science/mathematics/science education, including well-prepared teachers and course offerings, distributed among schools in different types of communities and different socioeconomic levels?

The 2018 NSSME+ is based on a national probability sample of schools and computer science, mathematics, and science teachers in grades K–12 in the 50 states and the District of Columbia. The sample was designed to yield national estimates of course offerings and enrollment, teacher background preparation, textbook usage, instructional techniques, and availability and use of facilities and equipment. Every eligible school and teacher in the target population had a known, positive probability of being sampled. A total of 7,600 computer science, mathematics, and science teachers in 1,273 schools across the United States participated in this study, a response rate of 78 percent.

This report describes the status of elementary (K–5 and 6th grade self-contained) mathematics education based on the responses of 972 teachers, 474 of whom teach grades K–2 (called "primary" grades in this report) and 498 of whom teach grades 3–5 and 6th grade self-contained (called "intermediate" grades). Items on the survey asked about teachers themselves (e.g.,

backgrounds and opinions) as well as about their classes. Most elementary teachers were reported to teach in self-contained classrooms; i.e., they were responsible for teaching all academic subjects to a single group of students. Each such sampled teacher was randomly assigned to 1 of 2 groups—science or mathematics—and received a questionnaire specific to that subject. Elementary mathematics teachers who do not teach self-contained classes (e.g., mathematics specialists) were asked to focus on a randomly selected class.

Details on the survey sample design, data collection and analysis procedures, and creation of composite variables[1] are included in the *Report of the 2018 NSSME+*.[2] The standard errors for the estimates presented in this report are included in parentheses in the tables. The narrative sections of the report generally point out only those differences that are substantial as well as statistically significant at the 0.05 level.

This status report of elementary school mathematics teaching is organized into major topical areas:

- Elementary mathematics teachers' backgrounds and beliefs;
- Professional development of elementary mathematics teachers;
- Elementary mathematics instruction;
- Resources available for elementary mathematics instruction; and
- Factors affecting elementary mathematics instruction.

Elementary Mathematics Teachers' Backgrounds and Beliefs

A well-prepared teaching force is essential for an effective education system. This section provides data about the nation's elementary mathematics teachers, including their course backgrounds, perceptions of preparedness, and beliefs about teaching and learning.

Teacher Characteristics

Elementary mathematics teachers in the United States are predominately white females; however, intermediate grades teachers are slightly more likely than those in the primary grades to be male (see Table 1). Roughly half of the elementary mathematics teaching force is over 40 years old, and about 1 in 4 are over 50, indicating that large numbers of teachers may be retiring in the next 10 years. One-third of elementary mathematics teachers have five or fewer years of experience teaching mathematics at the K–12 level.

[1] Factor analysis was used to create several composite variables related to key constructs measured on the questionnaires. Composite variables, which are more reliable than individual survey items, were computed to have a minimum possible value of 0 and a maximum possible value of 100.

[2] Banilower, E. R., Smith, P. S., Malzahn, K. A., Plumley, C. L., Gordon, E. M., & Hayes, M. L. (2018). *Report of the 2018 NSSME+*. Chapel Hill, NC: Horizon Research, Inc.

Table 1
Characteristics of the Elementary Mathematics Teaching Force

	PERCENT OF TEACHERS		
	ALL ELEMENTARY	PRIMARY GRADES	INTERMEDIATE GRADES
Sex			
Female	94 (1.0)	97 (0.8)	89 (1.9)
Male	6 (1.0)	3 (0.8)	11 (1.8)
Other	0 (0.1)	0 ---†	0 (0.2)
Hispanic or Latino			
Yes	10 (1.4)	11 (2.0)	8 (1.4)
No	90 (1.4)	89 (2.0)	92 (1.4)
Race			
White	89 (1.3)	88 (1.8)	92 (1.4)
Black or African American	7 (1.0)	7 (1.4)	6 (1.0)
Asian	3 (0.7)	4 (1.0)	2 (0.8)
American Indian or Alaska Native	1 (0.5)	2 (0.8)	1 (0.4)
Native Hawaiian or Other Pacific Islander	0 (0.3)	0 (0.4)	0 (0.3)
Age			
≤ 30	20 (1.6)	20 (2.0)	21 (2.2)
31–40	27 (1.8)	26 (2.2)	29 (2.3)
41–50	29 (2.1)	32 (2.9)	26 (2.5)
51–60	18 (1.3)	17 (2.0)	20 (2.1)
61+	5 (0.7)	5 (1.0)	5 (1.0)
Experience Teaching Mathematics at the K–12 Level			
0–2 years	14 (1.4)	14 (1.7)	14 (1.9)
3–5 years	17 (1.4)	15 (1.6)	20 (2.3)
6–10 years	18 (1.4)	18 (1.8)	18 (2.2)
11–20 years	33 (1.8)	34 (2.5)	32 (2.6)
≥ 21 years	17 (1.7)	18 (2.2)	16 (2.1)
Full-Time Job in Mathematics Prior to Teaching			
Yes	7 (1.1)	3 (1.1)	10 (2.0)
No	93 (1.1)	97 (1.1)	90 (2.0)

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

The vast majority of elementary mathematics teachers have had formal preparation for teaching leading to a teacher credential (see Table 2). About two-thirds received their teaching credential as part of their undergraduate program and nearly a quarter received their credential through a master's program.

Table 2
Elementary Mathematics Teachers' Paths to Certification

	PERCENT OF TEACHERS		
	ALL ELEMENTARY	PRIMARY GRADES	INTERMEDIATE GRADES
An undergraduate program leading to a bachelor's degree and a teaching credential	65 (2.2)	67 (3.1)	63 (3.2)
A master's program that also led to a teaching credential	23 (2.1)	21 (2.4)	25 (3.1)
A post-baccalaureate credentialing program (no master's degree awarded)	10 (1.5)	11 (2.1)	10 (2.1)
Has not earned a teaching credential	2 (0.6)	1 (0.6)	3 (1.0)

Content Preparedness

The *Common Core State Standards for Mathematics* (CCSSM)[3] for elementary grades call for the development of conceptual understanding of key ideas in number and operations, algebraic thinking, measurement and data, and geometry through the engagement in various mathematical practices. If elementary teachers are to effectively guide students in their exploration of mathematical concepts in these ways, they must themselves have a firm understanding of those concepts. As can be seen in Table 3, only 3 percent of elementary mathematics teachers have college degrees in mathematics or mathematics education. However, nearly all of elementary mathematics teachers have completed college coursework in mathematics content for elementary school teachers (see Table 4). Roughly half have had coursework in each of a number of areas of mathematics, including algebra and statistics. In contrast, fewer than half of elementary mathematics teachers have completed coursework in college geometry, probability, and calculus, and almost none have had coursework in discrete mathematics.

Table 3
Elementary Mathematics Teacher Degrees

	PERCENT OF TEACHERS		
	ALL ELEMENTARY	PRIMARY GRADES	INTERMEDIATE GRADES
Mathematics	1 (0.4)	1 (0.6)	2 (0.6)
Mathematics Education	2 (0.7)	1 (0.8)	2 (0.9)
Mathematics or Mathematics Education	3 (0.9)	3 (1.2)	4 (1.1)

[3] National Governors Association Center for Best Practices, & Council of Chief State School Officers (2010). *Common Core State Standards for mathematics.* Washington, DC: Author.

Table 4
Elementary Mathematics Teachers Completing Various College Courses

	PERCENT OF TEACHERS		
	ALL ELEMENTARY	PRIMARY GRADES	INTERMEDIATE GRADES
Mathematics			
Mathematics content for elementary school teachers	92 (1.1)	93 (1.4)	91 (1.6)
College algebra/trigonometry/functions	49 (2.1)	50 (2.7)	49 (2.6)
Statistics	47 (1.9)	46 (2.5)	48 (2.6)
Integrated mathematics	34 (1.6)	31 (2.1)	39 (2.1)
College geometry	32 (2.1)	33 (2.8)	31 (2.8)
Probability	25 (1.6)	23 (2.0)	28 (2.4)
Calculus	18 (1.4)	14 (1.7)	22 (2.2)
Discrete mathematics	6 (0.8)	4 (1.0)	7 (1.4)
Other upper division mathematics	14 (1.3)	13 (1.6)	16 (1.9)
Other			
Computer Science	27 (1.7)	27 (2.3)	28 (2.4)
Engineering	2 (0.5)	1 (0.5)	3 (1.0)

The National Council of Teachers of Mathematics (NCTM) has recommended that elementary mathematics teachers take college coursework in a number of different areas: number and operations (for which "mathematics for elementary teachers" can serve as a proxy), algebra, geometry, probability, and statistics.[4] As can be seen in Table 5, only 7 percent of elementary mathematics teachers have taken each of the five courses recommended by the NCTM. The typical elementary mathematics teacher has had coursework in only 1 or 2 of these 5 areas.

