NSSME | THE NATIONAL SURVEY OF SCIENCE & MATHEMATICS EDUCATION

2018 NSSME+ Compendium of Tables for High School Physics

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horizon RESEARCH, INC.

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/

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INTRODUCTION

In 2018, the National Science Foundation supported the sixth in a series of surveys through a grant to Horizon Research, Inc. (HRI). 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?

Data for the study come from six instruments:

School-level questionnaires

1. School Coordinator Questionnaire;
2. Mathematics Program Questionnaire;
3. Science Program Questionnaire;

Teacher-level questionnaires

4. High School Computer Science Teacher Questionnaire;[1]
5. Mathematics Teacher Questionnaire; and
6. Science Teacher Questionnaire.

The design and implementation of the 2018 NSSME+ involved developing a sampling strategy and selecting samples of schools and teachers, developing and piloting survey instruments, collecting data from sample members, and preparing data files and analyzing the data. These activities are described below, followed by an overview of the contents of the remainder of the report.

Sample Design and Sampling Error Considerations

The 2018 NSSME+ is based on a national probability sample of schools and science, mathematics, and computer 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.

The sample design involved clustering and stratification prior to sample selection. The first stage units consisted of elementary and secondary schools. Science, mathematics, and computer science teachers constituted the second stage units. The target sample sizes were designed to be large enough to allow sub-domain estimates, such as for particular regions or types of community.

The sampling frame for the school sample was constructed from the Common Core of Data and Private School Survey databases—programs of the U.S. Department of Education's National Center for Education Statistics—which include school name and address and information about the school needed for stratification and sample selection. The sampling frame for the teacher sample was constructed from lists provided by sample schools, identifying current teachers and the specific science, mathematics, and computer science subjects they were teaching.

Because biology is by far the most common science course at the high school level, selecting a random sample of science teachers would result in a much larger number of biology teachers than chemistry or physics teachers. Similarly, random selection of mathematics teachers might result in a smaller than desired sample of teachers of advanced mathematics courses. In order to ensure that the sample would include a sufficient number of advanced science and mathematics teachers for separate analysis, information on teaching assignments was used to create separate domains (e.g., for teachers of chemistry and physics), and sampling rates were adjusted by domain. In addition, because the number of computer science teachers in high schools is small

[1] Based on the recommendation of the project's Advisory Board, high school computer science was defined for this study as courses that teach programming or have programming as a prerequisite.

compared to the number of science and mathematics teachers, all high school teachers who taught computer science were sampled for that subject.

The study design included obtaining in-depth information from each teacher about curriculum and instruction in a single, randomly selected class. 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. Most secondary teachers in the sample taught several classes of a single subject. Some secondary teachers taught multiple subjects addressed by the study. If such a teacher taught high school computer science, s/he was selected to respond to the computer science questionnaire; if s/he taught science and mathematics, s/he was randomly assigned to receive the science or mathematics teacher questionnaire. In addition, for all teachers responsible for more than one class in their designated subject area, one class was randomly selected.

Whenever a sample is anything other than a simple random sample of a population, the results must be weighted to take the sample design into account. In the 2018 NSSME+, the weight for each respondent was calculated as the inverse of the probability of selecting the individual into the sample multiplied by a non-response adjustment factor.[2] In the case of data about a randomly selected class, the teacher weight was adjusted to reflect the number of classes taught in that subject, and therefore, the probability of a particular class being selected. Detailed information about the sample design, weighting procedures, and non-response adjustments used in the 2018 NSSME+ can be found in Appendix A of the Report of the 2018 NSSME+.[3]

The results of any survey based on a sample of a population (rather than on the entire population) are subject to sampling variability. The sampling error (or standard error) provides a measure of the range within which a sample estimate can be expected to fall a certain proportion of the time. For example, it may be estimated that 7 percent of all elementary mathematics lessons involve the use of computers. If it is determined that the sampling error for this estimate was 1 percent, then according to the Central Limit Theorem, 95 percent of all possible samples of that same size selected in the same way would yield computer usage estimates between 5 percent and 9 percent (that is, 7 percent ± 2 standard error units).

In survey research, the decision to obtain information from a sample rather than from the entire population is made in the interest of reducing costs, in terms of both money and the burden on the population to be surveyed. The particular sample design chosen is the one that is expected to yield the most accurate information for the least cost. It is important to realize that, other things being equal, estimates based on small sample sizes are subject to larger standard errors than those based on large samples. Also, for the same sample design and sample size, the closer a percentage is to zero or 100, the smaller the standard error. The standard errors for the estimates

[2] The aim of non-response adjustments is to reduce possible bias by distributing the non-respondent weights among the respondents expected to be most similar to these non-respondents. In this study, adjustment was made by region, school metro status, grade level, type (public, catholic, other private), and student body race/ethnicity.

[3] 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.

presented in this report are included in parentheses in the tables. All population estimates presented in this report were computed using weighted data.

Instrument Development

Because one purpose of the 2018 NSSME+ was to identify trends in science and mathematics education, the process of developing survey instruments began with the questionnaires that were used in the 2012 NSSME. The project's Advisory Board, composed of experienced researchers in computer science, science, and mathematics education, reviewed the 2012 questionnaires and made recommendations about retaining or deleting particular items. Additional items that were needed to provide important information about the current status of computer science, science, and mathematics education were also considered.

Preliminary drafts of the questionnaires were sent to the professional organizations that endorsed the study for review, including the American Federation of Teachers, the Computer Science Teachers Association, the National Council of Teachers of Mathematics, the National Education Association, and the National Science Teachers Association.

The survey instruments were revised based on feedback from the various reviewers, field tested, and revised again. The instrument development process was lengthy, constantly compromising between information needs and data collection constraints. There were several iterations, including rounds of cognitive interviews with teachers and revisions to help ensure that individual items were clear and unambiguous and that the survey as a whole would provide the necessary information with the least possible burden on participants. Lastly, because of the large number of questions stakeholders (e.g., advisors, endorsers) wanted to include in the study, all teachers sampled for science or mathematics teacher responded to a core set of items plus 1 of 3 sets of items randomly assigned to respondents. The relatively small sample size of high school computer science teachers would not support random assignment of items, thus these teachers were presented only with core items. A copy of the science teacher questionnaire is included in this compendium.

Data Collection

HRI secured permission for the study from education officials at various levels. First, notification letters were mailed to the Chief State School Officers. Similar letters were subsequently mailed to superintendents of districts including sampled public schools and diocesan offices of sampled Catholic schools, identifying the schools in the district that had been selected for the survey. (Information about this pre-survey mail-out is included in Appendix B of the Report of the 2018 NSSME+.) Copies of the survey instruments and additional information about the study were provided when requested.

Principals received a mailing asking them to log on to the study website and designate a school contact person or "school coordinator." The school coordinator designation page was designed to confirm the principal's contact information, as well as to obtain the name, title, phone number, and email address of the coordinator. (The mailing also included a printed copy of the form and postage-paid return envelope.) Of the 2,000 target slots, 1,273 schools were successfully recruited; 41 slots were ineligible (e.g., the school had closed, should have been excluded from the sampling frame, merged with another school already in the sample). Thus, 65 percent of eligible slots were filled.

An incentive system was developed to encourage school and teacher participation in the survey. School coordinators were offered an honorarium of up to $200 ($100 for completing a teacher list and school questionnaire, $15 for completing each program questionnaire (optional), and $10 for each completed teacher questionnaire). Teachers were offered a $25 honorarium for completing the teacher questionnaire.

Survey invitation letters were mailed to teachers beginning in February 2018. In addition to the incentives described, phone calls and emails to school coordinators were used to encourage non-respondents to complete the questionnaires. In May 2018, a final questionnaire invitation mailing was sent to teachers who had not yet completed their questionnaires. The teacher response rate was 78 percent. The response rate for the school-level questionnaires was 86 percent. A detailed description of the data collection procedures is included in Appendix B of the Report of the 2018 NSSME+.

Structure of This Compendium

The 2018 NSSME+ Compendium of Tables for High School Physics contains the Science Teacher Questionnaire and corresponding tables. The analyses are based on 479 high school teachers whose teaching schedule includes at least one physics course. Furthermore, science teachers assigned to teach both physics and other science classes may have been asked about any of their classes so the number of physics classes included in the analyses involving class-level data is smaller (309) than the number of responding teachers of physics. Table numbers correspond to the questionnaire item numbers. Results are expressed in terms of percentages or means, with standard errors in parentheses.

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
◻	I 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 other teachers (for example: a science specialist or a teacher you team with). ***[Presented only to teachers who answered in Q2 that they teach science]***
○	This class receives science instruction only from another teacher (for example: a science specialist or a teacher you team with). ***[Presented only to teachers who answered in Q2 that they do not currently teach science] [Teacher ineligible, exit survey]***
○	This class does not receive science instruction this year. ***[Presented only to teachers who answered in Q2 that they do not currently teach science] [Teacher ineligible, exit survey]***

4. Omitted – Used only for survey routing.

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 not every day of the week.
○	I teach science some weeks, but typically not every week. ***[Skip to Q7]***

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		

7. *[Presented only to self-contained teachers who did not answer Q6]*
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		
a. Reading/Language Arts		

8. *[Presented to non-self-contained teachers only]*
In a typical week, how many different classes (sections) of each of the following are you currently teaching? [Select one on each row.]
   - 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.

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

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

For each science class you currently 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 ENROLLED
Your 1st science class:		
Your 2nd science class:		
…		
Your 10th science class:		

COURSE TYPE LIST	
1	Science (Grades K–5)
2	Life Science (Grades 6–8)
3	Earth/Space Science (Grades 6–8)
4	Physical Science (Grades 6–8)
5	General or Integrated Science (Grades 6–8)
6	Multi-discipline science courses (for example: General Science, Integrated Science, 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)

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

Use the descriptions below to select the level that best describes the content addressed in each grades 9–12 science class you teach. [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 Q9]*	○	○	○
Your 2nd science class:		○	○	○
…				
Your 10th science class:		○	○	○

11. ***[Presented to non-self-contained teachers only]***
Later in this questionnaire, we will ask you questions about your *[[x^th]]* science class, which you indicated was *[[level indicated in Q10]] [[course type indicated in Q9]]*. What is your school's title for this course? ______________________________________

12. 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. Do not include endorsements or certificates.) [Select one on each row.]

