NSSME THE NATIONAL SURVEY OF SCIENCE & MATHEMATICS EDUCATION

Translating Research Findings Into Practice

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Agenda

1. Introduction to the NSSME+
2. How NSSME+ results have been used with practitioners
3. How your results have been/could be used with practitioners

A Brief Overview of the 2027 NSSME+

The 2027 NSSME+ will be the seventh in a series of studies dating back to 1977

The most recent iteration was the 2018 NSSME+

The plus symbol reflects the study’s added emphasis on computer science and engineering education

Main audiences have historically been researchers, policy makers, and state-/district-level practitioners

AAAS
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

AACT
American Association of Chemistry Teachers

AAPT
PHYSICS EDUCATION®

AASA
THE SCHOOL SUPERINTENDENTS ASSOCIATION

AMTE

ASA
AMERICAN STATISTICAL ASSOCIATION
Promoting the Practice and Profession of Statistics

ASSM

ASTE

Benjamin Banneker Association

Council of State Science Supervisors

CSTA

NABT
National Association of Biology Teachers

naesp National Association of Elementary School Principals

NAGT

NARST
A global organization for improving science education through research

ncsm
Leadership in Mathematics Education

NCTM
NATIONAL COUNCIL OF TEACHERS OF MATHEMATICS

nea
NATIONAL EDUCATION ASSOCIATION

NATIONAL EARTH SCIENCE TEACHERS ASSOCIATION

NSELA
NATIONAL SCIENCE EDUCATION LEADERSHIP ASSOCIATION

nsta
National Science Teaching Association

Focal Areas

Teacher data:

- Background, beliefs, and preparation
- Professional development participation
- Instructional practices
- Instructional materials used
- Other factors affecting instruction

School data:

- STEM Courses offered
- Programs and policies to support STEM teaching and learning

The Sample

Two-stage random sample:

- Schools—goal is 2,000
- K–12 Teachers within schools—goal is ~10,000 teachers of science, mathematics, and high school computer science

This sampling strategy allows us to make national estimates as well estimates for subgroups:

- Subject and grade-range groups
- Student demographics
- Prior achievement of students
- Community type

2027 NSSME+ Timeline

January 2026 – March 2027

- School Recruitment

September 2026 – March 2027

- Teacher sampling on a rolling basis

January 2027 – June 2027

- Questionnaire administration

December 2027 on

- Reporting

Interpreting Results

After data collection, design weights are computed, adjusted for nonresponse, and applied to the data.

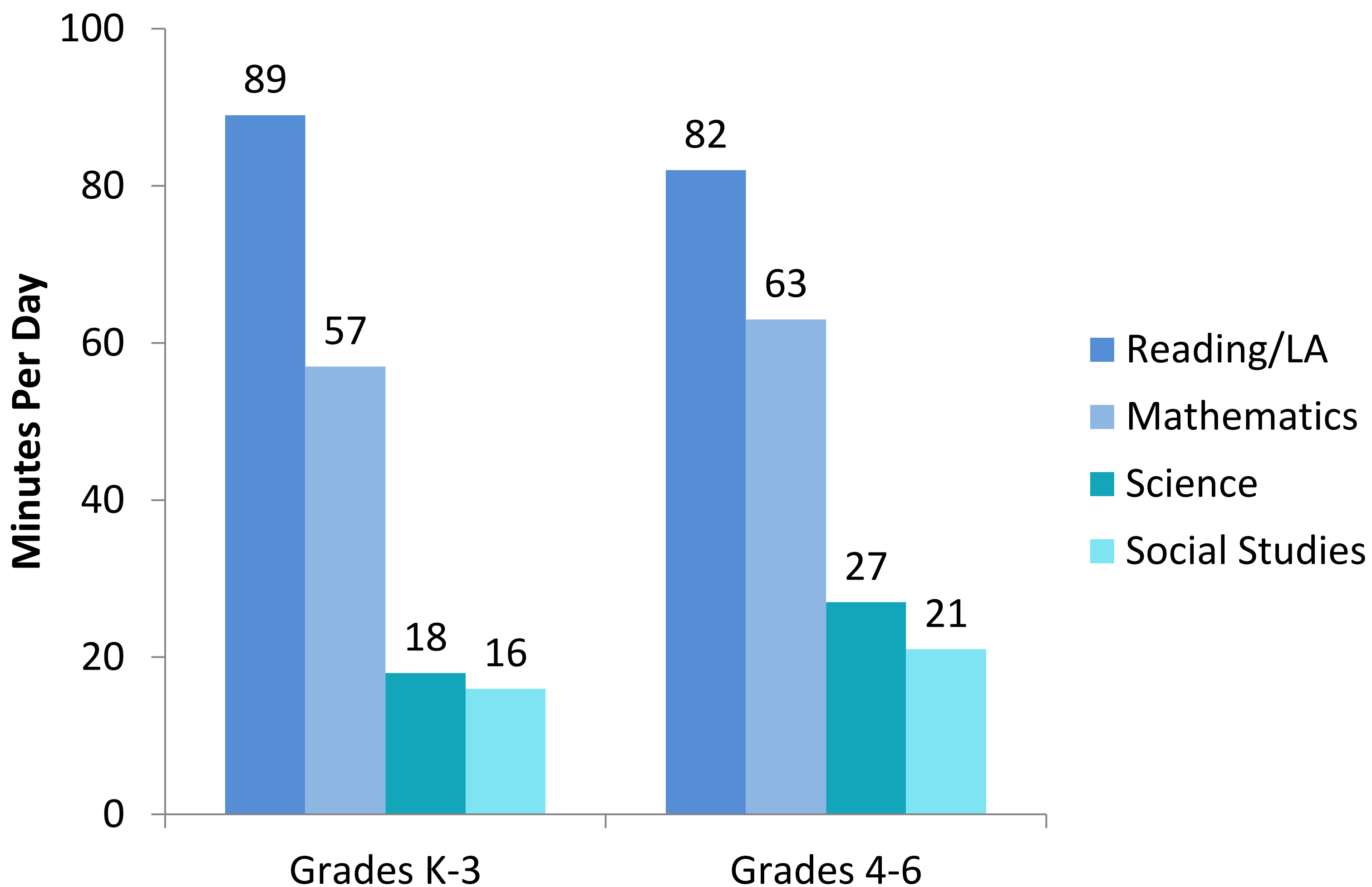
The sampling and weighting processes mean that the results are national estimates of schools, teachers, and classes—<u>not</u> characteristics of the respondents.

Smattering of 2018 Results

How much time do elementary teachers spend teaching:

- Mathematics
- Science
- Social Studies
- Reading/Language Arts

Instructional Time: Elementary



How often do science teachers have students use various science and engineering practices?