Table 5
Elementary Mathematics Teachers' Coursework Related to NCTM Preparation Standards

	PERCENT OF TEACHERS		
	ALL ELEMENTARY	PRIMARY GRADES	INTERMEDIATE GRADES
Courses in algebra, geometry, number and operations, probability, and statistics	7 (0.9)	7 (1.3)	7 (1.4)
Courses in 3–4 of the 5 areas	39 (1.9)	39 (2.6)	38 (2.8)
Courses in 1–2 of the 5 areas	53 (2.0)	52 (2.5)	54 (2.9)
Courses in 0 of the 5 areas	2 (0.5)	2 (0.7)	2 (0.6)

In addition to asking teachers about their college coursework, the 2018 NSSME+ asked how well prepared they feel to teach various topics. As self-contained elementary teachers are typically responsible for teaching not only mathematics, but also science, language arts, and social studies, the survey asked them to rate their preparedness to teach each of those subject areas. As can been seen in Table 6, it is clear that elementary teachers do not feel equally well prepared to teach the various subjects. Seventy-seven percent of elementary teachers feel very well prepared to teach reading/language arts, compared to 42 percent for social studies, 31 percent for science,

[4] National Council of Teachers of Mathematics. (2012). *NCTM CAEP mathematics content for elementary mathematics specialist.* Reston, VA: NCTM.

and 6 percent computer science/programming. Despite their lack of strong mathematics content preparation, elementary teachers feel relatively well prepared to teach mathematics, perhaps because they are considering instruction in areas such as number and operations, rather than topics in areas such as early algebra.

Table 6
Self-Contained Elementary Teachers' Perceptions of Their Preparedness to Teach Each Subject

	PERCENT OF TEACHERS			
	NOT ADEQUATELY PREPARED	SOMEWHAT PREPARED	FAIRLY WELL PREPARED	VERY WELL PREPARED
All Elementary				
Reading/Language Arts	0 (0.1)	3 (0.5)	19 (1.0)	77 (1.2)
Mathematics	0 (0.1)	4 (0.7)	23 (1.6)	73 (1.6)
Social Studies	3 (0.5)	15 (1.0)	39 (1.4)	42 (1.3)
Science	4 (0.8)	23 (1.8)	42 (1.9)	31 (1.9)
Computer Science/Programming	45 (1.8)	35 (1.5)	14 (1.1)	6 (0.7)
Primary Grades				
Reading/Language Arts	0 (0.2)	2 (0.5)	16 (1.3)	82 (1.4)
Mathematics	0 ---†	4 (0.9)	22 (1.9)	74 (1.9)
Social Studies	2 (0.5)	15 (1.5)	39 (1.8)	43 (1.8)
Science	3 (0.9)	22 (2.2)	44 (2.3)	31 (2.5)
Computer Science/Programming	44 (1.9)	34 (1.6)	15 (1.3)	7 (0.9)
Intermediate Grades				
Reading/Language Arts	0 (0.2)	4 (0.9)	24 (1.7)	71 (1.9)
Mathematics	0 (0.3)	4 (1.1)	24 (2.7)	72 (2.9)
Social Studies	4 (0.8)	15 (1.5)	40 (2.2)	41 (2.3)
Science	7 (1.4)	24 (2.6)	39 (2.6)	31 (2.6)
Computer Science/Programming	47 (2.8)	35 (2.4)	14 (1.4)	4 (1.0)

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

This hypothesis is supported by data from an item on the survey that asked self-contained elementary mathematics teachers to rate how well prepared they feel to teach each of a number of fundamental topics. As can be seen in Table 7, three-quarters of elementary mathematics teachers feel very well prepared to teach about number and operations, which is the same proportion that feel very well prepared to teach mathematics in general. Markedly fewer teachers feel very well prepared to teach measurement and data representation, geometry, and early algebra. Although this pattern is evident among both primary and intermediate grades teachers, intermediate grades mathematics teachers are more likely than their primary grades counterparts to feel very well prepared to teach geometry (55 vs. 44 percent, respectively) and early algebra (51 vs. 34 percent, respectively).

Table 7
Self-Contained Elementary Teachers' Perceptions of Their Preparedness to Teach Various Mathematics Topics

	PERCENT OF TEACHERS			
	NOT ADEQUATELY PREPARED	SOMEWHAT PREPARED	FAIRLY WELL PREPARED	VERY WELL PREPARED
All Elementary				
Number and Operations	0 (0.1)	2 (0.5)	23 (1.7)	74 (1.7)
Measurement and Data Representation	3 (0.5)	8 (1.1)	37 (1.8)	53 (1.8)
Geometry	4 (0.7)	12 (1.3)	35 (1.8)	49 (2.2)
Early Algebra	6 (0.9)	17 (1.2)	36 (2.1)	41 (1.9)
Primary Grades				
Number and Operations	0 (0.3)	3 (0.9)	27 (2.4)	70 (2.3)
Measurement and Data Representation	4 (0.8)	8 (1.4)	37 (2.7)	51 (2.6)
Geometry	6 (1.1)	14 (1.6)	35 (2.4)	44 (2.9)
Early Algebra	10 (1.4)	20 (2.0)	37 (2.7)	34 (2.4)
Intermediate Grades				
Number and Operations	0 ---†	1 (0.5)	18 (2.5)	80 (2.6)
Measurement and Data Representation	1 (0.5)	8 (1.7)	37 (2.6)	55 (2.8)
Geometry	1 (0.5)	10 (1.7)	35 (3.1)	55 (3.3)
Early Algebra	2 (0.8)	13 (2.0)	34 (3.3)	51 (3.1)

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

The items from Table 7 were combined into a composite variable titled Perceptions of Content Preparedness. The mean scores shown in Table 8 indicate that elementary mathematics teachers generally feel prepared to teach mathematics, with intermediate grades teachers feeling slightly more prepared than primary grades teachers.

Table 8
Mean Scores for Elementary Mathematics Teachers' Perceptions of Content Preparedness Composite

	MEAN SCORE
All Elementary	79 (0.7)
Primary Grades	76 (1.0)
Intermediate Grades	83 (0.9)

Pedagogical Preparedness

The survey asked teachers two series of items focused on their preparedness for a number of tasks associated with instruction. First, they were asked how well prepared they feel to carry out a number of tasks in instruction, including developing students' understanding and abilities, encouraging participation of students, and differentiating their instruction to meet learners' needs. Second, they were asked how well prepared they feel to carry out a number of tasks related to teaching their most recent mathematics unit, including monitoring and addressing student understanding.

As can be seen in Table 9, over half of elementary teachers feel very well prepared to encourage participation of all students in mathematics and use formative assessment to monitor students

understanding. Slightly fewer than half feel very well prepared to develop (1) students' abilities to do mathematics and (2) their conceptual understanding. In contrast, few elementary teachers feel very well prepared to incorporate students' cultural backgrounds into instruction (15 percent) and develop students' awareness of STEM careers (8 percent). The data are similar between primary and intermediate grades teachers.

Table 9
Elementary Mathematics Teachers Considering Themselves Very Well Prepared for Each of a Number of Tasks

	PERCENT OF TEACHERS		
	ALL ELEMENTARY	PRIMARY GRADES	INTERMEDIATE GRADES
Encourage participation of all students in mathematics	56 (1.6)	57 (2.2)	55 (2.5)
Use formative assessment to monitor student learning	53 (1.7)	50 (2.1)	56 (2.5)
Develop students' abilities to do mathematics (e.g., consider how to approach a problem, explain and justify solutions, create and use mathematical models)	46 (1.7)	42 (2.3)	50 (2.5)
Develop students' conceptual understanding	46 (1.6)	45 (2.3)	47 (2.6)
Encourage students' interest in mathematics	42 (1.9)	42 (2.4)	43 (2.9)
Differentiate mathematics instruction to meet the needs of diverse learners	41 (1.9)	40 (2.1)	41 (3.0)
Provide mathematics instruction that is based on students' ideas	19 (1.6)	19 (1.7)	20 (2.3)
Incorporate students' cultural backgrounds into mathematics instruction	15 (1.5)	15 (1.8)	15 (1.7)
Develop students' awareness of STEM careers	8 (1.0)	7 (1.1)	10 (1.9)

Table 10 shows the percentage of classes taught by teachers who feel very well prepared for each of a number of tasks related to monitoring and addressing student understanding in a specific mathematics unit. Teachers in the majority of elementary classes feel very well prepared to assess student understanding at the conclusion of the mathematics unit, monitor student understanding during the unit, and implement the instructional materials designated for that unit. Anticipating difficulties students may have with particular mathematical ideas and procedures and finding out what students thought or already knew about key mathematical ideas are tasks that teachers in fewer than half of elementary mathematics classes feel very well prepared to do.

Table 10
Elementary Mathematics Classes in Which Teachers Feel Very Well Prepared for Each of a Number of Tasks in the Most Recent Unit in a Designated Class

	PERCENT OF CLASSES		
	ALL ELEMENTARY	PRIMARY GRADES	INTERMEDIATE GRADES
Assess student understanding at the conclusion of this unit	64 (1.9)	63 (2.3)	65 (2.8)
Monitor student understanding during this unit	60 (1.8)	61 (2.4)	59 (2.6)
Implement the instructional materials to be used during this unit	55 (1.8)	56 (2.6)	55 (2.7)
Anticipate difficulties that students may have with particular mathematical ideas and procedures in this unit	43 (1.7)	44 (2.3)	42 (2.6)
Find out what students thought or already knew about the key mathematical ideas	42 (2.1)	42 (2.8)	42 (2.8)

Items from Table 9 and Table 10 were combined to create two composite variables: Perceptions of Pedagogical Preparedness and Perceptions of Preparedness to Implement Instruction in a

Particular Unit. As shown in Table 11, elementary teachers have relatively strong feelings of general pedagogical preparedness, but even stronger feelings of unit-specific pedagogical preparedness (mean scores of 69 and 81, respectively).