		YES	NO
a.	Education (general or subject specific such as science education)	○	○
b.	Engineering	○	○
c.	Natural Sciences (for example: biology, chemistry, physics, Earth sciences)	○	○
d.	Other, including social sciences; please specify ____________________	○	○

13. ***[Presented only to teachers that selected "Yes" for Q12a]***
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. ___________

14. ***[Presented only to teachers that selected "Yes" for Q12b]***
What type of engineering degree do you have? (With regard to bachelor's degrees, count only areas in which you majored.) [Select all that apply.]

□	Aerospace/Aeronautical/Astronautical Engineering
□	Bioengineering/Biomedical Engineering
□	Chemical Engineering
□	Civil Engineering
□	Computer Engineering
□	Electrical/Electronics Engineering
□	Environmental Engineering
□	Industrial/Manufacturing Engineering
□	Mechanical Engineering
□	Other engineering, please specify ___________

15. *[Presented only to teachers that selected "Yes" for Q12c]*
What type of natural science 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
☐	Environmental Science/Ecology
☐	Physics
☐	Other natural science, please specify __________

16. 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, Biology for Teachers)	○	○
b.	Biology/life science courses beyond the general/introductory level	○	○
c.	Biology/life science teaching methods courses	○	○

17. *[Presented only to teachers that selected "Yes" for Q16b]*
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

18. 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 teaching methods courses	○	○

19. ***[Presented only to teachers that selected "Yes" for Q18b]***
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.]

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

20. 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 teaching methods courses	○	○

21. ***[Presented only to teachers that selected "Yes" for Q20b]***
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.]

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

22. 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, Introductory Astronomy)	○	○
b.	Earth/space science courses beyond the general/introductory level	○	○
c.	Earth/space science teaching methods courses	○	○

23. *[Presented only to teachers that selected "Yes" for Q22b]*
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/Astrophysics
□	Geology
□	Meteorology
□	Oceanography
□	Physical Geography
□	Other Earth/space science beyond the general/introductory level

24. 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 teaching methods courses	○	○

25. *[Presented only to teachers that selected "Yes" for Q24b]*
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

26. *[Presented only to teachers who did not select Q12b]*
Did you complete one or more engineering courses at the undergraduate or graduate level?

○	Yes
○	No

27. Which of the following best describes the program you completed to earn your teaching credential (sometimes called certification or license)?

○	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 led to a teaching credential
○	I have not completed a program to earn a teaching credential. *[Skip to Q29]*

28. *[Presented only to high school teachers]*
In which of the following areas are you certified (have a credential, endorsement, or license) to teach at the high school level? [Select all that apply.]

□	Biology/life science
□	Chemistry
□	Earth/space science
□	Ecology/environmental science
□	Engineering
□	Physics

29. After completing your undergraduate degree and prior to becoming a teacher, did you have a full-time job in a science- or engineering-related field?

○	Yes
○	No

Professional Development

The questions in this section ask about your participation in professional development focused on science/engineering or science/engineering teaching. When answering these questions, please include:

- face-to-face and/or online courses;
- professional meetings/conferences;
- workshops;
- professional learning communities/lesson studies/teacher study groups; and
- coaching and mentoring.

Do not include:

- courses you took prior to becoming a teacher; and
- time spent providing professional development (including coaching and mentoring) for other teachers.

30. When did you **last participate** in professional development focused on science/engineering or science/engineering teaching?

○	In the last 12 months	
○	1–3 years ago	
○	4–6 years ago	*[Skip to Q35]*
○	7–10 years ago	*[Skip to Q35]*
○	More than 10 years ago	*[Skip to Q35]*
○	Never	*[Skip to Q35]*

31. **In the last 3 years,** which of the following types of professional development related to science/engineering or science/engineering teaching have you had? [Select one on each row.]

		YES	NO
a.	I attended a professional development program/workshop.	○	○
b.	I attended a national, state, or regional science teacher association meeting.	○	○
c.	I completed an online course/webinar.	○	○
d.	I participated in a professional learning community/lesson study/teacher study group	○	○
e.	I received assistance or feedback from a formally designated coach/mentor.	○	○
f.	I took a formal course for college credit.	○	○

32. What is the **total** amount of time you have spent on professional development related to science/engineering or science/engineering teaching **in the last 3 years**?

○	Less than 6 hours
○	6–15 hours
○	16–35 hours
○	36–80 hours
○	More than 80 hours

33. Considering all of your science- and engineering-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.	I had opportunities to engage in science investigations/engineering design challenges.	①	②	③	④	⑤
b.	I had opportunities to experience lessons, as my students would, from the textbook/modules I use in my classroom.	①	②	③	④	⑤
c.	I had opportunities to examine classroom artifacts (for example: student work samples, videos of classroom instruction).	①	②	③	④	⑤
d.	I had opportunities to rehearse instructional practices during the professional development (meaning: try out, receive feedback, and reflect on those practices).	①	②	③	④	⑤
e.	I had opportunities to apply what I learned to my classroom and then come back and talk about it as part of the professional development.	①	②	③	④	⑤
f.	I worked closely with other teachers from my school.	①	②	③	④	⑤
g.	I worked closely with other teachers who taught the same grade and/or subject whether or not they were from my school.	①	②	③	④	⑤

34. Thinking about all of your science- and engineering-related professional development **in the last 3 years**, to what extent 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.	Deepening your understanding of how science is done (for example: developing scientific questions, developing and using models, engaging in argumentation)	①	②	③	④	⑤
c.	Deepening your understanding of how engineering is done (for example: identifying criteria and constraints, designing solutions, optimizing solutions)	①	②	③	④	⑤
d.	Implementing the science textbook/modules to be used in your classroom	①	②	③	④	⑤
e.	Learning about difficulties that students may have with particular science ideas	①	②	③	④	⑤
f.	Finding out what students think or already know prior to instruction on a topic	①	②	③	④	⑤
g.	Monitoring student understanding during science instruction	①	②	③	④	⑤
h.	Differentiating science instruction to meet the needs of diverse learners	①	②	③	④	⑤
i.	Incorporating students' cultural backgrounds into science instruction	①	②	③	④	⑤
j.	Learning how to provide science instruction that integrates engineering, mathematics, and/or computer science	①	②	③	④	⑤

Preparedness to Teach

35. *[Presented only to grades K–5 teachers; sub-items e-h 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/Space 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
h.	Computer Science/Programming	①	②	③	④

36. ***[Subset of items related to topic of randomly selected class presented to non-self-contained teachers]***

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				
i. Defining engineering problems	①	②	③	④
ii. Developing possible solutions	①	②	③	④
iii. Optimizing a design solution	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

37. 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.	Develop students' conceptual understanding of the science ideas you teach	①	②	③	④
b.	Develop students' abilities to do science (for example: develop scientific questions; design and conduct investigations; analyze data; develop models, explanations, and scientific arguments)	①	②	③	④
c.	Develop students' awareness of STEM careers	①	②	③	④
d.	Provide science instruction that is based on students' ideas (whether completely correct or not) about the topics you teach	①	②	③	④
e.	Use formative assessment to monitor student learning	①	②	③	④
f.	Differentiate science instruction to meet the needs of diverse learners	①	②	③	④
g.	Incorporate students' cultural backgrounds into science instruction	①	②	③	④
h.	Encourage students' interest in science and/or engineering	①	②	③	④
i.	Encourage participation of all students in science and/or engineering	①	②	③	④

Opinions about Science Instruction

38. 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.	It is better for science instruction to focus on ideas in depth, even if that means covering fewer topics.	①	②	③	④	⑤
c.	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
d.	Teachers should explain an idea to students before having them consider evidence that relates to the idea.	①	②	③	④	⑤
e.	Most class periods should provide opportunities for students to share their thinking and reasoning.	①	②	③	④	⑤
f.	Hands-on/laboratory activities should be used primarily to reinforce a science idea that the students have already learned.	①	②	③	④	⑤
g.	Teachers should ask students to support their conclusions about a science concept with evidence.	①	②	③	④	⑤
h.	Students learn best when instruction is connected to their everyday lives.	①	②	③	④	⑤
i.	Most class periods should provide opportunities for students to apply scientific ideas to real-world contexts.	①	②	③	④	⑤
j.	Students should learn science by doing science (for example: developing scientific questions; designing and conducting investigations; analyzing data; developing models, explanations, and scientific arguments).	①	②	③	④	⑤

Leadership Experiences

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

		YES	NO
a.	Served as a lead teacher or department chair in science?	○	○
b.	Served as a ***formal*** mentor or coach for a science teacher? (Do not include supervision of student teachers.)	○	○
c.	Supervised a student teacher in your classroom?	○	○
d.	Served on a school or district/diocese-wide science committee (for example: developing curriculum, developing pacing guides, selecting instructional materials)?	○	○
e.	Led or co-led a workshop or professional learning community (for example: teacher study group, lesson study) for other teachers focused on science or science teaching?	○	○
f.	Taught a science lesson for other teachers in your school to observe?	○	○
g.	Observed another teacher's science lesson for the purpose of giving him/her feedback?	○	○

Your Science Instruction

The rest of this questionnaire is about your science instruction in your *[[xth]]* science class, which you indicated is *[[level indicated in Q10]] [[type indicated in Q9]]* and is titled *[[title provided in Q11]]*. ***[Instructions presented to non-self-contained teachers only]***

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).] __________

The rest of this questionnaire is about your science instruction in this randomly selected class. ***[Instructions presented to self-contained teachers only]***