- 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 lessons

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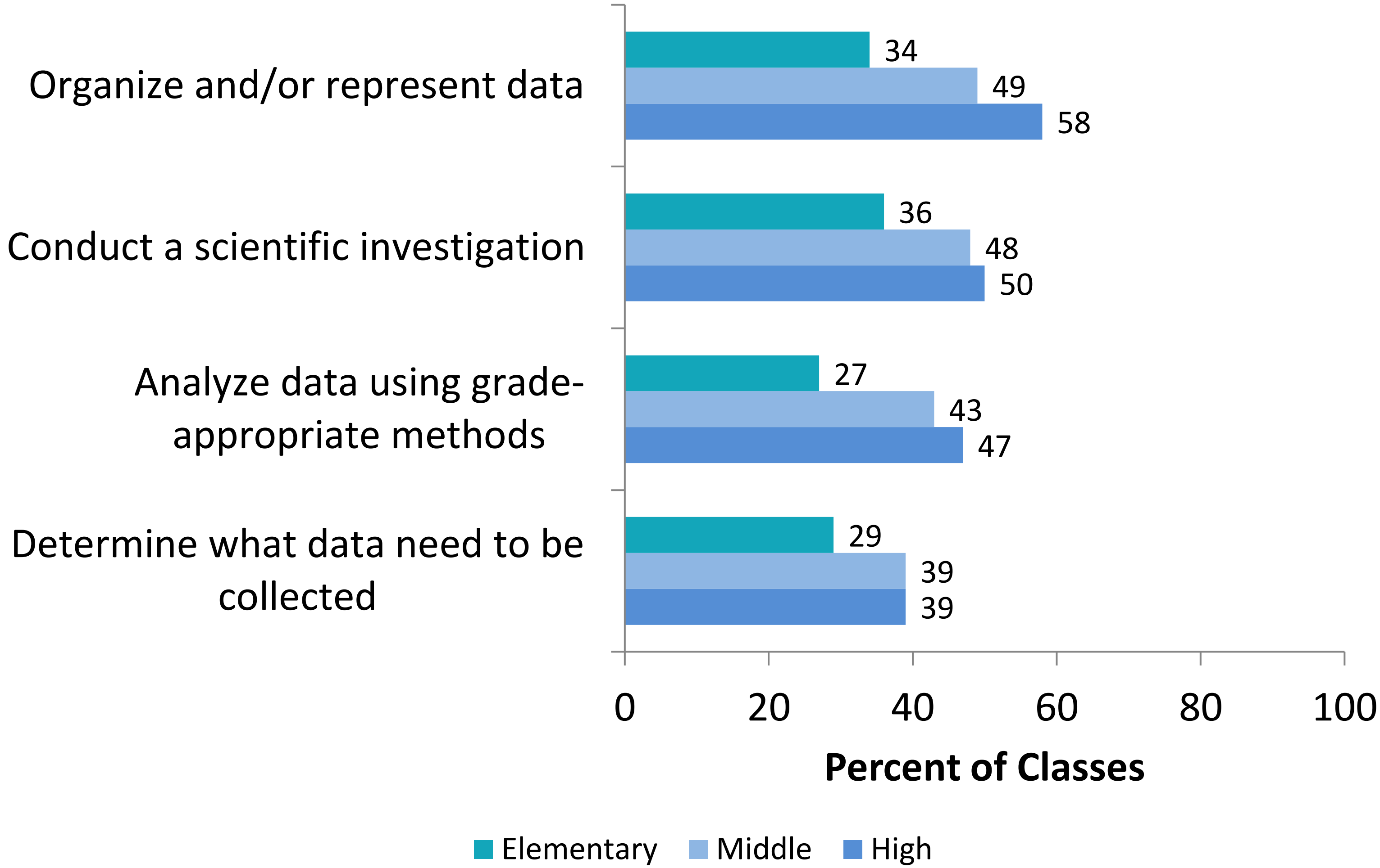
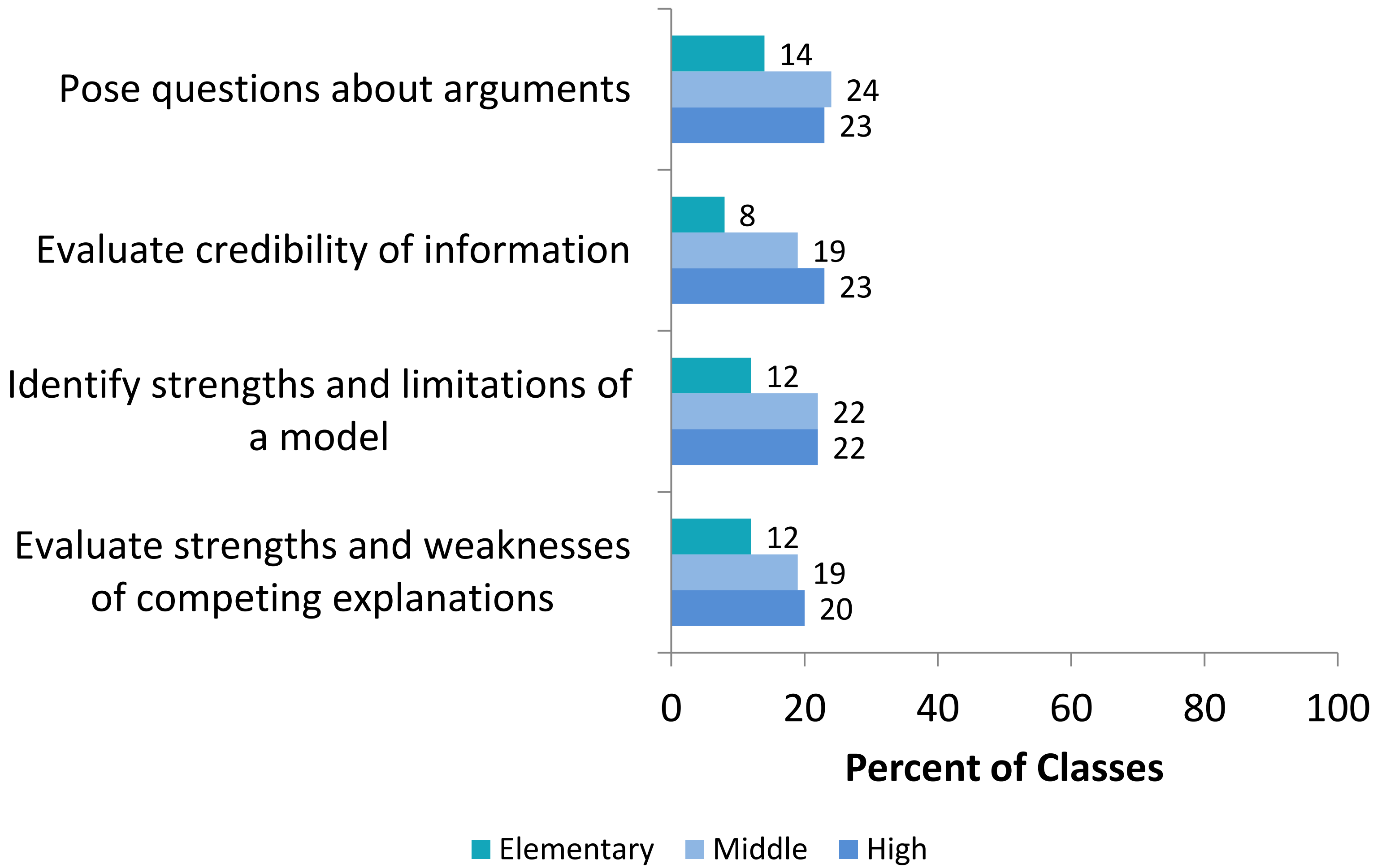
Conducting Investigations and Analyzing Data at Least Once a Week



Evaluating Evidence and Arguing at Least Once a Week



How well prepared do teachers feel to teach science/mathematics/computer science content?

- Not adequately prepared
- Somewhat prepared
- Fairly well prepared
- Very well prepared