Table 11
Mean Scores for Elementary Mathematics Teachers' Perceptions of General and Unit-Specific Pedagogical Preparedness Composites

	MEAN SCORE	
	PEDAGOGICAL PREPAREDNESS	PREPAREDNESS TO IMPLEMENT INSTRUCTION IN PARTICULAR UNIT
All Elementary	69 (0.7)	81 (0.8)
Primary Grades	68 (0.8)	81 (0.9)
Intermediate Grades	70 (1.0)	81 (1.1)

Pedagogical Beliefs

Teachers were asked about their beliefs regarding effective teaching and learning in mathematics. As can be seen in Table 12, elementary mathematics teachers hold a number of views that align with what is known about effective mathematics instruction. For example, nearly all elementary mathematics teachers agree that (1) teachers should ask students to justify their mathematical thinking, (2) students should learn mathematics by doing mathematics, (3) students learn best when instruction is connected to their everyday lives, and (4) most class periods should provide opportunities for students to share their thinking and reasoning.

At the same time, many elementary mathematics teachers also hold views that are inconsistent with effective mathematics instruction. About 8 in 10 teachers believe that students should be provided with definitions for new vocabulary at the beginning of instruction on a mathematical idea. About half also believe that hands-on activities/manipulatives should be used primarily to reinforce ideas the students already learned, despite recommendations that these be used to help students develop their initial understanding of key concepts. Further, a similar proportion of elementary mathematics teachers think that students learn best in classes with students of similar abilities.

Table 12
Elementary Mathematics Teachers Agreeing† With Various Statements About Teaching and Learning

	PERCENT OF TEACHERS		
	ALL ELEMENTARY	PRIMARY GRADES	INTERMEDIATE GRADES
Reform-Oriented Beliefs			
Students learn best when instruction is connected to their everyday lives.	97 (0.6)	96 (1.1)	98 (0.9)
Students should learn mathematics by doing mathematics (e.g., considering how to approach a problem, explaining and justifying solutions, creating and using mathematical models).	97 (0.7)	97 (1.1)	97 (1.0)
Teachers should ask students to justify their mathematical thinking.	97 (0.6)	98 (0.8)	96 (1.1)
Most class periods should provide opportunities for students to share their thinking and reasoning.	96 (0.9)	96 (1.4)	96 (1.2)
Most class periods should provide opportunities for students to apply mathematical ideas to real-world contexts.	93 (1.1)	91 (2.0)	95 (1.2)
It is better for mathematics instruction to focus on ideas in depth, even if that means covering fewer topics.	77 (2.0)	76 (2.6)	77 (2.6)
Traditional Beliefs			
At the beginning of instruction on a mathematical idea, students should be provided with definitions for new mathematics vocabulary that will be used.	82 (1.6)	86 (1.8)	78 (2.9)
Hands-on activities/manipulatives should be used primarily to reinforce a mathematical idea that the students have already learned.	53 (2.5)	57 (3.1)	49 (3.5)
Students learn mathematics best in classes with students of similar abilities.	49 (2.3)	46 (2.9)	52 (3.2)
Teachers should explain an idea to students before having them investigate the idea.	34 (2.1)	35 (2.8)	33 (3.2)

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

Table 13 displays mean scores for two composite variables: Traditional Teaching Beliefs and Reform-Oriented Teaching Beliefs. These scores suggest that elementary mathematics teachers have relatively strong reform-oriented beliefs. However, traditional beliefs are also fairly prevalent among these teachers.

Table 13
Mean Scores for Elementary Mathematics Teachers' Beliefs About Teaching and Learning Composites

	MEAN SCORE	
	TRADITIONAL BELIEFS	REFORM-ORIENTED BELIEFS
All Elementary	59 (0.9)	84 (0.6)
Primary Grades	60 (1.1)	83 (0.9)
Intermediate Grades	58 (1.3)	86 (0.9)

Leadership Roles and Responsibilities

The survey also asked teachers whether they have served in various leadership roles in the profession in the last three years. As can be seen in Table 14, a relatively small proportion of elementary mathematics teachers have had each of these leadership roles. Roughly one-fourth of teachers taught a mathematics lesson for other teachers in their school to observe, observed

another teacher's mathematics lesson for the purpose of providing feedback, and supervised a student teacher in their classroom. Only about a fifth served on a school or district-wide mathematics committee, and very few have served as a formal mentor or coach for a mathematics teacher.

Table 14
Elementary Mathematics Teachers Having Various Leadership Responsibilities Within the Last Three Years

	PERCENT OF TEACHERS		
	ALL ELEMENTARY	PRIMARY GRADES	INTERMEDIATE GRADES
Taught a mathematics lesson for other teachers in their school to observe	28 (1.7)	22 (2.5)	34 (3.1)
Observed another teacher's mathematics lesson for the purpose of giving them feedback	27 (1.9)	25 (2.7)	29 (2.9)
Supervised a student teacher in their classroom	27 (2.2)	28 (3.2)	26 (3.2)
Served on a school or district/diocese-wide mathematics committee	21 (1.6)	15 (2.1)	28 (3.2)
Served as a lead teacher or department chair in mathematics	14 (1.6)	12 (2.1)	16 (2.3)
Led or co-led a workshop or professional learning community for other teachers focused on mathematics or mathematics teaching	10 (1.2)	7 (1.3)	14 (2.3)
Served as a formal mentor or coach for a mathematics teacher	6 (1.2)	3 (1.0)	9 (2.1)

Professional Development of Elementary Mathematics Teachers

Mathematics teachers, like all professionals, need opportunities to keep up with advances in their field, including both disciplinary content and how to help their students learn important mathematics content. The 2018 NSSME+ collected data on teachers' participation in professional development, as well as characteristics of the professional development.

One important measure of teachers' continuing education is how long it has been since they participated in professional development. More than 8 in 10 elementary mathematics teachers, regardless of grade band (see Table 15), have participated in mathematics-focused professional development (i.e., focused on mathematics content or the teaching of mathematics) in the last three years.

Table 15
Elementary Teachers' Most Recent Participation in Mathematics-Focused Professional Development

	PERCENT OF TEACHERS		
	ALL ELEMENTARY	PRIMARY GRADES	INTERMEDIATE GRADES
In the last 12 months	59 (2.1)	58 (2.4)	61 (2.9)
1–3 years ago	24 (2.0)	26 (2.3)	23 (2.3)
4–6 years ago	7 (1.1)	7 (1.6)	8 (1.3)
7–10 years ago	1 (0.4)	1 (0.5)	2 (0.7)
More than 10 years ago	2 (0.5)	2 (0.6)	2 (0.8)
Never	5 (1.0)	5 (1.0)	5 (1.4)

Although some involvement in professional development is better than none, brief exposure of a few hours over several years is not likely to enhance teachers' knowledge and skills in meaningful ways. Accordingly, teachers were asked about the total amount of time they have spent on professional development related to mathematics teaching in the last three years. About one-third of elementary mathematics teachers have spent less than 6 hours in mathematics-related professional development (see Table 16). Only about 1 in 7 has had more than 35 hours in the last three years.

Table 16
Time Spent by Elementary Teachers on Mathematics-Focused Professional Development in the Last Three Years

	PERCENT OF TEACHERS		
	ALL ELEMENTARY	PRIMARY GRADES	INTERMEDIATE GRADES
None	16 (1.6)	16 (1.9)	17 (2.0)
Less than 6 hours	17 (1.4)	22 (2.5)	12 (1.6)
6–15 hours	31 (1.6)	32 (2.3)	31 (2.4)
16–35 hours	22 (1.6)	19 (2.1)	24 (2.4)
36-80 hours	10 (1.1)	8 (1.2)	12 (2.1)
More than 80 hours	4 (0.6)	3 (0.8)	4 (0.9)

As to how this time is spent, the workshop is the most common form of professional development, with 94 percent of elementary mathematics teachers who have had professional development attending one in the previous three years (see Table 17). Participating in a mathematics-focused professional learning community/lesson study/teacher study group and receiving assistance or feedback from a formally designated coach/mentor are the next most prevalent activities, each experienced by about half of elementary mathematics teachers. Moreover, intermediate grades mathematics teachers are more likely than the primary grades teachers to have participated in these two professional development activities, as well as completing an online course/webinar in the last three years.

Table 17
Elementary Teachers Participating in Various Mathematics-Focused Professional Development Activities in the Last Three Years

	PERCENT OF TEACHERS†		
	ALL ELEMENTARY	PRIMARY GRADES	INTERMEDIATE GRADES
Attended a professional development program/workshop	94 (1.1)	95 (1.4)	93 (1.8)
Participated in a professional learning community/lesson study/teacher study group	53 (2.6)	46 (3.4)	61 (3.6)
Received assistance or feedback from a formally designated coach/mentor	47 (2.4)	39 (3.3)	56 (3.4)
Completed an online course/webinar	19 (1.5)	14 (1.8)	25 (2.9)
Attended a national, state, or regional mathematics teacher association meeting	13 (1.7)	11 (2.1)	15 (2.6)
Took a formal course for college credit	5 (1.1)	5 (1.3)	5 (1.7)

† Only elementary mathematics teachers indicating that they participated in mathematics-focused professional development in the last three years are included in these analyses.

It is widely agreed upon 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 providing opportunities for teachers to engage in investigations, both to learn disciplinary content and to experience inquiry-oriented learning; examine student work and other classroom artifacts for evidence of what students do and do not understand; and apply what they have learned in their classrooms and subsequently discuss how it went.[5] Accordingly, teachers who had participated in professional development in the last three years were asked a series of additional questions about the nature of those experiences.