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 *[sum of Q41]* 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 Alaskan Native		
b. Asian		
c. Black or African American		
d. Hispanic or 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 for 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 curriculum materials (for example: textbooks/modules)	①	②	③	④	⑤
c.	Selecting content, topics, and skills to be taught	①	②	③	④	⑤
d.	Selecting the sequence in which topics are covered	①	②	③	④	⑤
e.	Determining the amount of instructional time to spend on each topic	①	②	③	④	⑤
f.	Selecting teaching techniques	①	②	③	④	⑤
g.	Determining the amount of homework to be assigned	①	②	③	④	⑤
h.	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.	Learning science vocabulary and/or facts	①	②	③	④
b.	Understanding science concepts	①	②	③	④
c.	Learning about different fields of science/engineering	①	②	③	④
d.	Learning how to do science (develop scientific questions; design and conduct investigations; analyze data; develop models, explanations, and scientific arguments)	①	②	③	④
e.	Learning how to do engineering (for example: identify criteria and constraints, design solutions, optimize solutions)	①	②	③	④
f.	Learning about real-life applications of science/engineering	①	②	③	④
g.	Increasing students' interest in science/engineering	①	②	③	④
h.	Developing students' confidence that they can successfully pursue careers in science/engineering	①	②	③	④
i.	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.	Have students do hands-on/laboratory activities	①	②	③	④	⑤
e.	Use flipped instruction (have students watch lectures/demonstrations outside of class to prepare for in-class activities)	①	②	③	④	⑤
f.	Have students read from a textbook, module, or other material in class, either aloud or to themselves	①	②	③	④	⑤
g.	Engage the class in project-based learning (PBL) activities	①	②	③	④	⑤
h.	Have students write their reflections (for example: in their journals, on exit tickets) in class or for homework	①	②	③	④	⑤
i.	Focus on literacy skills (for example: informational reading or writing strategies)	①	②	③	④	⑤
j.	Have students practice for standardized tests	①	②	③	④	⑤

47. How often do you have **students** do each of the following during 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.	Determine whether or not a question is “scientific” (meaning it requires an answer supported by evidence gathered through systematic investigation)	①	②	③	④	⑤
b.	Generate scientific questions based on their curiosity, prior knowledge, careful observation of real-world phenomena, scientific models, or preliminary data from an investigation	①	②	③	④	⑤
c.	Determine what data would need to be collected in order to answer a scientific question (regardless of who generated the question)	①	②	③	④	⑤
d.	Develop procedures for a scientific investigation to answer a scientific question (regardless of who generated the question)	①	②	③	④	⑤
e.	Conduct a scientific investigation (regardless of who developed the procedures)	①	②	③	④	⑤
f.	Organize and/or represent data using tables, charts, or graphs in order to facilitate analysis of the data	①	②	③	④	⑤
g.	Compare data from multiple trials or across student groups for consistency in order to identify potential sources of error or inconsistencies in the data	①	②	③	④	⑤

h.	Analyze data using grade-appropriate methods in order to identify patterns, trends, or relationships	①	②	③	④	⑤
i.	Consider how missing data or measurement error can affect the interpretation of data	①	②	③	④	⑤
j.	Make and support claims (proposed answers to scientific questions) with evidence	①	②	③	④	⑤
k.	Use multiple sources of evidence (for example: different investigations, scientific literature) to develop an explanation	①	②	③	④	⑤
l.	Revise their explanations (claims supported by evidence and reasoning) for real-world phenomena based on additional evidence	①	②	③	④	⑤
m.	Develop scientific models—physical, graphical, or mathematical representations of real-world phenomena—based on data and reasoning	①	②	③	④	⑤
n.	Identify the strengths and limitations of a scientific model—in terms of accuracy, clarity, generalizability, accessibility to others, strength of evidence supporting it—regardless of who created the model	①	②	③	④	⑤
o.	Select and use grade-appropriate mathematical and/or statistical techniques to analyze data (for example: determining the best measure of central tendency, examining variation in data, or developing a fit line)	①	②	③	④	⑤
p.	Use mathematical and/or computational models to generate data to support a scientific claim	①	②	③	④	⑤
q.	Determine what details about an investigation (for example: its design, implementation, and results) might persuade a targeted audience about a scientific claim (regardless of who made the claim)	①	②	③	④	⑤
r.	Use data and reasoning to defend, verbally or in writing, a claim or refute alternative scientific claims about a real-world phenomenon (regardless of who made the claims)	①	②	③	④	⑤
s.	Evaluate the strengths and weaknesses of competing scientific explanations (claims supported by evidence) for a real-world phenomenon	①	②	③	④	⑤
t.	Construct a persuasive case, verbally or in writing, for the best scientific model or explanation for a real-world phenomenon	①	②	③	④	⑤
u.	Pose questions that elicit relevant details about the important aspects of a scientific argument (for example: the claims/models/explanations, research design, implementation, data analysis)	①	②	③	④	⑤
v.	Evaluate the credibility of scientific information—for example: its reliability, validity, consistency, logical coherence, lack of bias, or methodological strengths and weaknesses (regardless of whether it is from their own or others' work)	①	②	③	④	⑤
w.	Summarize patterns, similarities, and differences in scientific information obtained from multiple sources (regardless of whether it is from their own or others' work)	①	②	③	④	⑤

48. Thinking about your instruction in this class over the entire year, about how often do you incorporate engineering into your science instruction?

o	Never
o	Rarely (for example: A few times per year)
o	Sometimes (for example: Once or twice a month)
o	Often (for example: Once or twice a week)
o	All or almost all science lessons

49. Thinking about your instruction in this class over the entire year, about how often do you have students use coding to develop or revise computer programs as part of your science instruction (for example: use Scratch or Python as part of doing science)?

o	Never
o	Rarely (for example: A few times per year)
o	Sometimes (for example: Once or twice a month)
o	Often (for example: Once or twice a week)
o	All or almost all science lessons

50. In a typical week, how much time outside of this class are students expected to spend on science assignments?

○	None
○	1–15 minutes per week
○	16–30 minutes per week
○	31–60 minutes per week
○	61–90 minutes per week
○	91–120 minutes per week
○	More than 2 hours per week

51. How often are students in this class required to take science tests that you did not choose to administer, 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. Please indicate the availability of each of the following for your science instruction in this class. [Select one on each row.]

	LOCATED IN YOUR CLASSROOM	AVAILABLE IN ANOTHER ROOM	NOT AVAILABLE
a. Lab tables	○	○	○
b. Electric outlets	○	○	○
c. Faucets and sinks	○	○	○
d. Gas for burners *[Grades 9-12 only]*	○	○	○
e. Fume hoods *[Grades 9–12 only]*	○	○	○

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

	ALWAYS AVAILABLE IN YOUR CLASSROOM	AVAILABLE UPON REQUEST	NOT AVAILABLE
a. Probes for collecting data (for example: motion sensors, temperature probes)	○	○	○
b. Microscopes	○	○	○
c. Balances (for example: pan, triple beam, digital scale)	○	○	○
d. Projection devices (for example: Smartboard, document camera, LCD projector)	○	○	○

54. Science courses may benefit from the availability of particular resources. Considering what you have available, how adequate is each of the following for teaching this science 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. Consumable supplies (for example: chemicals, living organisms, batteries)	①	②	③	④	⑤
c. Equipment (for example: thermometers, magnifying glasses, microscopes, beakers, photogate timers, Bunsen burners)	①	②	③	④	⑤
d. Facilities (for example: lab tables, electric outlets, faucets and sinks)	①	②	③	④	⑤

This item asks about different types of instructional materials; please read the entire list of materials before answering

55. Thinking about your instruction in this class over the entire year, about how often is instruction based on materials from each of the following sources? [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.	Commercially published textbooks (printed or electronic), including the supplementary materials (for example: worksheets, laboratory handouts) that accompany the textbooks	①	②	③	④	⑤
b.	Commercially published kits/modules (printed or electronic)	①	②	③	④	⑤
c.	State, county, or district/diocese-developed units or lessons	①	②	③	④	⑤
d.	Online units or courses that students work through at their own pace (for example: i-Ready, Edgenuity)	①	②	③	④	⑤
e.	Lessons or resources from websites that have a subscription fee or per lesson cost (for example: BrainPOP, Discovery Ed, Teachers Pay Teachers)	①	②	③	④	⑤
f.	Lessons or resources from websites that are free (for example: Khan Academy, PhET)	①	②	③	④	⑤
g.	Units or lessons you created (either by yourself or with others)	①	②	③	④	⑤
h.	Units or lessons you collected from any other source (for example: conferences, journals, colleagues, university or museum partners)	①	②	③	④	⑤

56. Does your school/district/diocese designate instructional materials (textbooks, kits, modules, units, or lessons) to be used in this class?

○	Yes
○	No *[Skip to Q58]*

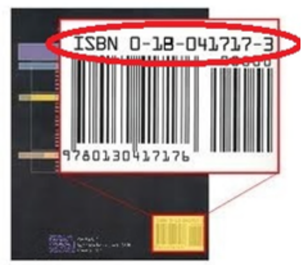
57. Which of the following types of instructional materials does your school/district/diocese designate to be used in this class? [Select all that apply.]

□	Commercially published textbooks (printed or electronic), including the supplementary materials (for example: worksheets, laboratory handouts) that accompany the textbooks
□	Commercially published kits/modules (printed or online)
□	State, county, or district/diocese-developed instructional materials
□	Online units or courses that students work through at their own pace (for example: i-Ready, Edgenuity)
□	Lessons or resources from websites that have a subscription fee or per lesson cost (for example: BrainPOP, Discovery Ed, Teachers Pay Teachers)
□	Lessons or resources from websites that are free (for example: Khan Academy, PhET)

58. Omitted – Used only for survey routing.

59. ***[Presented only to teachers who selected "Sometimes" "Often" or "All" for Q55a, b, or d]***
[Version for teachers who indicate using a commercial textbook most often] Please indicate the title, author, most recent copyright year, and ISBN code of the commercially published textbook or kits/modules (printed or electronic) used <u>most often</u> by the students in this class.

- If you use multiple kits/modules, select one to enter the information for.
- The 10- or 13-character ISBN code can be found on the copyright page and/or the back cover of the textbook or kit/module.
- Do not include the dashes when entering the ISBN.
- Example ISBN:



[Version for teachers who indicate using an online course most often]
Please indicate the title and URL of the online units or courses used <u>most often</u> by the students in this class.