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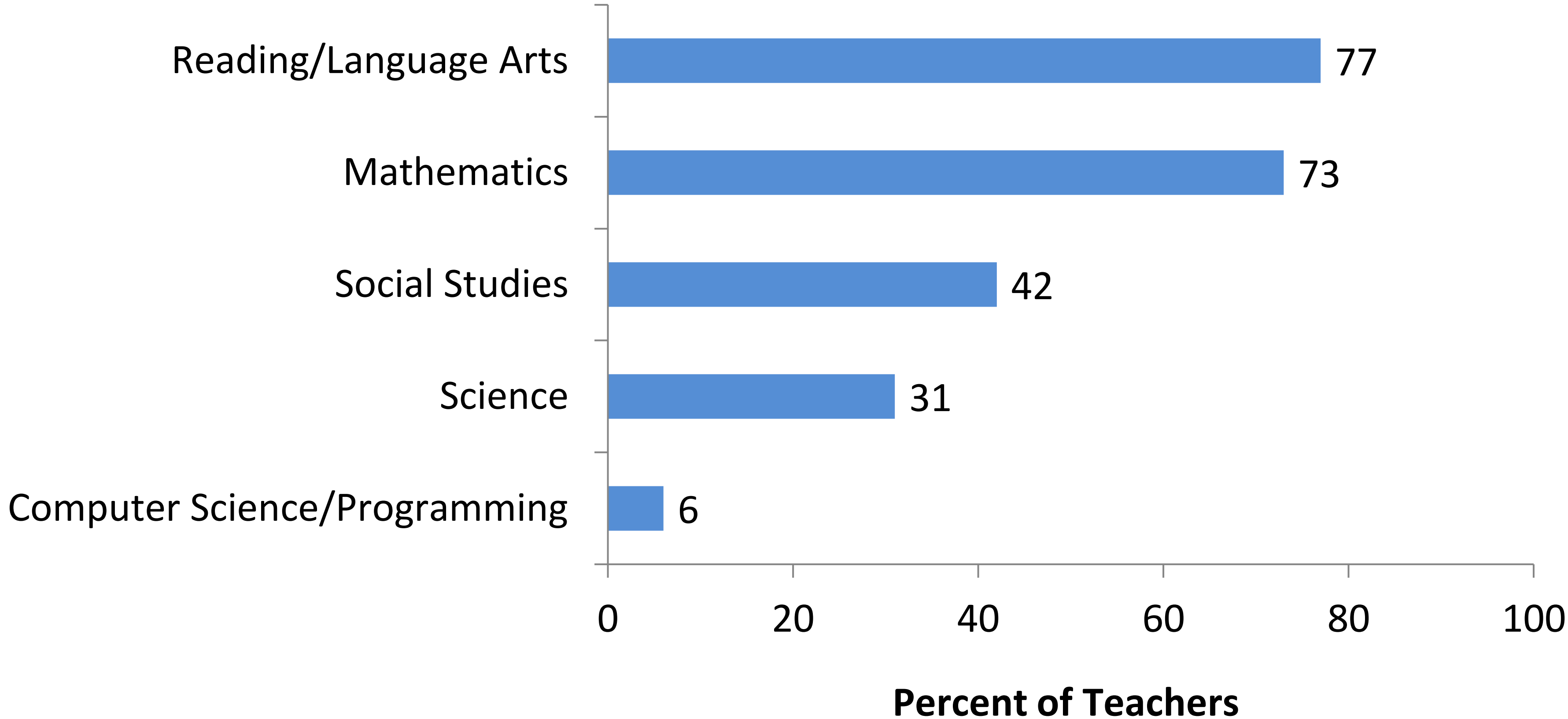
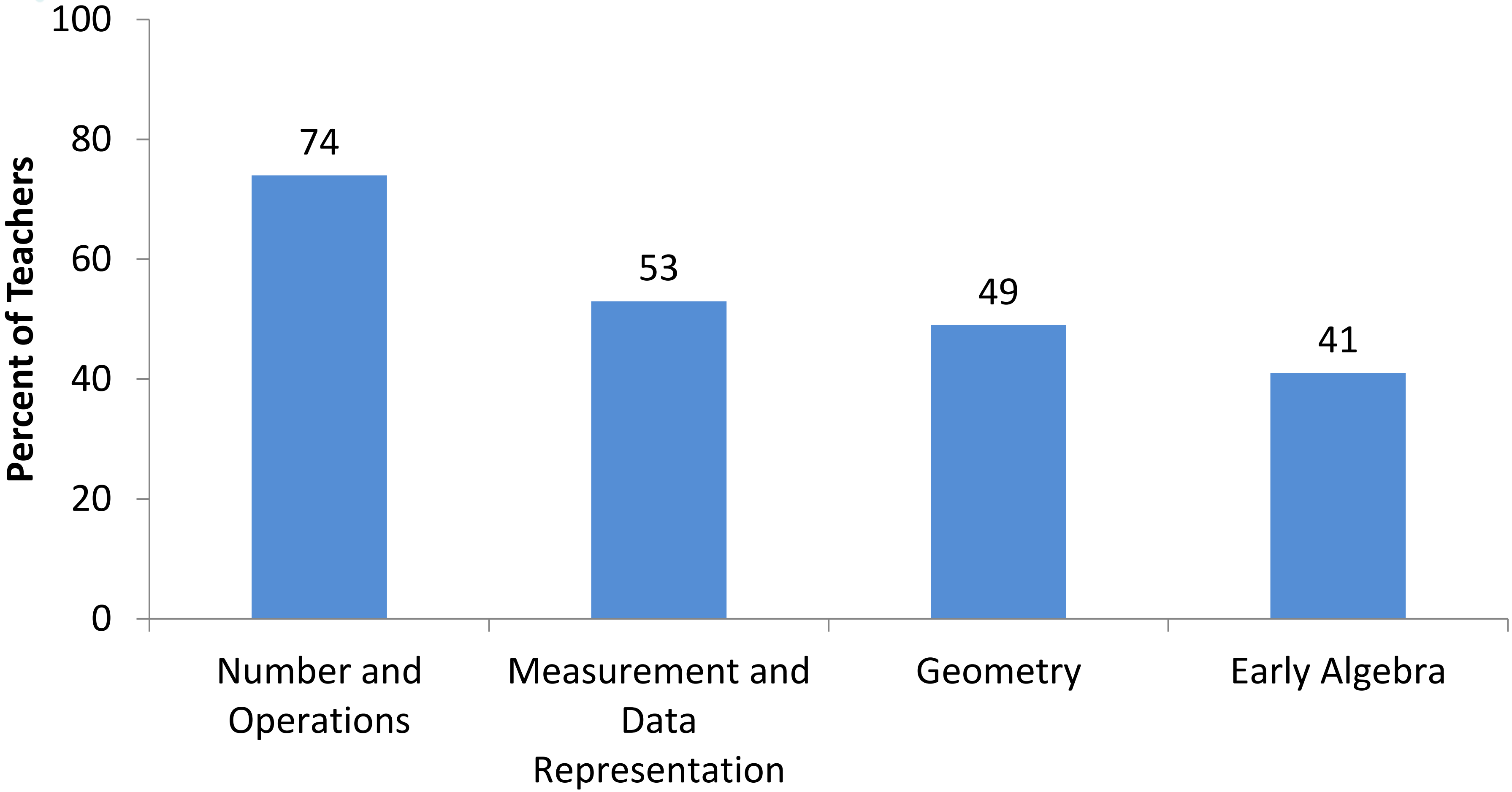
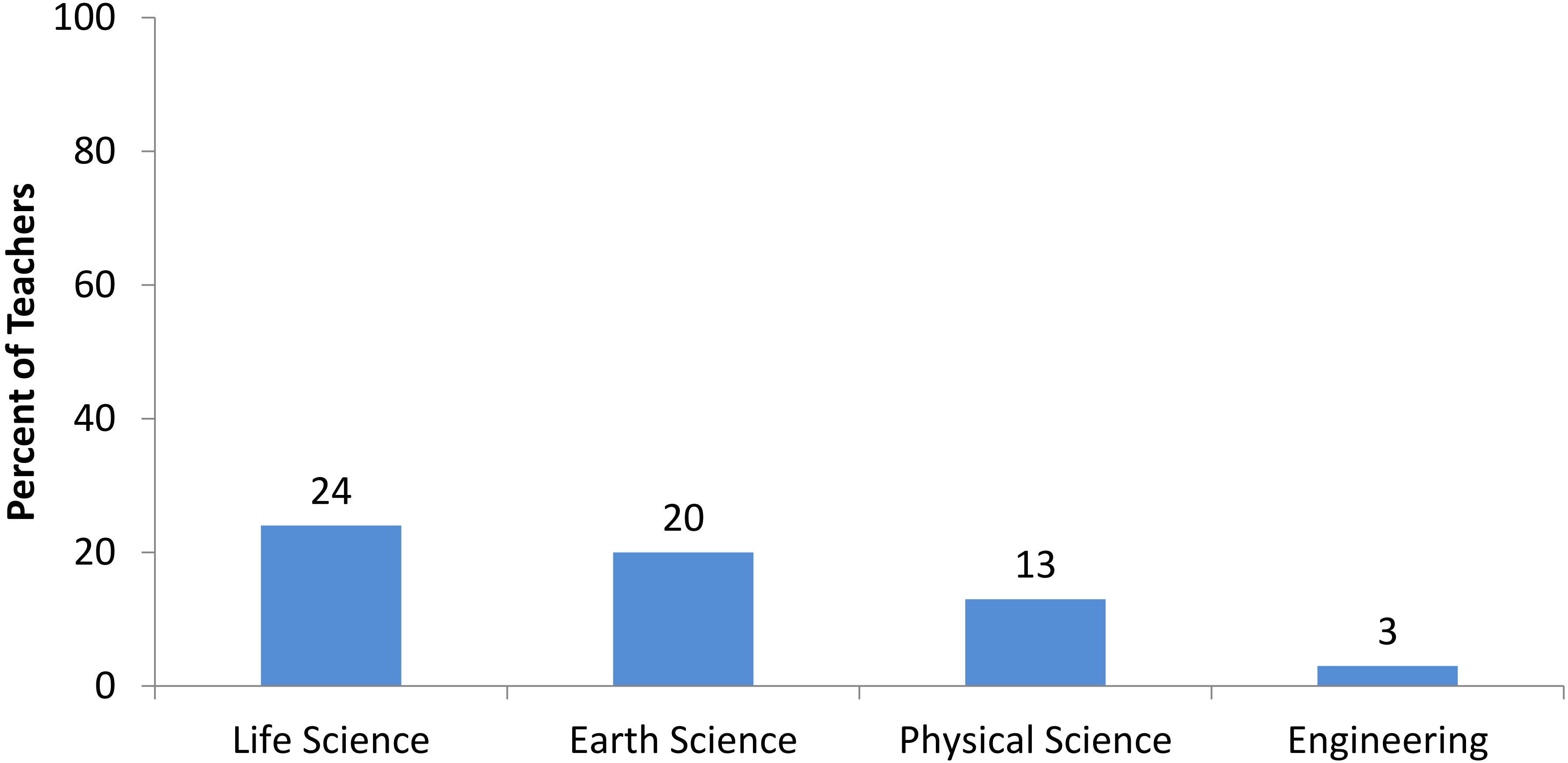
Self-Contained Elementary Teachers Considering Themselves Very Well Prepared to Teach Each Subject