As can be seen in Table 18, the most prevalent characteristic of mathematics-focused professional development for elementary teachers is working closely with other teachers (56–69 percent), whereas having opportunities to rehearse instructional practices during the professional development is a far less likely activity (35 percent). Fewer than half of elementary mathematics teachers have had substantial opportunities to experience lessons as their students would from the textbooks/units they use in their classroom, engage in mathematics investigations, examine classroom artifacts, and apply what they have learned in their classrooms and then discuss how it went.

Table 18

Elementary Teachers Whose Mathematics-Focused Professional Development in the Last Three Years Had Each of a Number of Characteristics to a Substantial Extent†

	PERCENT OF TEACHERS‡		
	ALL ELEMENTARY	PRIMARY GRADES	INTERMEDIATE GRADES
Worked closely with other teachers from their school	69 (2.5)	67 (3.3)	71 (3.7)
Worked closely with other teachers who taught the same grade and/or subject whether or not they were from their school	56 (2.1)	58 (2.8)	54 (3.9)
Had opportunities to experience lessons, as their students would, from the textbook/units they use in their classroom	48 (2.5)	46 (3.3)	51 (3.8)
Had opportunities to engage in mathematics investigations	46 (2.6)	43 (3.3)	51 (3.9)
Had opportunities to examine classroom artifacts (e.g., student work samples, videos of classroom instruction)	46 (2.6)	44 (3.4)	48 (3.5)
Had opportunities to apply what they learned to their classroom and then come back and talk about it as part of the professional development	44 (2.4)	44 (3.2)	45 (3.7)
Had opportunities to rehearse instructional practices during the professional development (i.e., try out, receive feedback, and reflect of those practices)	35 (2.2)	36 (3.3)	35 (3.4)

† Includes elementary mathematics teachers indicating 4 or 5 on a five-point scale ranging from 1 "not at all" to 5 "to a great extent."

‡ Only elementary mathematics teachers indicating that they participated in mathematics-focused professional development in the last three years are included in these analyses.

[5] Desimone, L. M. (2009). Improving impact studies of teachers' professional development: Toward better conceptualizations and measures. *Educational Researcher, 38*(3), 181–199.

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.

Another series of items asked about the focus of the teachers' professional development. About 6 in 10 elementary teachers have had professional growth opportunities that gave heavy emphasis to learning how to use hands-on activities/manipulatives for mathematics instruction and deepening their understanding of how mathematics is done (see Table 19). Other areas heavily emphasized were differentiating mathematics instruction to meet the needs of diverse learners (56 percent), monitoring student understanding during mathematics instruction (56 percent), and deepening their own mathematics content knowledge (51 percent). Only about 20 percent of elementary mathematics teachers' recent professional development emphasized providing mathematics instruction that integrates engineering, science, and/or computer science and incorporating students' cultural backgrounds into mathematics instruction.

Table 19

Elementary Teachers Reporting That Their Mathematics-Focused Professional Development in the Last Three Years Gave Heavy Emphasis† to Various Areas

	PERCENT OF TEACHERS‡		
	ALL ELEMENTARY	PRIMARY GRADES	INTERMEDIATE GRADES
Learning how to use hands-on activities/manipulatives for mathematics instruction	59 (2.5)	64 (3.6)	53 (3.9)
Deepening their understanding of how mathematics is done (e.g., considering how to approach a problem, explaining and justifying solutions, creating and using mathematical models)	58 (2.4)	53 (3.4)	63 (3.8)
Differentiating mathematics instruction to meet the needs of diverse learners	56 (2.7)	54 (3.7)	58 (3.4)
Monitoring student understanding during mathematics instruction	56 (2.1)	53 (3.5)	59 (3.5)
Deepening their own mathematics content knowledge	51 (2.5)	46 (3.3)	57 (3.5)
Learning about difficulties that students may have with particular mathematical ideas and procedures	47 (2.2)	43 (3.0)	53 (3.4)
Finding out what students think or already know prior to instruction on a topic	46 (2.4)	43 (3.7)	50 (3.3)
Implementing the mathematics textbook to be used in their classroom	40 (2.6)	43 (3.5)	37 (3.7)
Learning how to provide mathematics instruction that integrates engineering, science, and/or computer science	22 (2.4)	23 (3.3)	20 (2.7)
Incorporating students' cultural backgrounds into mathematics instruction	20 (1.9)	18 (2.5)	22 (2.7)

† Includes elementary mathematics teachers responding 4 or 5 on a five-point scale ranging from 1 "not at all" to 5 "to a great extent."

‡ Only elementary mathematics teachers indicating that they participated in mathematics-focused professional development in the last three years are included in these analyses.

Survey items describing the characteristics of professional development experiences and those related to the focus of the professional development were combined into two composite variables: Extent Professional Development Aligns with Elements of Effective Professional Development and Extent Professional Development Supports Student-Centered Instruction. As can be seen in Table 20, elementary mathematics teachers' professional development is only somewhat aligned with the elements of effective professional development and supportive of student-centered instruction.

Table 20
Elementary Mathematics Teacher Mean Scores for Professional Development Composites

	MEAN SCORE	
	EXTENT PROFESSIONAL DEVELOPMENT ALIGNS WITH ELEMENTS OF EFFECTIVE PROFESSIONAL DEVELOPMENT	EXTENT PROFESSIONAL DEVELOPMENT SUPPORTS STUDENT-CENTERED INSTRUCTION
All Elementary	58 (1.1)	61 (1.1)
Primary Grades	56 (1.6)	60 (1.5)
Intermediate Grades	59 (1.5)	62 (1.5)

Elementary Mathematics Instruction

The 2018 NSSME+ collected data on elementary mathematics instruction, including time spent on various subjects in the elementary grades and composition of elementary mathematics classes (e.g., gender, race/ethnicity, and prior achievement levels of students). The 2018 NSSME+ also collected data about elementary mathematics teachers' perceptions of their autonomy in making curricular and instructional decisions, as well as their instructional objectives and class activities they use in accomplishing these objectives.

Time Spent

The survey asked self-contained elementary teachers to provide information about the frequency of their mathematics instruction. As can be seen in Table 21, mathematics is taught on most or all days in nearly all classes at the elementary grades.

Table 21
Frequency With Which Self-Contained Elementary Teachers Teach Mathematics

	PERCENT OF CLASSES		
	ALL ELEMENTARY	PRIMARY GRADES	INTERMEDIATE GRADES
All/Most days, every week	99 (0.2)	99 (0.3)	100 (0.3)
Three or fewer days, every week	1 (0.2)	1 (0.3)	0 (0.3)
Some weeks, but not every week	0 (0.1)	0 (0.1)	0 ---†

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

Table 22 shows the average number of minutes per day typically spent on instruction in reading/ language arts, mathematics, science, and social studies in self-contained classes that cover all four subjects. To facilitate comparisons among the subject areas, only teachers who teach all four of these subjects to one class of students were included in the analyses. In 2018, elementary mathematics classes spent an average of 58 minutes per day on mathematics instruction, compared to 87 minutes on reading/language arts and only 20 minutes on science. The average number of minutes spent on mathematics instruction is greater in the intermediate grades than in the primary grades, with averages of 63 and 55 minutes, respectively. Over a school year, this equates to approximately 24 additional hours of mathematics instruction in the higher grades.

Table 22
Average Number of Minutes Per Day Spent Teaching Each Subject in Self-Contained Classes†

	NUMBER OF MINUTES		
	ALL ELEMENTARY	PRIMARY GRADES	INTERMEDIATE GRADES
Reading/Language Arts	87 (1.4)	89 (1.8)	85 (2.2)
Mathematics	58 (0.8)	55 (0.9)	63 (1.3)
Science	20 (0.5)	17 (0.5)	23 (0.6)
Social Studies	17 (0.4)	15 (0.5)	19 (0.6)

† Only elementary classes for which teachers indicated they teach reading, mathematics, science, and social studies to one class of students are included in these analyses.

Class Characteristics

The typical elementary mathematics class has 21 students; two-thirds of classes have between 17 and 25 students. Demographic data for elementary mathematics students are shown in Table 23.

Table 23
Demographics of Students in Elementary Mathematics Classes

	PERCENT OF STUDENTS		
	ALL ELEMENTARY	PRIMARY GRADES	INTERMEDIATE GRADES
Sex			
Male	52 (0.7)	52 (0.9)	52 (0.9)
Female	48 (0.7)	48 (0.9)	48 (0.9)
Race/Ethnicity			
White	52 (1.6)	51 (2.1)	52 (1.8)
Hispanic or Latino	19 (1.3)	19 (1.8)	19 (1.2)
Black or African American	18 (1.4)	18 (1.8)	18 (1.7)
Asian	4 (0.7)	5 (1.1)	4 (0.5)
American Indian or Alaska Native	2 (0.5)	2 (0.7)	1 (0.5)
Native Hawaiian or Other Pacific Islander	1 (0.2)	1 (0.4)	0 (0.2)
Two or more races	5 (0.4)	5 (0.6)	4 (0.4)

Elementary mathematics teachers were asked to indicate the prior achievement level of students in their class relative to other students in the school. Fifty-one percent of elementary mathematics classes are heterogeneous in terms of prior achievement; most of the remaining classes are composed primarily of average prior-achieving students (see Table 24).