Title:	
First Author: [for teachers who indicate using a commercial textbook most often]	
Year: [for teachers who indicate using a commercial textbook most often]	
ISBN: [for teachers who indicate using a commercial textbook most often]	
URL: [for teachers who indicate using an online program most often]	

60. Please rate how each of the following affects your science instruction in this class. [Select one on each row.]

	INHIBITS EFFECTIVE INSTRUCTION		NEUTRAL OR MIXED		PROMOTES EFFECTIVE INSTRUCTION	N/A
a. Current state standards	①	②	③	④	⑤	○
b. District/diocese and/or school pacing guides	①	②	③	④	⑤	○
c. State/district/diocese testing/accountability policies *[Not presented to non-Catholic private schools]*	①	②	③	④	⑤	○
d. Textbook/module selection policies	①	②	③	④	⑤	○
e. Teacher evaluation policies	①	②	③	④	⑤	○
f. College entrance requirements [Presented to grades 9–12 teachers only]	①	②	③	④	⑤	○
g. Students' prior knowledge and skills	①	②	③	④	⑤	○
h. Students' motivation, interest, and effort in science	①	②	③	④	⑤	○
i. Parent/guardian expectations and involvement	①	②	③	④	⑤	○
j. Principal support	①	②	③	④	⑤	○
k. Amount of time for you to plan, individually and with colleagues	①	②	③	④	⑤	○
l. Amount of time available for your professional development	①	②	③	④	⑤	○
m. Amount of instructional time devoted to science [Presented to grades K–5 teachers only]	①	②	③	④	⑤	○

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 which you indicated is *[level indicated in Q10] [type indicated in Q9]* and is titled *[title provided in Q11]*.

- 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.

61. Which one of the following best describes the content of this unit?

○	Earth/space science
○	Life science/biology
○	Environmental science/ecology
○	Chemistry
○	Physics
○	Engineering

62. *[Presented only to teachers who selected "Sometimes" "Often" or "All" for Q55a, b, or c]*
Was this unit based primarily on a commercially published textbook/kit/module or state, county, or district/diocese-developed materials?

○	Yes
○	No *[Skip to Q66]*

This next set of items is about the commercially published textbook/kit/module or state, county, or district/diocese-developed lessons you used in this unit.

63. 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.	I used these materials to guide the structure and content emphasis of the unit.	①	②	③	④	⑤
b.	I picked what is important from these materials and skipped the rest.	①	②	③	④	⑤
c.	I incorporated activities (for example: problems, investigations, readings) from other sources to supplement what these materials were lacking.	①	②	③	④	⑤
d.	I modified activities from these materials.	①	②	③	④	⑤

64. *[Presented only to teachers who did not select "Not at all" for Q63b]*
During this unit, when you skipped activities (for example: problems, investigations, readings) in these materials, 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 I skipped are not included in my pacing guide/standards.	①	②	③
b.	I did not have the materials needed to implement the activities I skipped.	①	②	③
c.	I did not have the knowledge needed to implement the activities I skipped			
d.	The activities I skipped were too difficult for my students.	①	②	③
e.	My students already knew the science ideas or were able to learn them without the activities I skipped.	①	②	③
f.	I have different activities for those science ideas that work better than the ones I skipped.	①	②	③
g.	I did not have enough instructional time for the activities I skipped.	①	②	③

65. ***[Presented only to teachers who did not select "Not at all" for Q63c]***
During this unit, when you supplemented these materials 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.	My pacing guide indicated that I 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
e.	I had additional activities that I liked.	①	②	③

66. ***[Presented only to teachers who did not select "Not at all" in Q63d]***
During this unit, when you modified activities from these materials, 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.	I did not have the necessary materials/supplies for the original activities.	①	②	③
b.	The original activities were too difficult conceptually for my students.	①	②	③
c.	The original activities were too easy conceptually for my students.	①	②	③
d.	I did not have enough instructional time to implement the activities as designed.	①	②	③
e.	The original activities were too structured for my students.	①	②	③
f.	The original activities were not structured enough for my students.	①	②	③

67. 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 instructional materials (for example: textbook, module) to be used during this unit	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

Your Most Recent Science Lesson in this Class

The next set of questions refer to the most recent science lesson in this class which you indicated is *[level indicated in Q10] [type indicated in Q9]* and is titled *[title provided in Q11]*, even if it included activities and/or interruptions that are not typical (for example: a test, students working on projects, a fire drill). If the lesson spanned multiple days, please answer for the most recent day.

68. How many minutes was that day's science lesson? Answer for the entire length of the class period, even if there were interruptions. [Enter your response as a non-zero whole number (for example: 50).] __________

69. Of these *[[answer to Q68]]* 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)	

70. Which of the following activities took place during that day's science lesson? [Select all that apply.]

□	Teacher explaining a science idea to the whole class
□	Teacher conducting a demonstration while students watched
□	Whole class discussion
□	Students working in small groups
□	Students completing textbook/worksheet problems
□	Students doing hands-on/laboratory activities
□	Students reading about science
□	Students writing about science (do not include students taking notes)
□	Practicing for standardized tests
□	Test or quiz
□	None of the above

Demographic Information

71. Are you:

○	Female
○	Male
○	Other

72. Are you of Hispanic or Latino origin?

○	Yes
○	No

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

◻	American Indian or Alaskan Native
◻	Asian
◻	Black or African American
◻	Native Hawaiian or Other Pacific Islander
◻	White

74. In what year were you born? [Enter your response as a whole number (for example: 1969).]

____

Thank you!

Table 1
Number of Years High School Physics Teachers Spent Teaching Prior to This School Year

	MEAN NUMBER OF YEARS
Any subject at the K–12 level	13 (0.7)
Science at the K–12 level	13 (0.7)
At this school, any subject	8 (0.4)

There is no Table 2.

There is no Table 3.

There is no Table 4.

There is no Table 5.

There is no Table 6.

There is no Table 7.

Table 8
Number of Sections of Science and Engineering Classes Taught Per Week by High School Physics Teachers

	PERCENT OF TEACHERS	
	SCIENCE	ENGINEERING
0 Sections	n/a	89 (1.9)
1 Section	4 (2.0)	4 (1.0)
2 Sections	7 (1.7)	4 (1.6)
3 Sections	18 (2.9)	2 (0.6)
4 Sections	16 (2.4)	0 (0.2)
5 Sections	26 (2.6)	0 (0.2)
6 Sections	23 (3.2)	0 (0.2)
7 Sections	5 (1.3)	0 ---†
8 Sections	0 (0.5)	0 ---†
9 Sections	0 (0.1)	0 ---†
10 Sections	0 (0.2)	0 ---†

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

There is no Table 9.

There is no Table 10.

There is no Table 11.

Table 12
Subjects of High School Physics Teachers' Degrees

	PERCENT OF TEACHERS
Education (general or subject specific such as science education)	68 (2.9)
Engineering	10 (1.2)
Natural Sciences (e.g., biology, chemistry, physics, Earth sciences)	72 (3.2)
Other Subject	21 (3.1)

Table 13
High School Physics Teachers With Education Degrees

	PERCENT OF TEACHERS†
Elementary Education	2 (0.9)
Mathematics Education	9 (4.4)
Science Education	56 (4.5)
Other Education	16 (2.6)

† Teachers indicating in Q12 that they do not have an education degree are treated as not having a degree in these areas.

Table 14
High School Physics Teachers With Engineering Degrees

	PERCENT OF TEACHERS†
Aerospace/Aeronautical/Astronautical Engineering	0 (0.1)
Bioengineering/Biomedical Engineering	1 (0.4)
Chemical Engineering	1 (0.6)
Civil Engineering	1 (0.5)
Computer Engineering	0 ---‡
Electrical/Electronics Engineering	1 (0.4)
Environmental Engineering	0 (0.4)
Industrial/Manufacturing Engineering	1 (0.4)
Mechanical Engineering	2 (0.7)
Other engineering	4 (1.4)

† Teachers indicating in Q12 that they do not have an engineering degree are treated as not having a degree in these areas.
‡ No high school physics teachers in the sample selected this response option. Thus, it is not possible to calculate the standard error of this estimate.

Table 15
High School Physics Teachers With Natural Science Degrees

	PERCENT OF TEACHERS†
Biology/Life Science	26 (3.3)
Chemistry	25 (4.0)
Earth/Space Science	5 (1.3)
Environmental Science/Ecology	2 (0.7)
Physics	24 (2.6)
Other natural science	9 (2.4)

† Teachers indicating in Q12 that they do not have a natural science degree are treated as not having a degree in these areas.

Table 16
Biology/Life Science College Courses Completed by High School Physics Teachers

	PERCENT OF TEACHERS
General/introductory biology/life science courses (e.g., Biology I, Introduction to Biology, Biology for Teachers)	79 (2.5)
Biology/life science courses beyond the general/introductory level	59 (3.4)
Biology/life science teaching methods courses	34 (3.2)

Table 17
Advanced Biology/Life Science College Courses Completed by High School Physics Teachers

	PERCENT OF TEACHERS†
Anatomy/Physiology	35 (3.2)
Biochemistry	35 (4.1)
Botany	21 (2.2)
Cell Biology	30 (3.4)
Ecology	32 (3.9)
Evolution	20 (3.1)
Genetics	32 (3.3)
Microbiology	31 (3.4)
Zoology	20 (2.3)
Other biology/life science beyond the general/introductory level	25 (2.7)

† Teachers indicating in Q16 that they have not taken biology/life science courses beyond the general/introductory level are treated as not having taken any of these courses.

Table 18
Chemistry College Courses Completed by High School Physics Teachers

	PERCENT OF TEACHERS
General/introductory chemistry courses (e.g., Chemistry I, Introduction to Chemistry)	91 (2.3)
Chemistry courses beyond the general/introductory level	70 (3.5)
Chemistry teaching methods courses	31 (3.9)

Table 19
Advanced Chemistry College Courses Completed by High School Physics Teachers

	PERCENT OF TEACHERS†
Analytic Chemistry	34 (3.4)
Biochemistry	36 (3.6)
Inorganic Chemistry	45 (3.9)
Organic Chemistry	57 (3.9)
Physical Chemistry	38 (4.0)
Quantum Chemistry	10 (1.7)
Other chemistry beyond the general/introductory level	21 (3.1)

† Teachers indicating in Q18 that they have not taken chemistry courses beyond the general/introductory level are treated as not having taken any of these courses.