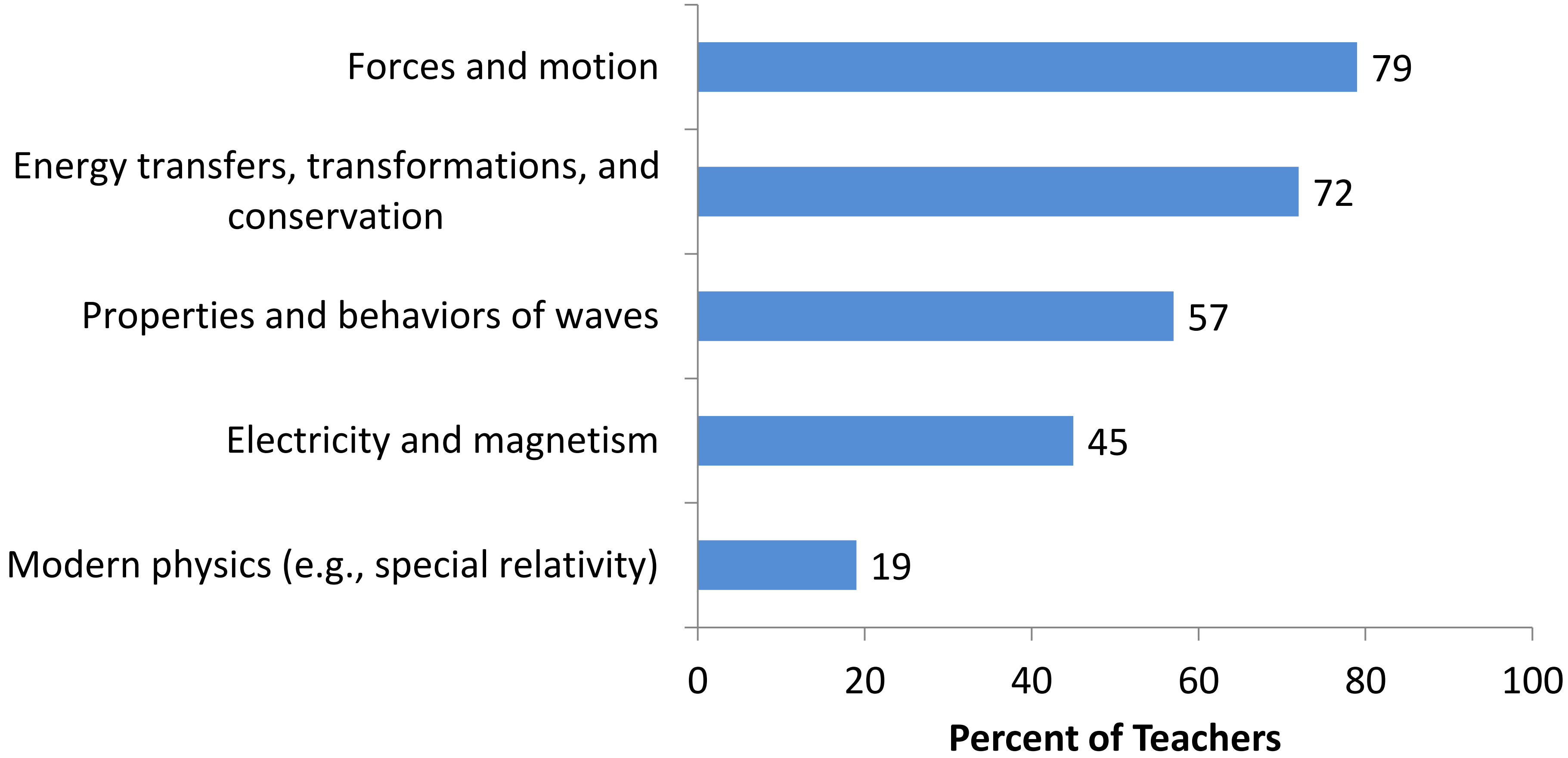
Elementary Teachers Considering Themselves Very Well Prepared to Teach Various Mathematics Topics