Table 24
Prior Achievement Grouping in Elementary Mathematics Classes

	PERCENT OF CLASSES			
	MOSTLY LOW ACHIEVERS	MOSTLY AVERAGE ACHIEVERS	MOSTLY HIGH ACHIEVERS	A MIXTURE OF LEVELS
All Elementary	12 (1.4)	30 (1.5)	7 (1.0)	51 (1.8)
Primary Grades	8 (1.3)	35 (2.5)	6 (1.3)	51 (2.7)
Intermediate Grades	17 (2.3)	26 (2.2)	7 (1.3)	50 (2.8)

Teachers' Perceptions of Their Decision-Making Autonomy

Teachers were asked the extent to which they had control over a number of curriculum and instruction decisions for their classes. In elementary mathematics classes, teachers are more likely to perceive themselves as having strong control over pedagogical decisions, such as determining the amount of homework to be assigned and selecting teaching techniques (see Table 25). In fewer classes, teachers perceive themselves as having strong control over curriculum decisions such as selecting what content, topics, and skills to teach; and selecting curriculum materials.

Table 25
Elementary Mathematics Classes in Which Teachers Report Having Strong Control Over Various Curricular and Instructional Decisions

	PERCENT OF CLASSES		
	ALL ELEMENTARY	PRIMARY GRADES	INTERMEDIATE GRADES
Determining the amount of homework to be assigned	61 (2.2)	57 (2.8)	65 (3.0)
Selecting teaching techniques	52 (2.2)	45 (3.1)	58 (2.9)
Choosing criteria for grading student performance	34 (2.0)	24 (2.3)	42 (3.1)
Determining the amount of instructional time to spend on each topic	21 (1.8)	19 (2.4)	23 (2.6)
Selecting the sequence in which topics are covered	19 (1.7)	17 (2.2)	21 (2.3)
Determining course goals and objectives	16 (1.7)	15 (2.3)	17 (2.4)
Selecting content, topics, and skills to be taught	11 (1.3)	10 (1.9)	12 (1.8)
Selecting curriculum materials (e.g., textbooks)	11 (1.5)	8 (1.7)	14 (2.6)

Two composite variables were created from this series of items: Curriculum Control and Pedagogy Control. Curriculum Control consists of:

- Determining course goals and objectives;
- Selecting curriculum materials;
- Selecting content, topics, and skills to be taught; and
- Selecting the sequence in which topics are covered.

For Pedagogy Control, the items are:

- Selecting teaching techniques;
- Determining the amount of homework to be assigned; and
- Choosing criteria for grading student performance.

Composite scores shown in Table 26 clearly indicate that in elementary mathematics classes, teachers feel much more in control of pedagogical decisions than curriculum decisions. Also, intermediate grades teachers perceive themselves as having stronger control over pedagogical decisions than their primary counterparts (mean scores of 81 and 74, respectively).

Table 26
Elementary Mathematics Class Mean Scores for Curriculum Control and Pedagogy Control Composites

	MEAN SCORE	
	CURRICULUM CONTROL	PEDAGOGY CONTROL
All Elementary	39 (1.4)	78 (0.9)
Primary Grades	38 (1.9)	74 (1.2)
Intermediate Grades	40 (2.2)	81 (1.1)

Instructional Objectives

Teachers were given a list of potential objectives and asked to rate the emphasis they give each. As can be seen in Table 27, a large proportion of elementary mathematics classes focus heavily on understanding mathematical ideas (67 percent) and learning how to do mathematics (62 percent). In addition, roughly half of elementary mathematics classes emphasize learning mathematical algorithms/procedures. Learning test-taking skills/strategies is heavily emphasized in fewer than a third of classes; given that most accountability systems begin at 3rd grade, it is not surprising that a larger percentage of intermediate grades classes focus on this objective than primary grades classes do.

Table 27
Elementary Mathematics Classes With Heavy Emphasis on Various Instructional Objectives

	PERCENT OF CLASSES		
	ALL ELEMENTARY	PRIMARY GRADES	INTERMEDIATE GRADES
Understanding mathematical ideas	67 (1.7)	65 (2.3)	69 (2.6)
Learning how to do mathematics (e.g., consider how to approach a problem, explain and justify solutions, create and use mathematical models)	62 (1.9)	58 (2.5)	66 (2.7)
Learning mathematical procedures and/or algorithms	52 (1.7)	49 (2.3)	54 (2.4)
Increasing students' interest in mathematics	41 (1.9)	43 (2.6)	40 (3.0)
Developing students' confidence that they can successfully pursue careers in mathematics	37 (1.7)	37 (2.4)	37 (2.3)
Learning mathematics vocabulary	36 (1.7)	33 (2.4)	39 (2.7)
Learning about real-life applications of mathematics	34 (1.9)	33 (2.5)	35 (3.0)
Learning to perform computations with speed and accuracy	33 (2.1)	34 (2.6)	31 (2.5)
Learning test-taking skills/strategies	30 (1.8)	22 (2.3)	38 (2.6)

The objectives related to reform-oriented instruction (understanding mathematical ideas, learning how to do mathematics, learning about real-life applications of mathematics, increasing students' interest in mathematics, and developing students' confidence that they can successfully pursue careers in mathematics) were combined into a composite variable. Overall, scores on this composite indicate that elementary mathematics classes, in both grade bands, are likely to emphasize reform-oriented instructional objectives (see Table 28).

Table 28
Elementary Mathematics Class Mean Scores for the Reform-Oriented Instructional Objectives Composite

	MEAN SCORE
All Elementary	79 (0.6)
Primary Grades	78 (0.9)
Intermediate Grades	80 (0.8)

Class Activities

The 2018 NSSME+ included several items that provide information about how mathematics is taught at the elementary school level. One item asked how often different pedagogies (e.g., explaining ideas to students, small group work) are used. Not unexpectedly, nearly all elementary mathematics classes include the teacher explaining mathematical ideas and leading whole class discussions at least once a week (see Table 29). Having students work in small groups is also common in elementary mathematics instruction. Consistent with other survey data, the influence of accountability systems is evident in the types of class activities that occur, especially in the intermediate grades. Having students practice for standardized tests is more common in intermediate grades, whereas the use of manipulatives is more common in primary grades.

Table 29
Elementary Mathematics Classes in Which Teachers Report Using Various Activities at Least Once a Week

	PERCENT OF CLASSES		
	ALL ELEMENTARY	PRIMARY GRADES	INTERMEDIATE GRADES
Engage the whole class in discussions	95 (0.8)	95 (1.1)	95 (1.0)
Explain mathematical ideas to the whole class	95 (0.9)	95 (1.0)	94 (1.3)
Have students work in small groups	88 (1.2)	85 (1.9)	91 (1.3)
Provide manipulatives for students to use in problem-solving/investigations	78 (1.4)	90 (1.4)	67 (2.4)
Focus on literacy skills (e.g., informational reading or writing strategies)	41 (2.0)	45 (2.6)	37 (2.7)
Have students write their reflections (e.g., in their journals, on exit tickets) in class or for homework	41 (1.8)	34 (2.3)	48 (2.7)
Have students read from a textbook or other material in class, either aloud or to themselves	28 (1.7)	28 (2.2)	28 (2.4)
Have students practice for standardized tests	26 (1.7)	16 (1.8)	35 (2.6)
Use flipped instruction (have students watch lectures/demonstrations outside of class to prepare for in-class activities)	13 (1.6)	10 (1.6)	15 (2.4)

Teachers were also asked how often they engage students in the practices of mathematics described in the CCSSM, such as making sense of problems, constructing arguments, critiquing the reasoning of others, and modeling with mathematics. As can be seen in Table 30, a large proportion of elementary mathematics classes are likely to engage students in a number of aspects of these practices on a weekly basis. For example, roughly 80–90 percent of classes have students, at least once a week, develop representations of aspects of problems; determine whether their answer makes sense; provide mathematical reasoning to explain, justify, or prove their thinking; and continue working through a mathematics problem when they reach points of difficulty, challenge, or error. A number of activities are more common in intermediate grades

than in primary grades, including: develop a mathematical model to solve a mathematics problem (82 vs. 68 percent, respectively), work on challenging problems that require thinking beyond just applying rules, algorithms, or procedures (84 vs. 65 percent, respectively), analyze the mathematical reasoning of others (72 vs. 57 percent), and work on generating a rule or formula (69 vs. 48 percent, respectively).