Table 20
Physics College Courses Completed by High School Physics Teachers

	PERCENT OF TEACHERS
General/introductory physics courses (e.g., Physics I, Introduction to Physics)	96 (1.2)
Physics courses beyond the general/introductory level	66 (3.6)
Physics teaching methods courses	39 (3.8)

Table 21
Advanced Physics College Courses Completed by High School Physics Teachers

	PERCENT OF TEACHERS†
Astronomy/Astrophysics	33 (3.2)
Electricity and Magnetism	46 (3.2)
Heat and Thermodynamics	40 (3.7)
Mechanics	52 (3.8)
Modern or Quantum Physics	40 (3.3)
Nuclear Physics	17 (2.2)
Optics	28 (3.9)
Other physics beyond the general/introductory level	31 (3.5)

† Teachers indicating in Q20 that they have not taken physics courses beyond the general/introductory level are treated as not having taken any of these courses.

Table 22
Earth/Space Science College Courses Completed by High School Physics Teachers

	PERCENT OF TEACHERS
General/introductory Earth/space science courses (e.g., Earth Science I, Introduction to Earth Science, Introductory Astronomy)	65 (2.6)
Earth/space science courses beyond the general/introductory level	26 (2.7)
Earth/space science teaching methods courses	13 (1.7)

Table 23
Advanced Earth/Space Science College Courses Completed by High School Physics Teachers

	PERCENT OF TEACHERS†
Astronomy/Astrophysics	16 (2.0)
Geology	21 (2.5)
Meteorology	11 (1.7)
Oceanography	6 (1.1)
Physical Geography	8 (1.9)
Other Earth/space science beyond the general/introductory level	10 (2.1)

† Teachers indicating in Q22 that they have not taken Earth/space science courses beyond the general/introductory level are treated as not having taken any of these courses.

Table 24
Environmental Science College Courses Completed by High School Physics Teachers

	PERCENT OF TEACHERS
General/introductory environmental science courses (e.g., Environmental Science I, Introduction to Environmental Science)	41 (3.2)
Environmental science courses beyond the general/introductory level	18 (2.8)
Environmental science teaching methods courses	6 (1.2)

Table 25
Advanced Environmental Science College Courses Completed by High School Physics Teachers

	PERCENT OF TEACHERS†
Conservation Biology	6 (1.5)
Ecology	13 (2.8)
Forestry	5 (2.4)
Hydrology	4 (1.2)
Oceanography	6 (2.4)
Toxicology	2 (0.7)
Other environmental science beyond the general/introductory level	9 (1.8)

† Teachers indicating in Q24 that they have not taken environmental science courses beyond the general/introductory level are treated as not having taken any of these courses.

Table 26
High School Physics Teachers Having Completed One or More Engineering College Courses

	PERCENT OF TEACHERS
One or more engineering college course	29 (2.7)

Table 27
High School Physics Teachers' Paths to Certification

	PERCENT OF TEACHERS
An undergraduate program leading to a bachelor's degree and a teaching credential	42 (4.8)
A post-baccalaureate credentialing program (no master's degree awarded)	23 (3.4)
A master's program that also led to a teaching credential	25 (3.6)
Has not earned a teaching credential	10 (2.3)

Table 28
High School Physics Teachers' Areas of Certification

	PERCENT OF TEACHERS
Biology/life science	50 (4.2)
Chemistry	62 (3.9)
Earth/space science	39 (4.0)
Ecology/environmental science	29 (4.0)
Engineering	10 (2.5)
Physics	75 (4.0)

Table 29
High School Physics Teachers With Full-Time Job Experience in a Science- or Engineering-Related Field Prior to Teaching

	PERCENT OF TEACHERS
Full-time job experience in science- or engineering-related field prior to teaching	36 (3.6)

Table 30
High School Physics Teachers' Most Recent Participation in Science/Engineering-Focused Professional Development

	PERCENT OF TEACHERS
In the last 12 months	63 (3.0)
1–3 years ago	22 (2.7)
4–6 years ago	4 (0.9)
7–10 years ago	2 (0.8)
More than 10 years ago	2 (0.6)
Never	8 (2.2)

Table 31
High School Physics Teachers Participating in Various Science/ Engineering-Focused Professional Development Activities in the Last Three Years

	PERCENT OF TEACHERS†
I attended a professional development program/workshop.	89 (2.9)
I attended a national, state, or regional science teacher association meeting.	44 (5.0)
I completed an online course/webinar.	35 (5.1)
I participated in a professional learning community/lesson study/teacher study group.	51 (4.6)
I received assistance or feedback from a formally designated coach/mentor.	31 (3.6)
I took a formal course for college credit.	22 (3.2)

† Only high school physics teachers indicating in Q30 that they participated in science-focused professional development in the last three years are included in these analyses.

Table 32
Time Spent by High School Physics Teachers on Science/ Engineering-Focused Professional Development in the Last Three Years

	PERCENT OF TEACHERS†
Less than 6 hours	8 (2.1)
6–15 hours	23 (4.1)
16–35 hours	24 (3.0)
36–80 hours	24 (2.8)
More than 80 hours	21 (2.4)

† Only high school physics teachers indicating in Q30 that they participated in science-focused professional development in the last three years are included in this analysis.

Table 33
High School Physics Teachers' Description of Science/Engineering-Focused† Professional Development in the Last Three Years

	PERCENT OF TEACHERS†				
	NOT AT ALL 1	2	SOMEWHAT 3	4	TO A GREAT EXTENT 5
I had opportunities to engage in science investigations/engineering design challenges	15 (3.3)	10 (4.2)	27 (3.6)	29 (3.3)	18 (3.5)
I had opportunities to experience lessons, as my students would, from the textbook/modules I use in my classroom	22 (4.1)	15 (3.1)	23 (3.2)	22 (2.8)	17 (2.8)
I had opportunities to examine classroom artifacts (e.g., student work samples, videos of classroom instruction)	13 (2.7)	20 (5.0)	30 (3.6)	25 (3.5)	12 (2.1)
I had opportunities to rehearse instructional practices during the professional development (i.e., try out, receive feedback, and reflect on those practices)	27 (4.0)	20 (3.6)	21 (3.3)	22 (3.5)	10 (1.9)
I had opportunities to apply what I learned to my classroom and then come back and talk about it as part of the professional development	27 (4.3)	11 (2.2)	24 (3.5)	27 (4.1)	11 (1.7)
I worked closely with other teachers from my school	15 (3.5)	13 (4.3)	23 (3.3)	22 (3.2)	27 (3.9)
I worked closely with other teachers who taught the same grade and/or subject whether or not they were from my school	9 (1.8)	12 (4.8)	28 (3.6)	26 (3.6)	25 (3.9)

† Only high school physics teachers indicating in Q30 that they participated in science-focused professional development in the last three years are included in these analyses.

Table 34
High School Physics Teachers' Perceptions of Topics Emphasized During Professional Development in the Last Three Years

	PERCENT OF TEACHERS†				
	NOT AT ALL 1	2	SOMEWHAT 3	4	TO A GREAT EXTENT 5
Deepening your own science content knowledge	12 (3.1)	17 (4.9)	28 (3.0)	21 (2.7)	21 (4.3)
Deepening your understanding of how science is done (e.g., developing scientific questions, developing and using models, engaging in argumentation)	9 (2.4)	10 (4.1)	27 (3.0)	33 (3.7)	21 (3.0)
Deepening your understanding of how engineering is done (e.g., identifying criteria and constraints, designing solutions, optimizing solutions)	26 (3.5)	15 (2.5)	33 (4.4)	18 (3.0)	8 (2.0)
Implementing the science textbook/modules to be used in your classroom	17 (2.6)	29 (3.7)	24 (3.5)	20 (4.1)	9 (2.9)
Learning about difficulties that students may have with particular science ideas	12 (2.6)	17 (4.6)	32 (4.1)	32 (4.3)	7 (1.8)
Finding out what students think or already know prior to instruction on a topic	13 (2.6)	21 (4.7)	35 (4.3)	24 (3.4)	6 (1.9)
Monitoring student understanding during science instruction	15 (3.1)	16 (5.1)	26 (3.5)	31 (3.7)	12 (2.5)
Differentiating science instruction to meet the needs of diverse learners	14 (2.6)	18 (5.3)	31 (4.4)	24 (3.0)	14 (2.7)
Incorporating students' cultural backgrounds into science instruction	32 (4.2)	29 (3.9)	23 (3.5)	11 (2.2)	5 (1.6)
Learning how to provide science instruction that integrates engineering, mathematics, and/or computer science	12 (2.8)	15 (3.2)	35 (4.8)	24 (3.0)	14 (3.4)

† Only high school physics teachers indicating in Q30 that they participated in science-focused professional development in the last three years are included in these analyses.

There is no Table 35.

Table 36
High School Physics Teachers' Perceptions of Their Preparedness to Teach Physics Topics

	PERCENT OF TEACHERS†			
	NOT ADEQUATELY PREPARED	SOMEWHAT PREPARED	FAIRLY WELL PREPARED	VERY WELL PREPARED
Forces and motion	0 (0.3)	2 (0.9)	16 (3.7)	82 (3.7)
Energy transfers, transformations, and conservation	1 (0.5)	3 (1.1)	18 (3.7)	78 (3.8)
Properties and behaviors of waves	0 (0.3)	11 (3.3)	25 (3.2)	64 (3.8)
Electricity and magnetism	1 (0.3)	16 (3.4)	36 (4.4)	48 (4.6)
Modern physics (e.g., special relativity)	11 (2.2)	29 (3.2)	39 (4.3)	22 (2.7)

Table 37
High School Physics Teachers' Perceptions of Their Preparedness for Each of a Number of Tasks

	PERCENT OF TEACHERS			
	NOT ADEQUATELY PREPARED	SOMEWHAT PREPARED	FAIRLY WELL PREPARED	VERY WELL PREPARED
Develop students' conceptual understanding of the science ideas you teach	0 (0.3)	4 (1.5)	34 (3.6)	61 (3.5)
Develop students' abilities to do science (e.g., develop scientific questions; design and conduct investigations; analyze data; develop models, explanations, and scientific arguments)	1 (1.1)	9 (1.7)	41 (3.3)	49 (3.3)
Develop students' awareness of STEM careers	5 (1.1)	27 (3.5)	43 (3.3)	25 (2.3)
Provide science instruction that is based on students' ideas (whether completely correct or not) about the topics you teach	8 (2.9)	19 (2.5)	46 (3.4)	27 (3.0)
Use formative assessment to monitor student learning	1 (1.0)	7 (1.4)	39 (3.2)	53 (3.2)
Differentiate science instruction to meet the needs of diverse learners	3 (1.1)	26 (3.1)	39 (3.7)	32 (2.7)
Incorporate students' cultural backgrounds into science instruction	18 (3.1)	37 (3.0)	26 (3.5)	19 (2.2)
Encourage students' interest in science and/or engineering	1 (0.4)	14 (3.4)	38 (3.1)	47 (3.4)
Encourage participation of all students in science and/or engineering	1 (0.5)	14 (2.1)	39 (3.6)	47 (3.2)