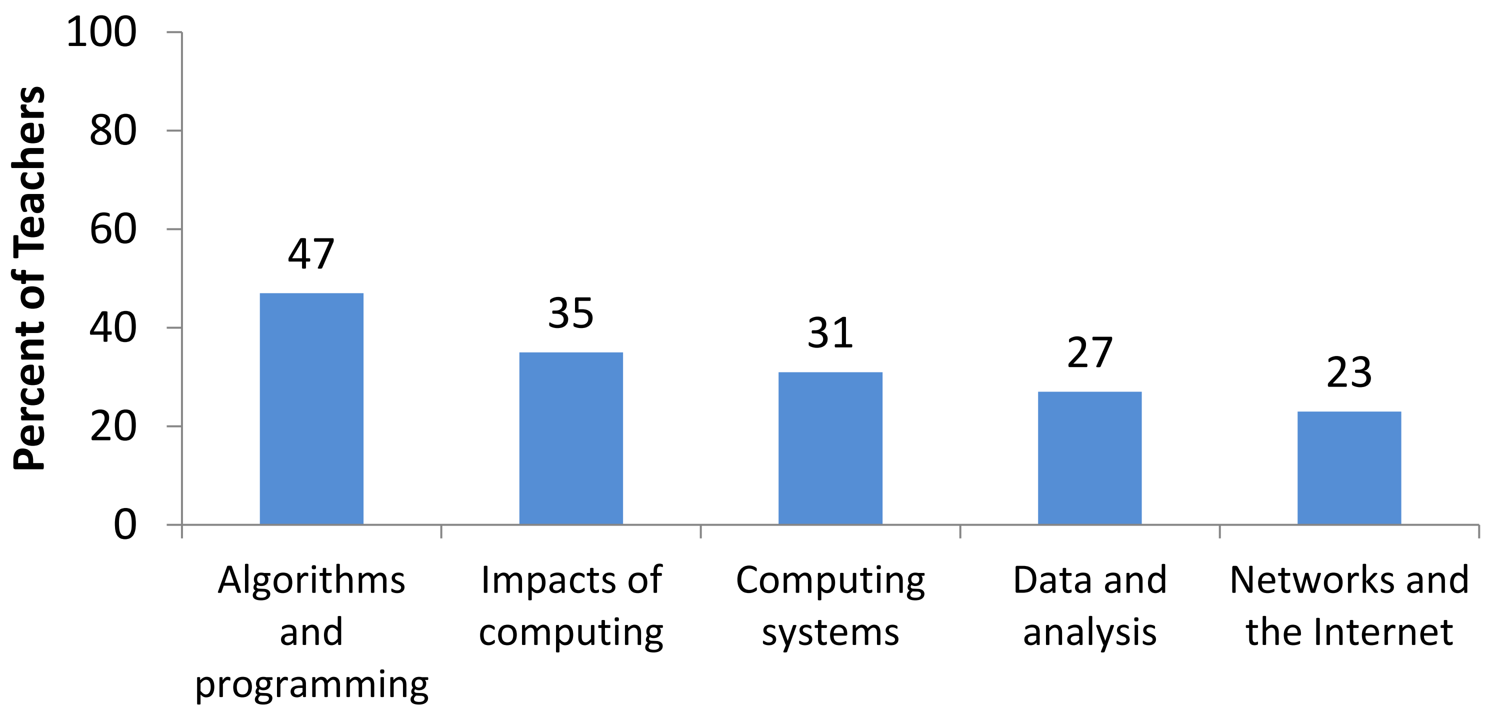
Elementary Teachers Considering Themselves Very Well Prepared to Teach Various Science Disciplines



High School Science Teachers Considering Themselves Very Well Prepared to Teach Physics Topics



Perceptions of Preparedness: Very Well Prepared to Teach CS Topics



What are teachers' pedagogical beliefs?

- Strongly disagree
- Disagree
- No opinion
- Agree
- Strongly Agree

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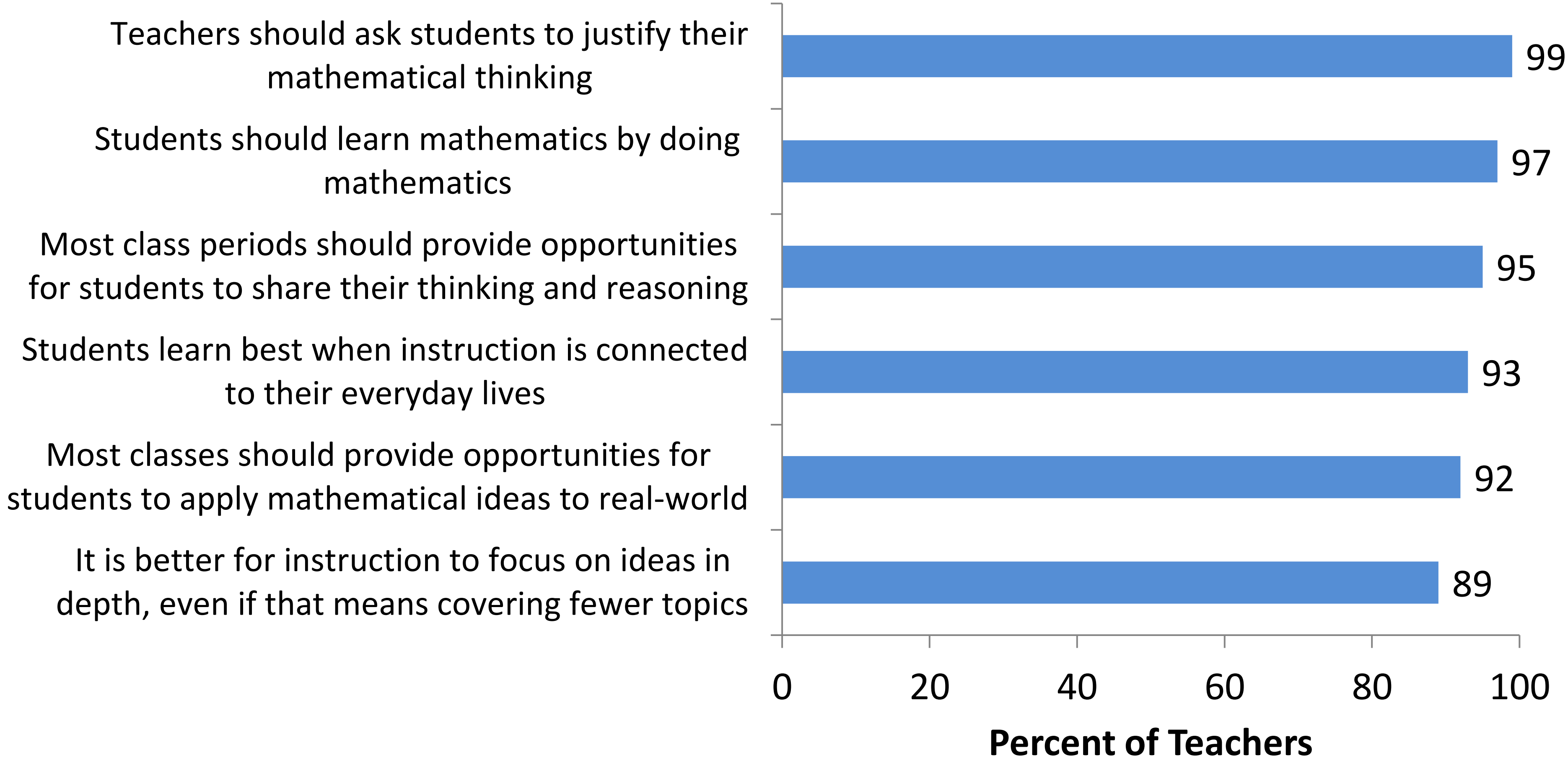
Middle School Mathematics Teachers Agreeing With Various Statements About Teaching and Learning