Table 30
Elementary Mathematics Classes in Which Teachers Report Students Engaging in Various Aspects of Mathematical Practices at Least Once a Week

	PERCENT OF CLASSES		
	ALL ELEMENTARY	PRIMARY GRADES	INTERMEDIATE GRADES
Represent aspects of a problem using mathematical symbols, pictures, diagrams, tables, or objects in order to solve it	88 (1.1)	88 (1.6)	89 (1.5)
Determine whether their answer makes sense	85 (1.5)	80 (1.9)	89 (2.0)
Provide mathematical reasoning to explain, justify, or prove their thinking	85 (1.5)	82 (2.0)	89 (1.9)
Continue working through a mathematics problem when they reach points of difficulty, challenge, or error	81 (1.5)	74 (2.2)	87 (1.8)
Figure out what a challenging problem is asking	78 (1.8)	73 (2.5)	83 (2.3)
Identify patterns or characteristics of numbers, diagrams, or graphs that may be helpful in solving a mathematics problem	78 (1.5)	75 (2.4)	80 (2.0)
Develop a mathematical model to solve a mathematics problem	75 (1.8)	68 (2.4)	82 (2.2)
Reflect on their solution strategies as they work through a mathematics problem and revise as needed	75 (2.0)	70 (2.5)	79 (2.4)
Work on challenging problems that require thinking beyond just applying rules, algorithms, or procedures	74 (1.6)	65 (2.5)	84 (1.8)
Determine what units are appropriate for expressing numerical answers, data, and/or measurements	72 (1.8)	62 (2.3)	81 (2.2)
Identify relevant information and relationships that could be used to solve a mathematics problem	72 (1.8)	63 (2.7)	80 (2.2)
Determine what tools are appropriate for solving a mathematics problem	71 (1.8)	70 (2.3)	73 (2.7)
Pose questions to clarify, challenge, or improve the mathematical reasoning of others	69 (2.2)	64 (2.7)	73 (2.9)
Analyze the mathematical reasoning of others	65 (1.9)	57 (2.7)	72 (2.4)
Discuss how certain terms or phrases may have specific meanings in mathematics that are different from their meaning in everyday language	62 (1.8)	56 (2.4)	68 (2.4)
Compare and contrast different solution strategies for a mathematics problem in terms of their strengths and limitations	60 (1.9)	56 (2.7)	65 (2.5)
Work on generating a rule or formula	59 (1.9)	48 (2.6)	69 (2.4)

Table 31 shows mean scores for Engaging Students in the Practices of Mathematics composite formed from these items. Overall, students in elementary mathematics classes are often engaged in doing mathematical practices, and even more so in intermediate grades classes than in primary grades classes.

Table 31
Elementary Mathematics Class Mean Scores for Engaging Students in the Practices of Mathematics Composite

	MEAN SCORE
All Elementary	74 (0.7)
Primary Grades	70 (0.8)
Intermediate Grades	78 (0.8)

Given recent trends to incorporate computer science into mathematics instruction, the 2018 NSSME+ asked teachers how frequently they do so. Very few elementary mathematics classes incorporate coding into instruction, and when they do, it tends to be done only a few times a year (see Table 32).

Table 32
Elementary Mathematics Classes in Which Teachers Report Incorporating Coding Into Instruction

	PERCENT OF CLASSES		
	ALL ELEMENTARY	PRIMARY GRADES	INTERMEDIATE GRADES
Never	74 (2.0)	78 (2.5)	71 (2.9)
Rarely (e.g., a few times per year)	15 (1.7)	11 (2.1)	19 (2.3)
Sometimes (e.g., once or twice a month)	7 (1.1)	7 (1.4)	7 (1.7)
Often (e.g., once or twice a week)	3 (0.8)	3 (1.0)	3 (1.2)
All or almost all mathematics lessons	0 (0.3)	0 (0.5)	1 (0.4)

In addition to asking about class activities across the entire school year, the survey asked teachers about activities that took place during their most recent mathematics lesson. With only a few exceptions, the frequency of activities in primary and intermediate grades classes is fairly similar. For example, most primary and intermediate grades mathematics lessons include the explanation of a mathematical idea, whole class discussion, and students working in small groups (see Table 33). Having students watch a demonstration and complete textbook/worksheet problems are also prevalent, occurring in about three-fourths of elementary mathematics lessons. Primary and intermediate grades classes differ in the use of hands-on/manipulative activities. At the primary level, 78 percent of lessons include students doing hands-on/manipulative activities, compared to 54 percent of intermediate grades lessons. In contrast, intermediate grades mathematics lessons are more likely than their primary counterparts to have students practice for standardized tests (20 and 6 percent, respectively).

Table 33
Elementary Mathematics Classes Participating in Various Activities in Most Recent Lesson

	PERCENT OF CLASSES		
	ALL ELEMENTARY	PRIMARY GRADES	INTERMEDIATE GRADES
Teacher explaining a mathematical idea to the whole class	89 (1.3)	88 (1.7)	89 (1.7)
Whole class discussion	87 (1.5)	88 (1.6)	85 (2.3)
Students working in small groups	87 (1.4)	84 (2.2)	91 (1.6)
Teacher conducting a demonstration while students watched	78 (1.9)	82 (2.1)	76 (2.6)
Students completing textbook/worksheet problems	77 (1.6)	76 (2.3)	79 (2.2)
Students doing hands-on/manipulative activities	65 (2.1)	78 (2.3)	54 (2.8)
Students writing about mathematics	27 (1.6)	26 (2.0)	29 (2.5)
Test or quiz	18 (1.8)	14 (2.0)	21 (2.7)
Students reading about mathematics	17 (1.4)	16 (1.9)	17 (2.2)
Practicing for standardized tests	13 (1.7)	6 (1.2)	20 (2.8)

The survey also asked teachers to estimate the time spent on each of a number of types of activities in this most recent mathematics lesson. On average, there are no substantive differences between primary and intermediate grades mathematics classes (see Table 34). About one-third of class time is spent on whole class activities and small group work, and one-fourth of class time is spent on students working individually. Non-instructional activities, including attendance taking and interruptions, account for 8 percent of mathematics class time.

Table 34
Average Percentage of Time Spent on Different Activities in the Most Recent Elementary Mathematics Lesson

	AVERAGE PERCENT OF CLASS TIME		
	ALL ELEMENTARY	PRIMARY GRADES	INTERMEDIATE GRADES
Whole class activities (e.g., lectures, explanations, discussions)	35 (0.7)	36 (0.9)	35 (1.0)
Small group work	33 (0.8)	32 (1.2)	33 (1.1)
Students working individually (e.g., reading textbooks, completing worksheets, taking a test or quiz)	24 (0.6)	24 (1.0)	24 (0.9)
Non-instructional activities (e.g., attendance taking, interruptions)	8 (0.3)	8 (0.3)	8 (0.4)

Homework and Assessment Practices

Teachers were asked about the amount of mathematics homework assigned per week in their class. Most elementary mathematics classes assign 60 minutes or less of homework per week (see Table 35). However, the amount of time students are asked to spend on mathematics homework increases with grade range. Thirty-nine percent of primary grades classes, compared to 13 percent of intermediate grades classes, are assigned 15 minutes or less of homework each week. In contrast, 25 percent of intermediate grades classes are assigned more than one hour of homework each week, compared to 9 percent of their primary grades counterparts.

Table 35
Amount of Homework Assigned in Elementary Mathematics Classes Per Week

	PERCENT OF CLASSES		
	ALL ELEMENTARY	PRIMARY GRADES	INTERMEDIATE GRADES
None	9 (1.5)	14 (2.5)	4 (1.2)
1–15 minutes per week	17 (1.7)	25 (2.5)	9 (2.2)
16–30 minutes per week	25 (1.9)	30 (3.0)	21 (2.3)
31–60 minutes per week	31 (2.3)	22 (2.6)	41 (3.2)
61–90 minutes per week	11 (1.5)	6 (1.5)	15 (2.2)
91–120 minutes per week	6 (1.0)	3 (1.2)	8 (1.6)
More than 2 hours per week	1 (0.4)	0 ---†	2 (0.9)

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

The survey asked how often students in the mathematics class are required to take assessments the teachers did not develop, such as state or district benchmark assessments. Given that mathematics tends to be included in the high-stakes accountability systems of states, it is not surprising that 91 percent of all elementary mathematics classes, and nearly all intermediate grades classes, are required to take such an assessment at least once a year (see Table 36).

Table 36
Frequency of Required External Testing in Elementary Mathematics Classes

	PERCENT OF CLASSES		
	ALL ELEMENTARY	PRIMARY GRADES	INTERMEDIATE GRADES
Never	9 (1.3)	17 (2.3)	2 (0.8)
Once a year	9 (1.3)	5 (1.2)	12 (2.3)
Twice a year	9 (1.4)	13 (2.4)	5 (1.2)
Three or four times a year	48 (2.8)	47 (3.6)	50 (3.8)
Five or more times a year	25 (2.2)	18 (2.6)	31 (3.1)

Resources Available for Elementary Mathematics Instruction

The quality and availability of instructional resources are major factors affecting elementary mathematics teaching. The 2018 NSSME+ included a series of items on instructional materials—which ones teachers use and how teachers use them—as well as the adequacy of other resources for their mathematics instruction.

Instructional Materials

The 2018 NSSME+ collected data on how much latitude teachers have in selecting instructional resources. Table 37 shows that instructional materials are designated by the district for the vast majority of elementary mathematics classes.

Table 37
Elementary Mathematics Classes for Which the District Designates Instructional Materials to Be Used

	PERCENT OF CLASSES
All Elementary	91 (1.3)
Primary Grades	91 (1.6)
Intermediate Grades	91 (1.9)

Commercially published textbooks are by far the most designated type of material (see Table 38). In addition, 44 percent of classes are expected to use state- or district-developed units or lessons, and 31 percent have fee-based or free websites designated. Given the recent emphasis on personalized learning instruction and 1-to-1 technology initiatives, it is not surprising that a third of elementary mathematics classes are expected to use online materials that students work through at their own pace (e.g., i-Ready, Edgeunity).