Table 38
High School Physics
Teachers' Opinions About Teaching and Learning

	PERCENT OF TEACHERS				
	STRONGLY DISAGREE	DISAGREE	NO OPINION	AGREE	STRONGLY AGREE
Students learn science best in classes with students of similar abilities.	1 (0.4)	26 (3.4)	11 (2.3)	46 (3.8)	17 (2.8)
It is better for science instruction to focus on ideas in depth, even if that means covering fewer topics.	2 (1.2)	11 (2.3)	12 (2.4)	51 (4.2)	24 (2.9)
At the beginning of instruction on a science idea, students should be provided with definitions for new scientific vocabulary that will be used.	2 (0.7)	18 (2.9)	14 (2.1)	48 (3.8)	18 (3.0)
Teachers should explain an idea to students before having them consider evidence that relates to the idea.	8 (2.0)	45 (4.2)	23 (4.3)	18 (3.1)	6 (1.1)
Most class periods should provide opportunities for students to share their thinking and reasoning.	1 (0.9)	3 (1.2)	13 (4.1)	51 (4.9)	32 (4.4)
Hands-on/laboratory activities should be used primarily to reinforce a science idea that the students have already learned.	8 (2.3)	31 (3.6)	18 (3.9)	25 (3.5)	19 (3.3)
Teachers should ask students to support their conclusions about a science concept with evidence.	0 (0.1)	0 (0.2)	2 (1.1)	36 (4.7)	62 (4.7)
Students learn best when instruction is connected to their everyday lives.	0 ---†	1 (0.9)	6 (1.7)	41 (4.2)	52 (4.2)
Most class periods should provide opportunities for students to apply scientific ideas to real-world contexts.	0 ---†	3 (1.2)	13 (4.2)	53 (4.9)	31 (3.6)
Students should learn science by doing science (e.g., developing scientific questions; designing and conducting investigations; analyzing data; developing models, explanations, and scientific arguments).	1 (0.9)	2 (0.8)	8 (3.8)	40 (3.5)	50 (3.9)

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

Table 39
High School Physics Teachers Having Various Leadership Responsibilities Within the Last Three Years

	PERCENT OF TEACHERS
Served as a lead teacher or department chair in science	36 (5.0)
Served as a formal mentor or coach for a science teacher	24 (3.1)
Supervised a student teacher in your classroom	20 (3.6)
Served on a school or district-wide/diocese-wide science committee (e.g., developing curriculum, developing pacing guides, selecting instructional materials)	52 (4.9)
Led or co-led a workshop or professional learning community (e.g., teacher study group, lesson study) for other teachers focused on science or science teaching	33 (4.8)
Taught a science lesson for other teachers in your school to observe	41 (4.4)
Observed another teacher's science lesson for the purpose of giving him/her feedback	43 (4.6)

Table 40
Average Minutes Per Week High School Physics Classes Meet

	AVERAGE NUMBER OF MINUTES
Instructional time per week	250 (4.8)

Table 41
Average Number of Students in High School Physics Classes

	AVERAGE NUMBER OF STUDENTS
High school physics classes	19 (0.7)

Table 42
Race/Ethnicity of Students in High School Physics Classes

	PERCENT OF STUDENTS
American Indian or Alaskan Native	1 (0.4)
Asian	8 (1.3)
Black or African American	8 (1.1)
Hispanic/Latino	17 (2.0)
Native Hawaiian or Other Pacific Islander	0 (0.1)
White	62 (2.4)
Two or more races	3 (0.6)

Table 43
Prior Science Achievement Level of Students in High School Physics Classes

	PERCENT OF CLASSES
Mostly low achievers	8 (1.5)
Mostly average achievers	24 (2.8)
Mostly high achievers	45 (4.0)
A mixture of levels	24 (3.3)

Table 44
High School Physics Classes in Which Teachers Report Having Control Over Various Curricular and Instructional Decisions

	PERCENT OF CLASSES				
	NO CONTROL 1	2	MODERATE CONTROL 3	4	STRONG CONTROL 5
Determining course goals and objectives	17 (3.9)	6 (1.8)	18 (3.6)	15 (4.5)	44 (5.4)
Selecting textbooks/modules	9 (2.6)	9 (2.5)	24 (4.5)	14 (3.0)	43 (4.8)
Selecting content, topics, and skills to be taught	12 (3.0)	10 (2.6)	23 (3.8)	16 (4.5)	38 (5.3)
Selecting the sequence in which topics are covered	6 (2.1)	7 (2.3)	13 (4.5)	15 (3.2)	58 (4.2)
Determining the amount of instructional time to spend on each topic	3 (1.4)	2 (1.1)	14 (2.4)	28 (4.9)	53 (4.2)
Selecting teaching techniques	0 ---†	1 (0.8)	5 (1.4)	20 (4.6)	73 (4.4)
Determining the amount of homework to be assigned	0 (0.1)	1 (0.4)	5 (1.8)	18 (4.6)	76 (4.4)
Choosing criteria for grading student performance	2 (1.3)	1 (0.6)	19 (6.9)	23 (3.9)	55 (5.7)

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

Table 45
Emphasis Given in High School Physics Classes to Various Instructional Objectives

	PERCENT OF CLASSES			
	NONE	MINIMAL EMPHASIS	MODERATE EMPHASIS	HEAVY EMPHASIS
Learning science vocabulary and/or facts	1 (0.7)	30 (4.0)	53 (3.5)	15 (2.4)
Understanding science concepts	0 ---†	0 (0.1)	15 (2.3)	85 (2.3)
Learning about different fields of science/engineering	9 (2.2)	49 (2.8)	38 (3.6)	5 (1.4)
Learning how to do science (develop scientific questions; design and conduct investigations; analyze data; develop models, explanations, and scientific arguments)	0 (0.2)	8 (2.0)	40 (3.2)	51 (3.1)
Learning how to do engineering (e.g., identify criteria and constraints, design solutions, optimize solutions)	23 (2.9)	31 (3.1)	32 (3.1)	14 (3.2)
Learning about real-life applications of science/engineering	1 (0.5)	18 (2.7)	47 (3.9)	34 (3.0)
Increasing students' interest in science/engineering	1 (0.7)	11 (2.2)	50 (3.6)	38 (3.4)
Developing students' confidence that they can successfully pursue careers in science/engineering	1 (0.7)	15 (2.5)	43 (4.8)	41 (4.4)
Learning test-taking skills/strategies	7 (1.7)	34 (3.8)	42 (4.2)	17 (2.6)

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

Table 46
High School Physics Classes in Which Teachers Report Using 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 ---†	1 (0.5)	9 (2.6)	51 (3.3)	39 (3.5)
Engage the whole class in discussions	0 ---†	3 (0.9)	19 (3.6)	47 (3.1)	31 (2.6)
Have students work in small groups	1 (0.8)	0 (0.3)	8 (2.0)	57 (3.4)	33 (2.8)
Have students do hands-on/laboratory activities	1 (0.8)	2 (0.8)	20 (3.0)	62 (3.3)	15 (2.2)
Use flipped instruction (have students watch lectures/ demonstrations outside of class to prepare for in-class activities)	35 (3.7)	32 (3.8)	19 (3.1)	12 (2.9)	2 (0.9)
Have students read from a textbook, module, or other material in class, either aloud or to themselves	26 (2.5)	35 (3.6)	21 (2.9)	13 (3.2)	5 (1.5)
Engage the class in project-based learning (PBL) activities	13 (2.2)	29 (3.1)	32 (3.4)	16 (2.4)	10 (2.7)
Have students write their reflections (e.g., in their journals, on exit tickets) in class or for homework	25 (3.0)	25 (3.3)	26 (3.0)	16 (3.2)	7 (1.5)
Focus on literacy skills (e.g., informational reading or writing strategies)	18 (2.6)	30 (3.3)	30 (3.2)	18 (3.9)	4 (1.4)
Have students practice for standardized tests	32 (3.2)	28 (3.6)	28 (3.1)	11 (2.1)	1 (0.5)

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

Table 47
High School Physics Classes in Which Teachers Report Students Engaging in Various Aspects of Science Practices

	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
Determine whether or not a question is "scientific" (i.e., it requires an answer supported by evidence gathered through systematic investigation)	14 (2.4)	29 (3.8)	33 (4.7)	19 (3.4)	6 (1.3)
Generate scientific questions based on their curiosity, prior knowledge, careful observation of real-world phenomena, scientific models, or preliminary data from an investigation	7 (2.0)	16 (2.7)	43 (3.7)	27 (2.8)	8 (1.4)
Determine what data would need to be collected in order to answer a scientific question (regardless of who generated the question)	4 (1.8)	12 (2.6)	40 (3.5)	33 (3.4)	11 (2.0)
Develop procedures for a scientific investigation to answer a scientific question (regardless of who generated the question)	6 (1.9)	14 (2.9)	41 (3.3)	31 (3.2)	8 (2.2)
Conduct a scientific investigation (regardless of who developed the procedures)	3 (1.4)	6 (1.4)	24 (3.2)	55 (4.1)	12 (2.4)
Organize and/or represent data using tables, charts, or graphs in order to facilitate analysis of the data	2 (1.0)	3 (1.3)	25 (3.4)	55 (4.6)	15 (2.7)
Compare data from multiple trials or across student groups for consistency in order to identify potential sources of error or inconsistencies in the data	3 (1.2)	14 (2.6)	34 (3.7)	41 (4.2)	9 (2.0)
Analyze data using grade-appropriate methods in order to identify patterns, trends, or relationships	3 (1.2)	5 (1.7)	33 (3.8)	46 (4.6)	13 (2.2)
Consider how missing data or measurement error can affect the interpretation of data	3 (1.2)	17 (2.8)	45 (4.4)	30 (4.7)	5 (1.0)
Make and support claims (proposed answers to scientific questions) with evidence	3 (1.2)	7 (1.8)	36 (3.7)	43 (4.7)	10 (1.9)
Use multiple sources of evidence (e.g., different investigations, scientific literature) to develop an explanation	7 (2.2)	29 (3.2)	34 (3.5)	23 (3.5)	6 (1.4)
Revise their explanations (claims supported by evidence and reasoning) for real-world phenomena based on additional evidence	6 (1.7)	21 (3.1)	44 (4.2)	23 (3.0)	7 (1.5)
Develop scientific models—physical, graphical, or mathematical representations of real-world phenomena—based on data and reasoning	4 (1.5)	13 (2.8)	32 (3.5)	37 (5.2)	13 (2.2)
Identify the strengths and limitations of a scientific model—in terms of accuracy, clarity, generalizability, accessibility to others, strength of evidence supporting it—regardless of who created the model	7 (1.9)	29 (3.5)	41 (3.4)	19 (2.7)	4 (1.2)
Select and use grade-appropriate mathematical and/or statistical techniques to analyze data (e.g., determining the best measure of central tendency, examining variation in data, or developing a fit line)	7 (1.8)	11 (2.1)	27 (3.0)	40 (4.6)	15 (2.4)
Use mathematical and/or computational models to generate data to support a scientific claim	5 (1.7)	14 (2.1)	31 (3.3)	36 (3.8)	13 (2.0)