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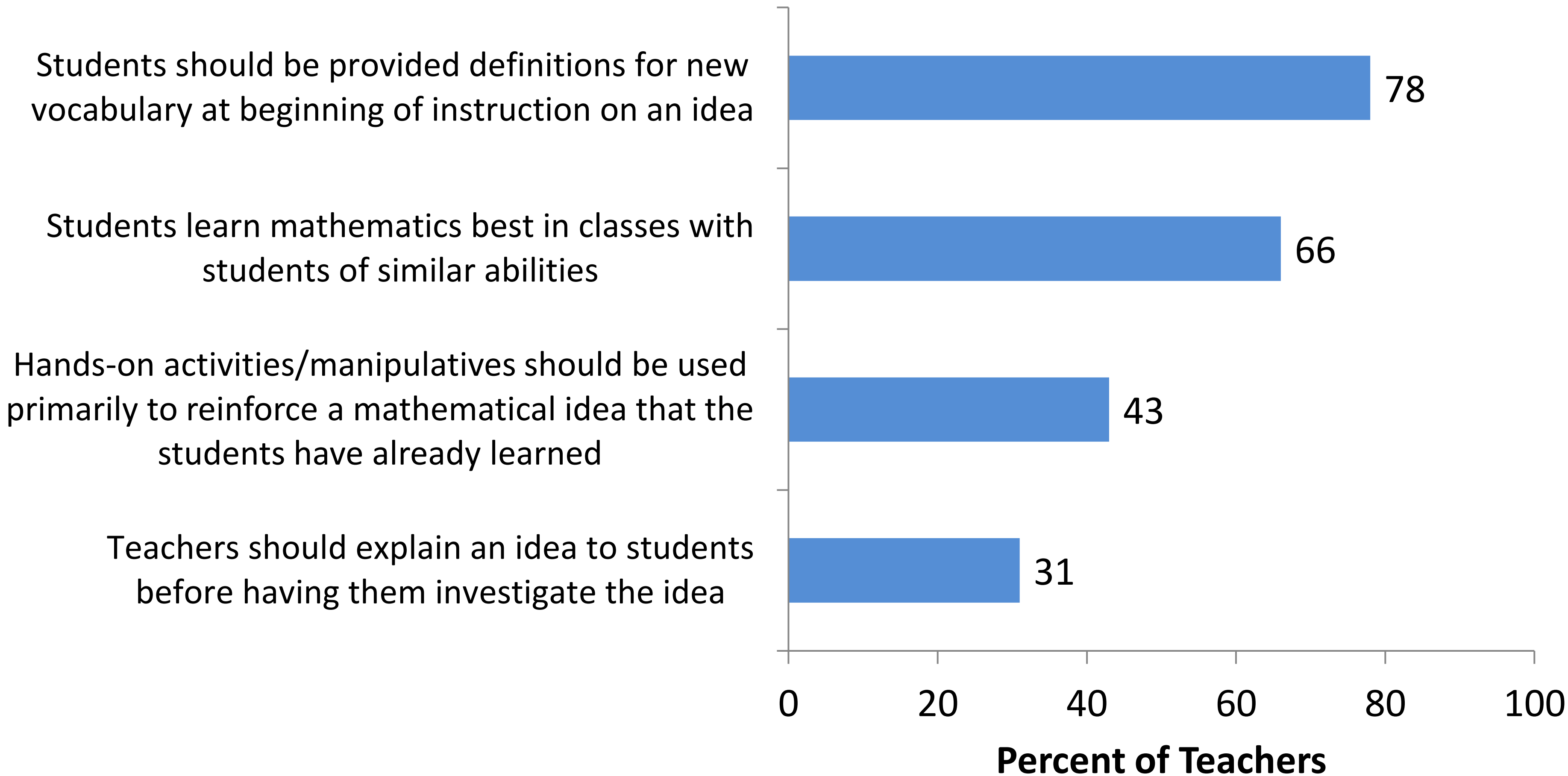

How often do teachers base their instruction on various type of instructional materials?

- Never
- Rarely (For example: A few times a year)
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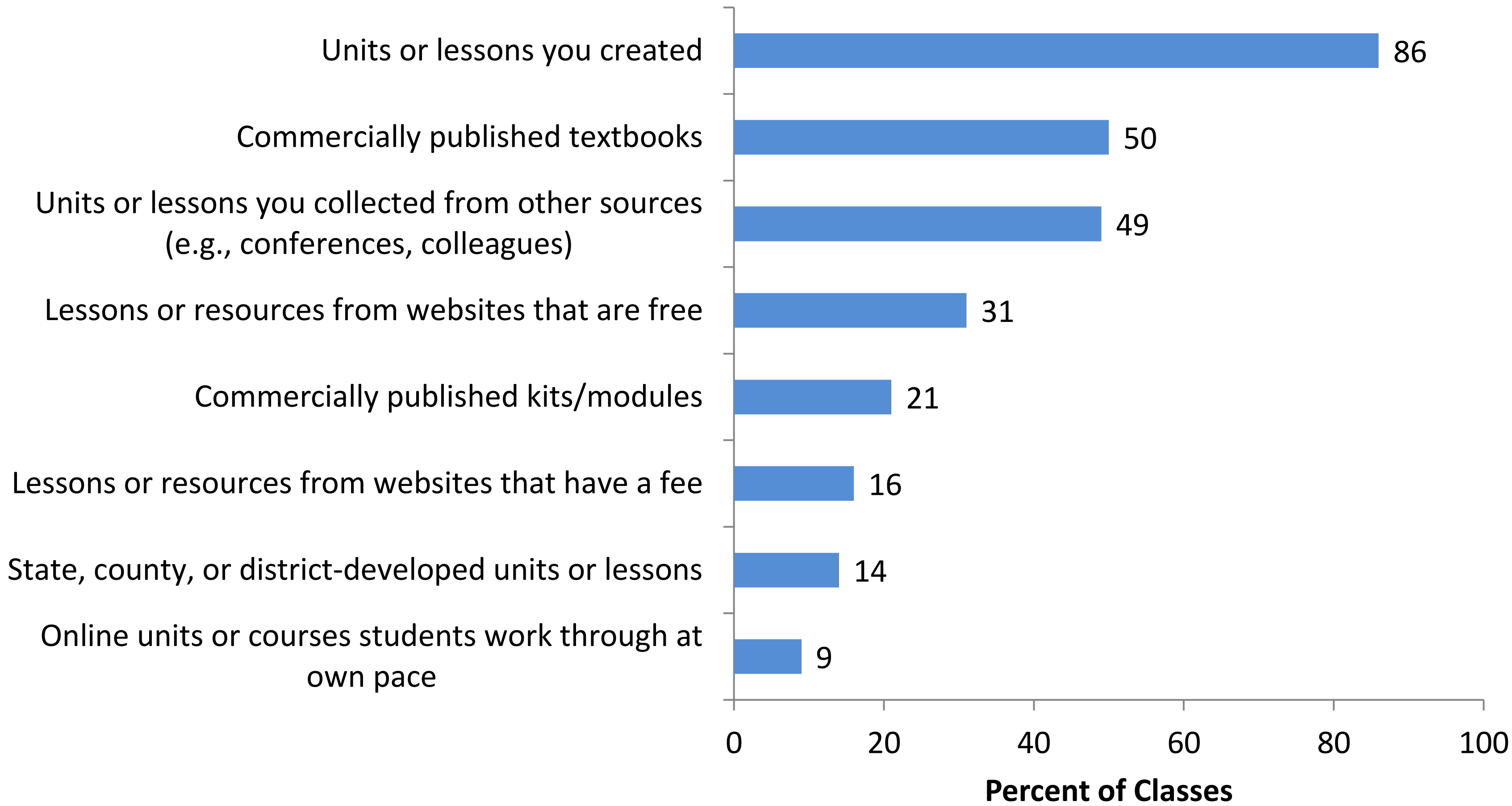
High School Science Classes Basing Instruction on Various Instructional Resources at Least Once a Week