Table 38
Elementary Mathematics Classes for Which Various Types of Instructional Resources Are Designated

	PERCENT OF CLASSES†		
	ALL ELEMENTARY	PRIMARY GRADES	INTERMEDIATE GRADES
Commercially published textbooks (printed or electronic), including the supplementary materials (e.g., worksheets) that accompany the textbooks	89 (1.4)	88 (1.9)	90 (1.7)
State, county, district, or diocese-developed units or lessons	44 (2.2)	43 (2.7)	46 (3.1)
Online units or courses that students work through at their own pace (e.g., i-Ready, Edgenuity)	33 (2.0)	30 (2.8)	36 (3.0)
Lessons or resources from websites that have a subscription fee or per lesson cost (e.g., BrainPOP, Discovery Ed, Teachers Pay Teachers)	31 (2.0)	33 (2.9)	29 (2.2)
Lessons or resources from websites that are free (e.g., Khan Academy, Illustrative Math)	28 (1.8)	25 (2.3)	30 (2.7)

† Only elementary mathematics classes for which instructional materials are designated by the state, district, or diocese are included in these analyses.

Regardless of whether instructional materials had been designated for their class, elementary mathematics teachers were asked how often instruction was based on various types of materials. As can be seen in Table 39, commercially published textbooks are used at least once a week in over three-fourths of elementary classes, considerably more often than any other resource. Lessons or resources from fee-based websites and those developed by teachers themselves or the state, county, or district are also commonly used (serving as the basis of instruction at least once a week in 41–54 percent of classes). In addition, intermediate grades classes are more likely than their primary grades counterparts to use lessons or resources from websites that are free and online units or courses that students work through at their own pace.

Table 39
Elementary Mathematics Classes Basing Instruction on Various Instructional Resources at Least Once a Week

	PERCENT OF CLASSES		
	ALL ELEMENTARY	PRIMARY GRADES	INTERMEDIATE GRADES
Commercially published textbooks (printed or electronic), including the supplementary materials (e.g., worksheets) that accompany the textbooks	76 (2.0)	75 (2.7)	77 (2.6)
Lessons or resources from websites that have a subscription fee or per lesson cost (e.g., BrainPOP, Discovery Ed, Teachers Pay Teachers)	54 (2.1)	56 (2.6)	52 (2.6)
Units or lessons you created (either by yourself or with others)	44 (2.0)	42 (2.5)	46 (2.9)
State, county, district, or diocese-developed units or lessons	41 (1.8)	40 (2.5)	41 (2.5)
Lessons or resources from websites that are free (e.g., Khan Academy, Illustrative Math)	37 (1.9)	29 (1.9)	45 (2.9)
Online units or courses that students work through at their own pace (e.g., i-Ready, Edgenuity)	36 (2.1)	29 (2.6)	41 (2.9)
Units or lessons you collected from any other source (e.g., conferences, journals, colleagues, university or museum partners)	30 (1.8)	29 (2.2)	32 (2.8)

Teachers who indicated that they used commercially published textbooks were asked to record the title, author, year, and ISBN of the material used most often in the class. The most commonly used elementary mathematics materials are *Go Math!* (Houghton Mifflin Harcourt) and *Envision Math* (Pearson).

Table 40 shows the publication year of commercially published textbooks used in elementary mathematics classes. Over half of elementary classes are using textbooks published within the last five years.

Table 40
Publication Year of Textbooks/Programs Used in Elementary Mathematics Classes

	PERCENT OF CLASSES†		
	ALL ELEMENTARY	PRIMARY GRADES	INTERMEDIATE GRADES
2009 or earlier	13 (2.0)	11 (2.1)	15 (2.8)
2010–12	32 (2.4)	35 (3.6)	29 (3.4)
2013–15	46 (3.1)	42 (4.1)	49 (4.1)
2016–18	9 (1.8)	12 (2.6)	7 (2.0)

† Only elementary mathematics classes using commercially published textbooks/programs are included in these analyses.

Teachers were also asked whether the most recent unit was based primarily on either a commercially published textbook or materials developed by the state or district. Consistent with earlier findings, a large proportion of elementary mathematics classes are based on such materials (see Table 41).

Table 41
Elementary Mathematics Classes in Which the Most Recent Unit Was Based on a Commercially Published Textbook or a Material Developed by the State or District

	PERCENT OF CLASSES†
All Elementary	81 (1.5)
Primary Grades	83 (2.0)
Intermediate Grades	80 (2.2)

† Only elementary mathematics classes using commercially published or state/district-developed materials at least once a month are included in these analyses.

As can be seen in Table 42, commercially published textbooks and state/district-developed materials heavily influence elementary mathematics instruction. Teachers in 87 percent of elementary mathematics classes use these instructional materials to guide the overall structure and content emphasis of their units. It is also clear that elementary mathematics teachers deviate from their materials substantially when designing instruction. In about two-thirds of mathematics classes, teachers substantially incorporate activities from other sources and modify activities from the materials.

Table 42
Ways Elementary Mathematics Teachers Substantially† Used Their Materials in Most Recent Unit

	PERCENT OF CLASSES‡		
	ALL ELEMENTARY	PRIMARY GRADES	INTERMEDIATE GRADES
I used these materials to guide the structure and content emphasis of the unit.	87 (1.6)	90 (1.9)	84 (2.2)
I incorporated activities (e.g., problems, investigations, readings) from other sources to supplement what these materials were lacking.	69 (1.9)	66 (2.7)	71 (2.5)
I modified activities from these materials.	61 (2.4)	56 (3.3)	65 (3.1)
I picked what is important from these materials and skipped the rest.	49 (2.5)	41 (3.1)	56 (3.5)

† Includes elementary mathematics teachers indicating 4 or 5 on a five-point scale ranging from 1 "not at all" to 5 "to a great extent."
‡ Only elementary mathematics classes in which the most recent unit was based on commercially published or state/district-developed materials are included in these analyses.

Teachers in roughly half of elementary mathematics classes also skip activities in the material regularly. When teachers skip parts of the materials, it is most often because they have another activity that works better than the one skipped (see Table 43). Other reasons for skipping parts of the materials include students already knowing the content (67 percent of classes) and not having enough instructional time (61 percent). In addition, teachers of intermediate grades classes are more likely than their primary counterparts to skip activities because the ideas are not in their pacing guides/state standards (71 and 58 percent, respectively).

Table 43
Reasons Why Parts of Elementary Mathematics Materials Are Skipped

	PERCENT OF CLASSES†		
	ALL ELEMENTARY	PRIMARY GRADES	INTERMEDIATE GRADES
I have different activities for those mathematical ideas that work better than the ones I skipped.	80 (2.2)	77 (3.6)	83 (2.7)
My students already knew the mathematical ideas or were able to learn them without the activities I skipped.	67 (2.9)	68 (4.4)	66 (4.0)
The mathematical ideas addressed in the activities I skipped are not included in my pacing guide/standards.	65 (2.8)	58 (4.2)	71 (3.9)
I did not have enough instructional time for the activities I skipped.	61 (3.1)	58 (4.3)	63 (4.0)
The activities I skipped were too difficult for my students.	38 (2.8)	43 (3.8)	35 (4.0)
I did not have the materials needed to implement the activities skipped.	26 (2.3)	29 (3.7)	24 (3.7)
I did not have the knowledge needed to implement the activities I skipped.	9 (2.5)	9 (2.6)	9 (3.3)

† Only elementary mathematics classes in which (1) the most recent unit was based on commercially published or state/district-developed materials and (2) teachers reported skipping some activities are included in these analyses.

Teachers in nearly all elementary mathematics classes that supplement their instructional materials do so to provide students with additional practice and differentiate instruction for students at different achievement levels (see Table 44). Once again, the influence of standardized testing in the upper elementary grades is evident as intermediate grades classes are more likely than primary grades classes to use supplemental activities for test preparation purposes (71 vs. 49 percent, respectively).

Table 44
Reasons Why Elementary Mathematics Materials Are Supplemented

	PERCENT OF CLASSES†		
	ALL ELEMENTARY	PRIMARY GRADES	INTERMEDIATE GRADES
Supplemental activities were needed to provide students with additional practice.	95 (1.0)	96 (1.5)	94 (1.6)
Supplemental activities were needed so students at different levels of achievement could increase their understanding of the ideas targeted in each activity.	94 (1.3)	91 (2.0)	96 (1.3)
I had additional activities that I liked.	80 (2.0)	83 (2.6)	78 (3.2)
Supplemental activities were needed to prepare students for standardized tests.	60 (2.9)	49 (4.1)	71 (3.8)
My pacing guide indicated that I should use supplemental activities.	45 (3.0)	46 (3.8)	44 (4.0)

† Only elementary mathematics classes in which (1) the most recent unit was based on commercially published or state/district-developed materials and (2) teachers reported supplementing some activities are included in these analyses.

Finally, when teachers indicated that they modified their instructional materials, they rated each of several factors that may have contributed to their decision. Teachers in about half of these elementary mathematics classes cited that the original activities were either too difficult or too easy conceptually for their students or that they did not have enough instructional time to implement the activities as designed (see Table 45). Not having the necessary materials/supplies for the original activities was the reason for modification in about one-fourth of all elementary mathematics classes.

Table 45
Reasons Why Elementary Mathematics Materials Are Modified

	PERCENT OF CLASSES†		
	ALL ELEMENTARY	PRIMARY GRADES	INTERMEDIATE GRADES
I did not have enough instructional time to implement the activities as designed.	52 (2.7)	48 (3.9)	56 (3.3)
The original activities were too easy conceptually for my students.	52 (3.2)	51 (3.5)	52 (4.3)
The original activities were too difficult conceptually for my students.	50 (3.1)	48 (3.5)	52 (4.7)
The original activities were too structured for my students.	32 (2.4)	34 (3.3)	31 (3.6)
The original activities were not structured enough for my students.	31 (2.5)	33 (3.6)	30 (4.0)
I did not have the necessary materials/supplies for the original activities.	27 (2.4)	30 (3.5)	25 (3.4)

† Only elementary mathematics classes in which (1) the most recent unit was based on commercially published or state/district-developed materials and (2) teachers reported modifying some activities are included in these analyses.