Determine what details about an investigation (e.g., its design, implementation, and results) might persuade a targeted audience about a scientific claim (regardless of who made the claim)	22 (2.5)	35 (4.0)	27 (3.2)	14 (3.2)	2 (0.8)
Use data and reasoning to defend, verbally or in writing, a claim or refute alternative scientific claims about a real-world phenomenon (regardless of who made the claims)	11 (1.8)	26 (3.4)	36 (3.5)	22 (3.6)	5 (1.2)
Evaluate the strengths and weaknesses of competing scientific explanations (claims supported by evidence) for a real-world phenomenon	12 (2.3)	32 (3.3)	34 (3.4)	19 (3.1)	3 (1.1)
Construct a persuasive case, verbally or in writing, for the best scientific model or explanation for a real-world phenomenon	19 (3.0)	37 (3.6)	30 (4.4)	12 (2.1)	2 (1.0)
Pose questions that elicit relevant details about the important aspects of a scientific argument (e.g., the claims/models/explanations, research design, implementation, data analysis)	15 (2.7)	31 (3.6)	34 (4.5)	17 (2.3)	4 (1.2)
Evaluate the credibility of scientific information— e.g., its reliability, validity, consistency, logical coherence, lack of bias, or methodological strengths and weaknesses (regardless of whether it is from their own or others' work)	17 (2.1)	35 (3.6)	27 (3.1)	17 (2.9)	4 (1.1)
Summarize patterns, similarities, and differences in scientific information obtained from multiple sources (regardless of whether it is from their own or others' work)	15 (2.1)	25 (3.5)	30 (2.8)	24 (3.4)	7 (1.4)

Table 48
High School Physics Classes in Which Teachers Report Incorporating Engineering Into Science Instruction

	PERCENT OF CLASSES
Never	6 (1.7)
Rarely (e.g., a few times per year)	40 (3.8)
Sometimes (e.g., once or twice a month)	35 (4.6)
Often (e.g., once or twice a week)	17 (3.0)
All or almost all science lessons	3 (1.1)

Table 49
High School Physics Classes in Which Teachers Report Incorporating Coding Into Science Instruction

	PERCENT OF CLASSES
Never	82 (3.6)
Rarely (e.g., a few times per year)	14 (3.1)
Sometimes (e.g., once or twice a month)	4 (1.4)
Often (e.g., once or twice a week)	0 (0.3)
All or almost all science lessons	0 (0.3)

Table 50
Amount of Homework Assigned in High School Physics Classes Per Week

	PERCENT OF CLASSES
None	6 (2.1)
1–15 minutes per week	3 (1.4)
16–30 minutes per week	16 (3.2)
31–60 minutes per week	29 (4.5)
61–90 minutes per week	26 (4.1)
91–120 minutes per week	9 (1.8)
More than 2 hours per week	9 (2.3)

Table 51
Frequency of Required External Science Testing in High School Physics Classes

	PERCENT OF CLASSES
Never	39 (4.7)
Once a year	32 (6.8)
Twice a year	11 (2.6)
Three or four times a year	11 (2.6)
Five or more times a year	7 (2.6)

Table 52
Availability of Resources in High School Physics Classes

	PERCENT OF CLASSES		
	NOT AVAILABLE	AVAILABLE IN ANOTHER ROOM	LOCATED IN YOUR CLASSROOM
Lab tables	6 (1.9)	13 (2.5)	81 (3.2)
Electric outlets	1 (0.8)	3 (1.1)	96 (1.4)
Faucets and sinks	9 (2.4)	16 (2.9)	75 (3.7)
Gas for burners	26 (4.6)	28 (3.5)	46 (4.3)
Fume hoods	24 (4.4)	48 (4.5)	28 (4.0)

Table 53
Availability of Instructional Technology in High School Physics Classes

	PERCENT OF CLASSES		
	NOT AVAILABLE	AVAILABLE UPON REQUEST	ALWAYS AVAILABLE IN YOUR CLASSROOM
Probes for collecting data (e.g., motion sensors, temperature probes)	14 (4.4)	34 (4.1)	52 (4.1)
Microscopes	10 (2.3)	72 (4.7)	18 (4.8)
Balances (e.g., pan, triple beam, digital scale)	0 (0.4)	28 (4.4)	72 (4.4)
Projection devices (e.g., Smartboard, document camera, LCD projector)	6 (4.1)	2 (1.2)	92 (3.2)

Table 54
Adequacy of Classroom Resources for Physics Instruction in High Schools

	PERCENT OF CLASSES				
	NOT ADEQUATE 1	2	SOMEWHAT ADEQUATE 3	4	ADEQUATE 5
Instructional technology (e.g., calculators, computers, probes/sensors)	7 (4.1)	2 (1.3)	14 (3.0)	21 (3.4)	56 (4.8)
Consumable supplies (e.g., chemicals, living organisms, batteries)	7 (1.9)	4 (1.6)	20 (4.2)	18 (3.2)	50 (4.1)
Equipment (e.g., thermometers, magnifying glasses, microscopes, beakers, photogate timers, Bunsen burners)	3 (1.4)	5 (2.0)	18 (4.3)	25 (3.6)	48 (4.2)
Facilities (e.g., lab tables, electric outlets, faucets and sinks)	6 (2.1)	4 (1.4)	17 (4.8)	15 (2.6)	57 (4.8)

Table 55
Frequency of Use of Various Instructional Resources in High School Physics Classes

	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
Commercially published textbooks (printed or electronic), including the supplementary materials (e.g., worksheets, laboratory handouts) that accompany the textbooks	15 (3.0)	21 (3.1)	17 (2.5)	34 (3.2)	13 (2.4)
Commercially published kits/modules (printed or electronic)	35 (4.8)	29 (3.5)	22 (3.3)	12 (2.1)	2 (1.2)
State county/district/diocese developed units or lessons	52 (3.3)	21 (3.3)	14 (2.6)	7 (1.3)	5 (1.5)
Online units or courses that students work through at their own pace (e.g., i-Ready, Edgenuity)	68 (3.6)	16 (2.8)	9 (2.7)	6 (1.5)	2 (0.9)
Lessons or resources from websites that have a subscription fee or per lesson cost (e.g., BrainPOP, Discovery Ed, Teachers Pay Teachers)	59 (3.3)	20 (3.1)	11 (2.3)	7 (1.6)	4 (1.5)
Lessons or resources from websites that are free (e.g., Khan Academy, PhET)	10 (2.3)	19 (3.2)	37 (3.7)	28 (3.6)	6 (1.5)
Units or lessons you created (either by yourself or with others)	1 (0.6)	1 (0.5)	7 (2.0)	32 (4.9)	60 (4.9)
Units or lessons you collected from any other source (e.g., conferences, journals, colleagues, university or museum partners)	8 (1.7)	16 (2.5)	28 (3.4)	34 (4.1)	13 (2.2)

Table 56
High School Physics Classes for Which the District Designates Instructional Materials to Be Used

	PERCENT OF CLASSES
Instructional materials designated by district	56 (3.7)

Table 57
High School Physics Classes for Which Various Types of Instructional Materials Are Designated

	PERCENT OF CLASSES
Commercially published textbooks (printed or electronic), including the supplementary materials (e.g., worksheets) that accompany the textbooks	49 (4.5)
Commercially published kits/modules (printed or online)	9 (2.0)
State county/district/diocese developed instructional materials	16 (2.5)
Online units or courses that students work through at their own pace (e.g., i-Ready, Edgenuity)	4 (1.4)
Lessons or resources from websites that have a subscription fee or per lesson cost (e.g., BrainPOP, Discovery Ed, Teachers Pay Teachers)	11 (1.7)
Lessons or resources from websites that are free (e.g., Khan Academy, PhET)	17 (2.5)

There is no table 58.

Table 59a
Copyright Year of Instructional Materials Used in High School Physics Classes

	PERCENT OF CLASSES†
2018	0 (0.3)
2017	2 (1.1)
2016	7 (2.1)
2015	11 (2.4)
2014	15 (3.0)
2013	9 (2.3)
2012 or earlier	57 (3.9)

† Only high school physics classes for which teachers indicated in Q55 that they use commercially published textbooks/modules are included in this analysis.

Table 59b
Publishers of Textbooks Used in High School Physics Classes

	PERCENT OF CLASSES†
Pearson	38 (4.8)
McGraw-Hill Education	18 (4.0)
Houghton Mifflin Harcourt	15 (2.8)
Wiley	8 (2.3)
Alpha Omega Publications	4 (4.5)
Cengage	4 (1.4)
PASCO Scientific	3 (1.5)
OpenStax	2 (1.7)
Activate Learning	1 (0.4)
Anchor	1 (1.3)
Elsevier	1 (1.0)
Oxford University Press	1 (0.8)
The Princeton Review	1 (0.5)
Accelerate Learning	0 (0.4)
Apologia Educational Ministries	0 (0.4)
CORD Communications	0 (0.3)
Frey Scientific	0 (0.2)
Physics Curriculum & Instruction	0 (0.2)
W. H. Freeman	0 (0.5)

† Only high school physics classes for which teachers indicated in Q55 that they use commercially published textbooks/modules are included in this analysis.