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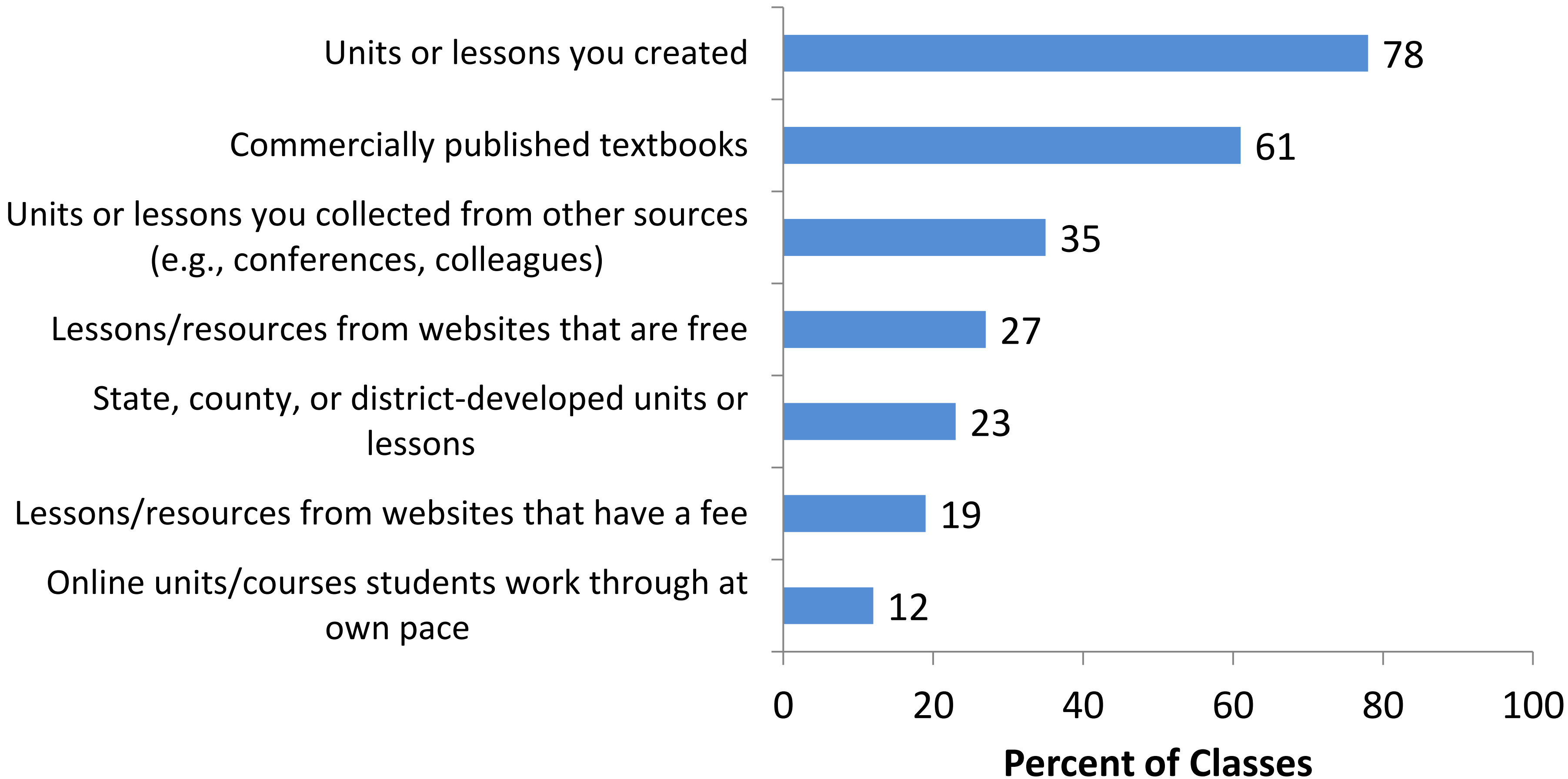
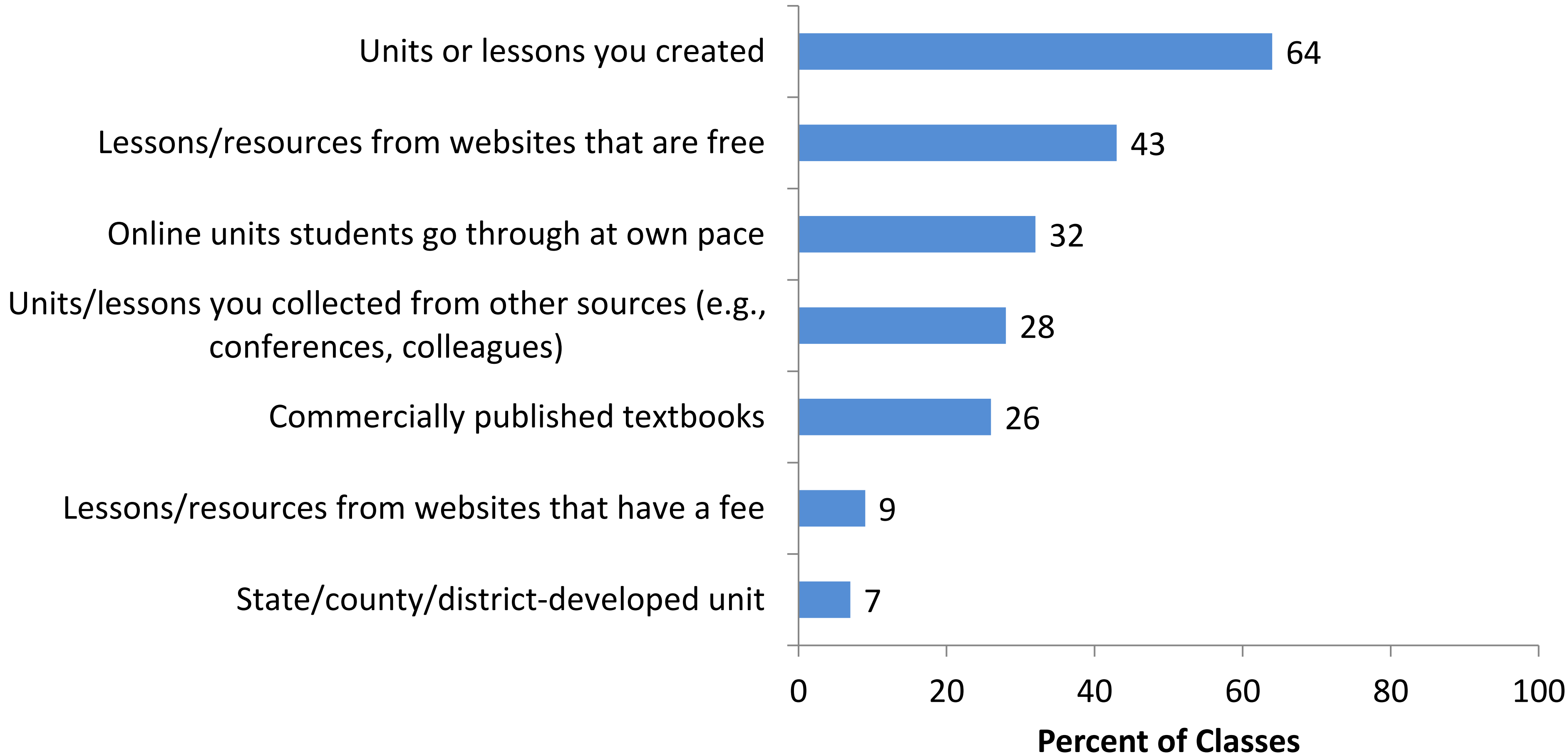


High School Computer Science Classes Basing Instruction on Various Instructional Resources at Least Once a Week



Situating our Research

Current work on the adaptation of instructional materials/curriculum resources:

More than half of elementary school teachers reported supplementing (65%), modifying (59%), or skipping (51%) of the curriculum resources they used (Banilower et al., 2018).

Situating our Research

Experience and assignments of out-of-field science teachers

Table 8. Percentage of classes taught by out of field teachers, by teaching experience (SE in parentheses).

	Novice Teachers		Veteran Teachers	
Grade Level of Class	Out of Field	In Field	Out of Field	In Field
Middle School	91 (2.4)	9 (2.4)	87 (2.6)	13 (2.6)
High School	66 (3.3)	34 (3.3)	56 (2.1)	44 (2.1)

Taylor, J., Banilower, E., & Clayton, G. (2020). National trends in the formal content preparation of US science teachers: Implications of out-of-field teaching for student outcomes. *Journal of Science Teacher Education*, *31*(7), 768-779.