Other Elementary Mathematics Instructional Resources

When asked about the adequacy of resources for instruction, teachers in large majorities of elementary mathematics classes, though more so in the primary grades than the immediate grades, rated their manipulatives as adequate. In contrast, measurement tools are more likely to be rated as adequate by teachers in intermediate grades than by their primary counterparts (see Table 46). Instructional technology and consumable supplies were rated as adequate by teachers in two-thirds of elementary classes.

Table 46
Adequacy† of Resources for Elementary Mathematics Instruction

	PERCENT OF CLASSES		
	ALL ELEMENTARY	PRIMARY GRADES	INTERMEDIATE GRADES
Manipulatives (e.g., pattern blocks, algebra tiles)	87 (1.8)	92 (1.9)	82 (2.5)
Measurement tools (e.g., protractors, rulers)	79 (1.7)	74 (2.8)	84 (2.2)
Instructional technology (e.g., calculators, computers, probes/sensors)	67 (2.0)	63 (3.1)	71 (2.6)
Consumable supplies (e.g., graphing paper, batteries)	65 (2.5)	62 (3.4)	67 (3.1)

† Includes elementary mathematics teachers indicating 4 or 5 on a five-point scale ranging from 1 "not adequate" to 5 "adequate."

These items were combined into a composite variable named Adequacy of Resources for Instruction. As can be seen in Table 47, teachers of elementary mathematics classrooms have positive views about their resources for teaching mathematics.

Table 47
Elementary Mathematics Class Mean Scores for the Adequacy of Resources for Instruction Composite

	MEAN SCORE
All Elementary	80 (1.0)
Primary Grades	79 (1.4)
Intermediate Grades	80 (1.5)

Factors Affecting Elementary Mathematics Instruction

Although the primary focus of the 2018 NSSME+ was on teachers and teaching, the study also collected information on the context of classroom practice. The survey included items asking teachers how various factors affect their instruction.

The amount of time available for elementary mathematics instruction was rated as the greatest promoter of effective instruction (see Table 48). Current state standards, principal support, amount of time for teachers to plan, individually and with colleagues, and students' prior knowledge and skills are seen as promoting mathematics instruction in 70 percent or more of elementary mathematics classes. In addition, at the primary level, more so than the intermediate level, student motivation, interest, and effort in mathematics and parent/guardian expectations and involvement are also seen as factors promoting effective instruction. State/district testing/ accountability policies and textbook selection policies are seen as promoting effective instruction in only about 40 percent of elementary mathematics classes.

Table 48
Factors Promoting† Effective Instruction in Elementary Mathematics Classes

	PERCENT OF CLASSES		
	ALL ELEMENTARY	PRIMARY GRADES	INTERMEDIATE GRADES
Amount of instructional time devoted to mathematics	84 (1.8)	85 (2.4)	82 (2.3)
Current state standards	79 (1.9)	78 (2.6)	79 (2.7)
Principal support	78 (2.0)	77 (2.8)	78 (2.6)
Amount of time for you to plan, individually and with colleagues	71 (2.3)	73 (3.1)	68 (3.3)
Students' motivation, interest, and effort in mathematics	71 (2.2)	78 (2.6)	64 (3.2)
Students' prior knowledge and skills	70 (2.3)	73 (3.1)	67 (3.0)
District/Diocese/School pacing guides	65 (2.0)	68 (2.9)	62 (3.1)
Amount of time available for your professional development	59 (2.3)	58 (3.4)	59 (2.8)
Parent/guardian expectations and involvement	53 (2.1)	60 (2.7)	47 (3.1)
Teacher evaluation policies	49 (2.6)	51 (3.2)	48 (3.7)
State/district/diocese testing/accountability policies‡	44 (2.2)	48 (3.2)	42 (3.1)
Textbook selection policies	42 (2.3)	39 (2.8)	46 (3.3)

† Includes elementary mathematics teachers indicating 4 or 5 on a five-point scale ranging from 1 "inhibits effective instruction" to 5 "promotes effective instruction."

‡ This item was presented only to teachers in public and Catholic schools.

Three composites from the items in Table 48 were created to summarize the extent to which various factors support effective instruction: (1) Extent to Which School Support Promotes Effective Instruction (i.e., amount of time for professional development, and amount of planning time); (2) Extent to Which the Policy Environment Promotes Effective Instruction (i.e., testing/ accountability, textbook selection, pacing guides, teacher evaluation, and current state standards); and (3) Extent to Which Stakeholders Promote Effective Instruction (i.e., students' motivation and interest, students' prior knowledge, parent/guardian expectations and involvement). The means are shown in Table 49. Overall, these data indicate that the climate is generally supportive for elementary mathematics instruction. Additionally, stakeholder support is more likely to be seen as promoting effective mathematics instruction in primary grades than in intermediate grades.

Table 49
Elementary Mathematics Class Mean Scores on Factors Affecting Instruction Composites

	MEAN SCORE		
	ALL ELEMENTARY	PRIMARY GRADES	INTERMEDIATE GRADES
Extent to Which School Support Promotes Effective Instruction	72 (1.4)	73 (2.0)	71 (1.8)
Extent to Which Stakeholders Promote Effective Instruction	71 (1.2)	75 (1.6)	66 (1.8)
Extent to Which the Policy Environment Promotes Effective Instruction	68 (1.0)	69 (1.4)	67 (1.2)

Summary

Nearly all elementary mathematics teachers are white females; however, intermediate teachers are slightly more likely than primary grades teachers to be male. In terms of teaching experience, about a third of elementary mathematics teachers are in their first five years of teaching. Only 3 percent have a degree in mathematics or the teaching of mathematics, and fewer than 10 percent have taken each of the five college mathematics courses recommended by the NCTM. Despite their lack of strong mathematics content preparation, the majority of elementary mathematics teachers feel very well prepared to teach fundamental topics such as number and operations. Intermediate grades mathematics teachers are more likely than their primary grades counterparts to feel well prepared to teach geometry and early algebra.

In terms of pedagogical preparedness, over half of elementary mathematics teachers feel very well prepared to encourage participation of all students in mathematics and use formative assessment to monitor student understanding. Fewer than half feel very well prepared to develop students' conceptual understanding or their abilities to do mathematics, encourage student interest, differentiate instruction to meet the needs of diverse learners, or incorporate students' cultural backgrounds into instruction. In addition, data on elementary teachers' beliefs about effective teaching show a dichotomy. On the one hand, a large majority hold a number of beliefs about teaching and learning that are in alignment with what is known about effective mathematics instruction (e.g., students should learn mathematics by doing mathematics). On the other hand, a substantial proportion holds views inconsistent with this research (e.g., students should be provided with definitions for new vocabulary at the beginning of instruction on an idea).

When asked about their professional development experiences, the vast majority of elementary mathematics teachers have participated in mathematics-focused professional development in the last three years. However, only about 1 in 10 have had sustained professional development (more than 35 hours) in that time period. The most prevalent characteristic of professional development is working closely with other teachers, whereas having opportunities to rehearse instructional practices during the professional development is a far less common activity. About 6 in 10 elementary teachers have had professional development with a heavy emphasis on learning how to use manipulatives for instruction and deepening their understanding of how mathematics is done. Only a fifth have had professional development with a heavy emphasis to learning how to incorporate students' cultural backgrounds into mathematics instruction, which may explain why only a small proportion of elementary teachers feel very well prepared to use culturally responsive pedagogy in their classrooms.

Elementary mathematics teachers feel much more in control of pedagogical decisions, such as determining the amount of homework to be assigned, than curriculum decisions, such as determining course goals and objectives. Data on instruction indicate that elementary mathematics instruction relies heavily on the explanation of ideas and whole group discussion, with students often completing textbook/worksheet problems. However, the data also indicate that students are engaged in practices consistent with the CCSSM, such as providing mathematical reasoning to explain, justify, or prove their thinking and determining whether answers make sense on a weekly basis. The influence of high-stakes assessments on mathematics instruction is also evident, especially in the intermediate grades. For example, a

larger percentage of intermediate grades classes than primary grades classes tend to focus on learning test-taking skills/strategies, and are more likely to have students practice taking standardized tests. In contrast, the use of hands-on/manipulative activities is more prevalent in primary mathematics classes.

The vast majority of elementary mathematics classes use commercially published instructional materials, with 3 in 4 mathematics classes relying heavily on them. However, the data also suggest that elementary mathematics teachers deviate from their instructional materials by supplementing, skipping parts, and modifying activities. Common reasons for supplementing materials include being able to differentiate instruction for students of different achievement levels, providing students with additional practice, and test preparation. When teachers skip parts of the materials, it is most often because they have another activity that works better than the one skipped. Further, most teachers tend to modify materials when the original activities are either too difficult or too easy conceptually for their students or if they do not have enough instructional time to implement the activities as designed.

Teachers in a majority of elementary mathematics classes believe the resources they have for instruction (i.e., manipulatives, measurement tools, instructional technology, and consumable supplies) are adequate. In addition, in 70 percent or more of elementary classes, teachers believe current state standards, principal support, amount of time for teachers to plan (individually and with colleagues), and students' prior knowledge and skills promote effective mathematics instruction.