Table 60
High School Physics Classes in Which Teachers Report the Effect Various Factors Have on Science Instruction

	PERCENT OF CLASSES					
	INHIBITS EFFECTIVE INSTRUCTION 1	2	NEUTRAL OR MIXED 3	4	PROMOTES EFFECTIVE INSTRUCTION 5	N/A OR DON'T KNOW
Current state standards	1 (0.6)	3 (1.4)	38 (4.5)	19 (3.4)	26 (4.9)	11 (2.9)
District/Diocese and/or school pacing guides	4 (2.0)	3 (1.6)	34 (4.3)	12 (2.5)	19 (3.8)	28 (4.2)
State district/diocese testing/accountability policies†	5 (1.8)	8 (2.6)	43 (4.3)	6 (1.8)	13 (3.8)	24 (3.9)
Textbook/module selection policies	4 (1.5)	5 (1.4)	46 (4.3)	11 (2.7)	16 (3.5)	19 (3.7)
Teacher evaluation policies	2 (1.0)	5 (1.5)	50 (3.9)	14 (2.7)	18 (4.3)	10 (2.7)
College entrance requirements	0 (0.1)	3 (1.5)	34 (4.3)	23 (3.2)	27 (4.7)	13 (3.2)
Students' prior knowledge and skills	5 (1.7)	12 (2.4)	18 (3.0)	21 (3.3)	44 (4.9)	0 (0.3)
Students' motivation, interest, and effort in science	5 (1.6)	9 (2.3)	15 (3.2)	23 (3.9)	46 (4.8)	1 (0.8)
Parent/guardian expectations and involvement	4 (1.8)	9 (2.6)	36 (4.3)	23 (3.7)	23 (3.5)	5 (3.2)
Principal support	1 (0.6)	4 (1.7)	21 (3.6)	22 (3.7)	46 (4.2)	7 (3.6)
Amount of time for you to plan, individually and with colleagues	6 (1.9)	8 (2.3)	17 (3.2)	21 (4.1)	43 (4.2)	6 (3.3)
Amount of time available for your professional development	5 (2.2)	14 (3.4)	26 (3.2)	19 (2.7)	31 (4.7)	5 (3.2)

† This item was presented only to public and Catholic school teachers.

There is no Table 61.

Table 62
Most Recent High School Physics Unit Based Primarily on Any Commercially Published Textbook/Module or State/County/District-Developed Materials

	PERCENT OF CLASSES†
Most recent unit based on specified instructional materials	52 (4.5)

† Only high school physics classes for which teachers indicated in Q55 that they use commercially published or state/district-developed materials at least once a month are included in this analysis.

Table 63
Ways Instructional Materials Were Used in the Most Recently Completed Unit in High School Physics Classes

	PERCENT OF CLASSES†				
	NOT AT ALL 1	2	SOMEWHAT 3	4	TO A GREAT EXTENT 5
I used the textbook/module to guide the overall structure and content emphasis of the unit	1 (0.7)	2 (1.2)	28 (5.4)	33 (6.6)	36 (5.4)
I picked what is important from the textbook/ module and skipped the rest	8 (2.9)	17 (7.6)	25 (4.5)	22 (4.6)	28 (4.6)
I incorporated activities (e.g., problems, investigations, readings) from other sources to supplement what the textbook/module was lacking	4 (1.9)	5 (2.6)	23 (7.5)	29 (4.9)	39 (5.3)
I modified activities from the textbook/module	7 (2.5)	1 (1.0)	22 (5.0)	41 (5.8)	29 (4.8)

† Only high school physics classes for which teachers indicated in Q55 that they use commercially published or state/district-developed materials at least once a month are included in these analyses.

Table 64
Reasons Parts of the Instructional Materials Were Skipped in High School Physics Classes

	PERCENT OF CLASSES†		
	NOT A FACTOR	A MINOR FACTOR	A MAJOR FACTOR
The science ideas addressed in the activities I skipped are not included in my pacing guide and/or current state standards.	43 (7.8)	34 (9.4)	23 (5.8)
I did not have the materials needed to implement the activities I skipped.	50 (8.3)	30 (10.7)	20 (5.7)
I did not have the knowledge needed to implement the activities I skipped.	78 (5.7)	19 (5.5)	2 (1.6)
The activities I skipped were too difficult for my students.	46 (8.7)	34 (9.9)	20 (5.5)
My students already knew the science ideas or were able to learn them without the activities I skipped.	45 (8.6)	41 (9.7)	15 (4.7)
I have different activities for those science ideas that work better than the ones I skipped.	16 (5.2)	35 (6.8)	49 (8.3)
I did not have enough instructional time for the activities I skipped.	25 (6.4)	51 (8.7)	25 (6.1)

† Only high school physics classes in which (1) teachers indicated in Q55 that the most recent unit was based on commercially published or state/district-developed materials and (2) teachers reported skipping some activities in Q63 are included in these analyses.

Table 65
Reasons Why the Instructional Materials Were Supplemented in High School Physics Classes

	PERCENT OF CLASSES†		
	NOT A FACTOR	A MINOR FACTOR	A MAJOR FACTOR
My pacing guide indicated that I should use supplemental activities	57 (9.0)	30 (9.6)	13 (3.7)
Supplemental activities were needed to prepare students for standardized tests	54 (8.6)	19 (5.0)	28 (9.3)
Supplemental activities were needed to provide students with additional practice	13 (4.3)	30 (6.7)	57 (7.9)
Supplemental activities were needed so students at different levels of achievement could increase their understanding of the ideas targeted in each activity	24 (5.5)	18 (4.8)	58 (7.8)
I had additional activities that I liked	16 (5.0)	49 (7.8)	35 (5.7)

† Only high school physics classes in which (1) teachers indicated in Q55 that the most recent unit was based on commercially published or state/district-developed materials and (2) teachers reported supplementing some activities in Q63 are included in these analyses.

Table 66
Reasons Why the Instructional Materials Were Modified in High School Physics Classes

	PERCENT OF CLASSES†		
	NOT A FACTOR	A MINOR FACTOR	A MAJOR FACTOR
I did not have the necessary materials/supplies for the original activities	51 (8.0)	34 (9.5)	15 (5.7)
The original activities were too difficult conceptually for my students	51 (9.1)	37 (9.0)	12 (4.5)
The original activities were too easy conceptually for my students	52 (8.6)	40 (9.3)	8 (3.5)
I did not have enough instructional time to implement the activities as designed	38 (7.3)	42 (8.9)	20 (4.5)
The original activities were too structured for my students	59 (9.0)	37 (9.4)	4 (2.2)
The original activities were not structured enough for my students	66 (10.5)	24 (5.9)	11 (11.1)

† Only high school physics classes in which (1) teachers indicated in Q55 that the most recent unit was based on commercially published or state/district-developed materials and (2) teachers reported modifying some activities in Q63 are included in these analyses.

Table 67
High School Physics Classes Taught by Teachers Feeling Prepared for Each of a Number of Tasks in the Most Recent Unit

	PERCENT OF CLASSES			
	NOT ADEQUATELY PREPARED	SOMEWHAT PREPARED	FAIRLY WELL PREPARED	VERY WELL PREPARED
Anticipate difficulties that students may have with particular science ideas and procedures in this unit	1 (0.3)	11 (3.3)	37 (3.7)	52 (4.3)
Find out what students thought or already knew about the key science ideas	1 (0.9)	7 (1.9)	47 (4.2)	45 (4.5)
Implement the instructional materials (e.g., textbook, module) to be used during this unit	2 (1.0)	8 (1.6)	34 (3.4)	57 (4.0)
Monitor student understanding during this unit	0 ---†	4 (1.1)	37 (4.3)	59 (4.3)
Assess student understanding at the conclusion of this unit	1 (0.6)	4 (1.0)	33 (4.1)	62 (4.3)

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

Table 68
Duration of the Most Recent High School Physics Lesson

	AVERAGE NUMBER OF MINUTES
Duration of lesson	61 (1.4)

Table 69
Average Percentage of Time Spent on Different Activities in the Most Recent High School Physics Lesson

	AVERAGE PERCENT OF CLASS TIME
Non-instructional activities (e.g., attendance taking, interruptions)	9 (0.4)
Whole class activities (e.g., lectures, explanations, discussions)	38 (1.4)
Small group work	37 (2.0)
Students working individually (e.g., reading textbooks, completing worksheets, taking a test or quiz)	16 (1.7)

Table 70
High School Physics Classes Participating in Various Activities in the Most Recent Lesson

	PERCENT OF CLASSES
Teacher explaining a science idea to the whole class	81 (2.7)
Teacher conducting a demonstration while students watched	49 (3.4)
Whole class discussion	55 (3.5)
Students working in small groups	84 (3.0)
Students completing textbook/worksheet problems	51 (4.0)
Students doing hands-on/laboratory activities	41 (3.6)
Students reading about science	16 (3.5)
Students writing about science (does not include students taking notes)	23 (3.3)
Practicing for standardized tests	6 (1.4)
Test or quiz	17 (3.1)
None of the above	1 (0.8)

Table 71
Sex of High School Physics Teachers

	PERCENT OF TEACHERS
Female	43 (3.7)
Male	57 (3.7)
Other	0 (0.1)

Table 72
High School Physics Teachers of Hispanic or Latino Origin

	PERCENT OF TEACHERS
Hispanic or Latino	5 (1.3)
Not Hispanic or Latino	95 (1.3)

Table 73
Race of High School Physics Teachers

	PERCENT OF TEACHERS
American Indian or Alaska Native	1 (0.5)
Asian	5 (1.2)
Black or African American	4 (1.1)
Native Hawaiian or Other Pacific Islander	1 (0.5)
White	93 (1.4)

Table 74
Age of High School Physics Teachers

	MEAN AGE OF TEACHERS
Age	43 (0.8)