Working with Teachers

How often should middle school science teachers have students revise their science explanations based on additional evidence?

a. Daily
b. Two to five times a week
c. Once a week
d. Once every two weeks
e. Other

Explain your thinking to the person next to you

Working with Science Teachers

Science Classes in Which Teachers Report Students Engaging in Various Aspects of Science Practices at Least Once a Week, by Grade Range

	PERCENT OF CLASSES		
	ELEMENTARY	MIDDLE	HIGH
Organize and/or represent data using tables, charts, or graphs in order to facilitate analysis of the data	34 (2.1)	49 (2.3)	58 (1.5)
Make and support claims with evidence	32 (2.0)	51 (2.1)	50 (1.5)
Conduct a scientific investigation	36 (2.2)	48 (2.2)	50 (1.6)
Analyze data using grade-appropriate methods in order to identify patterns, trends, or relationships	27 (1.9)	43 (2.4)	47 (1.4)
Determine what data would need to be collected in order to answer a scientific question	29 (2.1)	39 (2.1)	39 (1.4)
Generate scientific questions	38 (2.2)	44 (2.2)	38 (1.8)
Compare data from multiple trials or across student groups for consistency in order to identify potential sources of error or inconsistencies in the data	19 (2.2)	31 (2.3)	36 (1.5)
Develop scientific models—physical, graphical, or mathematical representations of real-world phenomena	19 (1.7)	34 (2.3)	34 (1.5)
Use multiple sources of evidence to develop an explanation	26 (2.0)	37 (2.3)	33 (1.6)
Develop procedures for a scientific investigation to answer a scientific question	29 (2.2)	35 (2.1)	32 (1.4)
Select and use grade-appropriate mathematical and/or statistical techniques to analyze data	15 (1.4)	21 (1.8)	30 (1.6)
Determine whether or not a question is scientific	19 (1.6)	31 (1.8)	28 (1.5)
Revise their explanations based on additional evidence	22 (2.0)	30 (2.1)	28 (1.4)
Summarize patterns, similarities, and differences in scientific information obtained from multiple sources	18 (2.2)	25 (2.0)	28 (1.5)

Working with District Leaders

Which statement do you most agree with?

a. My science teachers spend less than 30 hours an academic year engaged in professional learning.
b. My science teachers spend about 30 hours an academic year engaged in professional learning.
c. My science teachers spend more than 30 hours a year engaged in professional learning.

Discuss your answer with the person next to you.

Do you agree or disagree with these data? How do these data compare to your perceptions of the professional development of teachers in your district?

Time Spent on Professional Development in the Last Three Years, by Grade Range

	PERCENT OF TEACHERS		
	ELEMENTARY	MIDDLE	HIGH
Science			
None	43 (2.2)	22 (2.2)	18 (1.3)
Less than 6 hours	20 (1.6)	8 (1.1)	8 (1.3)
6–15 hours	20 (1.5)	23 (2.4)	18 (1.6)
16–35 hours	12 (1.3)	21 (1.6)	22 (1.3)
36–80 hours	3 (0.7)	16 (1.5)	21 (1.4)
More than 80 hours	1 (0.4)	10 (1.2)	14 (1.0)

Working with the General Public

Which of the following represents the national vision of science education?

a. At the beginning of instruction, students should be provided with a definition of science vocabulary that will be used in class.
b. Most class periods should allow students to share their ideas with one another.
c. A teacher should explain an idea before having students consider evidence that relates to the idea.
d. The instruction in a science class should connect to students' everyday lives.
e. All of the above
f. None of the above

Working with the General Public

Science Teachers Agreeing† With Various Statements About Teaching and Learning, by Grade Range

	PERCENT OF TEACHERS		
	ELEMENTARY	MIDDLE	HIGH
Reform-Oriented Beliefs			
Teachers should ask students to support their conclusions about a science concept with evidence.	95 (1.1)	97 (0.9)	99 (0.3)
Students learn best when instruction is connected to their everyday lives.	95 (1.0)	97 (0.7)	96 (0.7)
Students should learn science by doing science (e.g., developing scientific questions; designing and conducting investigations; analyzing data; developing models, explanations, and scientific arguments).	95 (1.0)	93 (1.7)	93 (1.2)
Most class periods should provide opportunities for students to apply scientific ideas to real-world contexts.	93 (1.2)	90 (2.0)	91 (1.4)
Most class periods should provide opportunities for students to share their thinking and reasoning.	96 (0.9)	92 (1.9)	89 (1.4)
It is better for science instruction to focus on ideas in depth, even if that means covering fewer topics.	75 (2.1)	74 (2.9)	77 (2.0)
Traditional Beliefs			
At the beginning of instruction on a science idea, students should be provided with definitions for new scientific vocabulary that will be used.	77 (2.1)	72 (2.3)	66 (2.1)
Students learn science best in classes with students of similar abilities.	25 (1.9)	48 (3.6)	60 (1.7)
Hands-on/laboratory activities should be used primarily to reinforce a science idea that the students have already learned.	56 (2.4)	57 (2.6)	52 (2.0)
Teachers should explain an idea to students before having them consider evidence that relates to the idea.	33 (2.1)	30 (2.6)	37 (2.3)

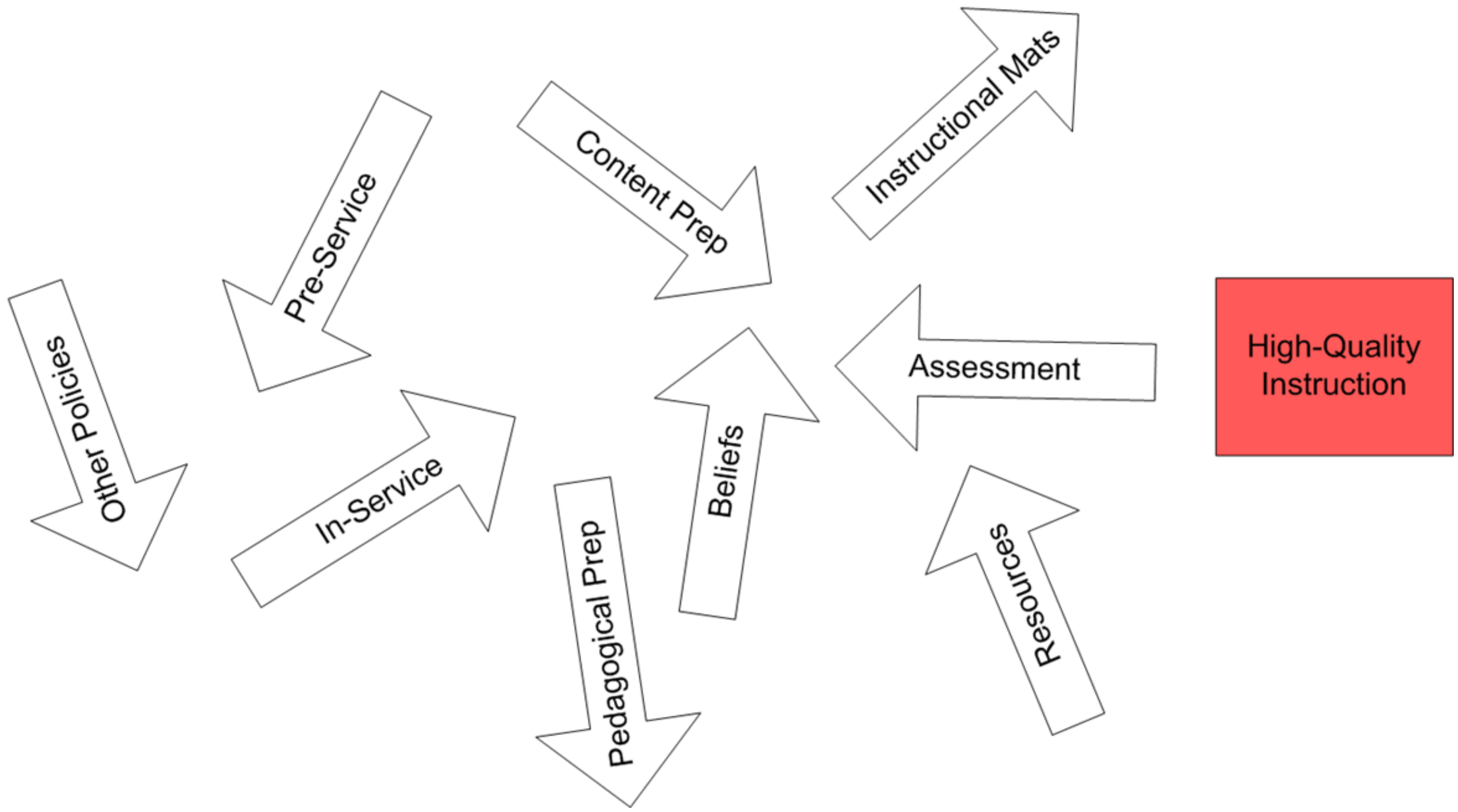
† Includes teachers indicating “strongly agree” or “agree” on a five-point scale ranging from 1 “strongly disagree” to 5 “strongly agree.”

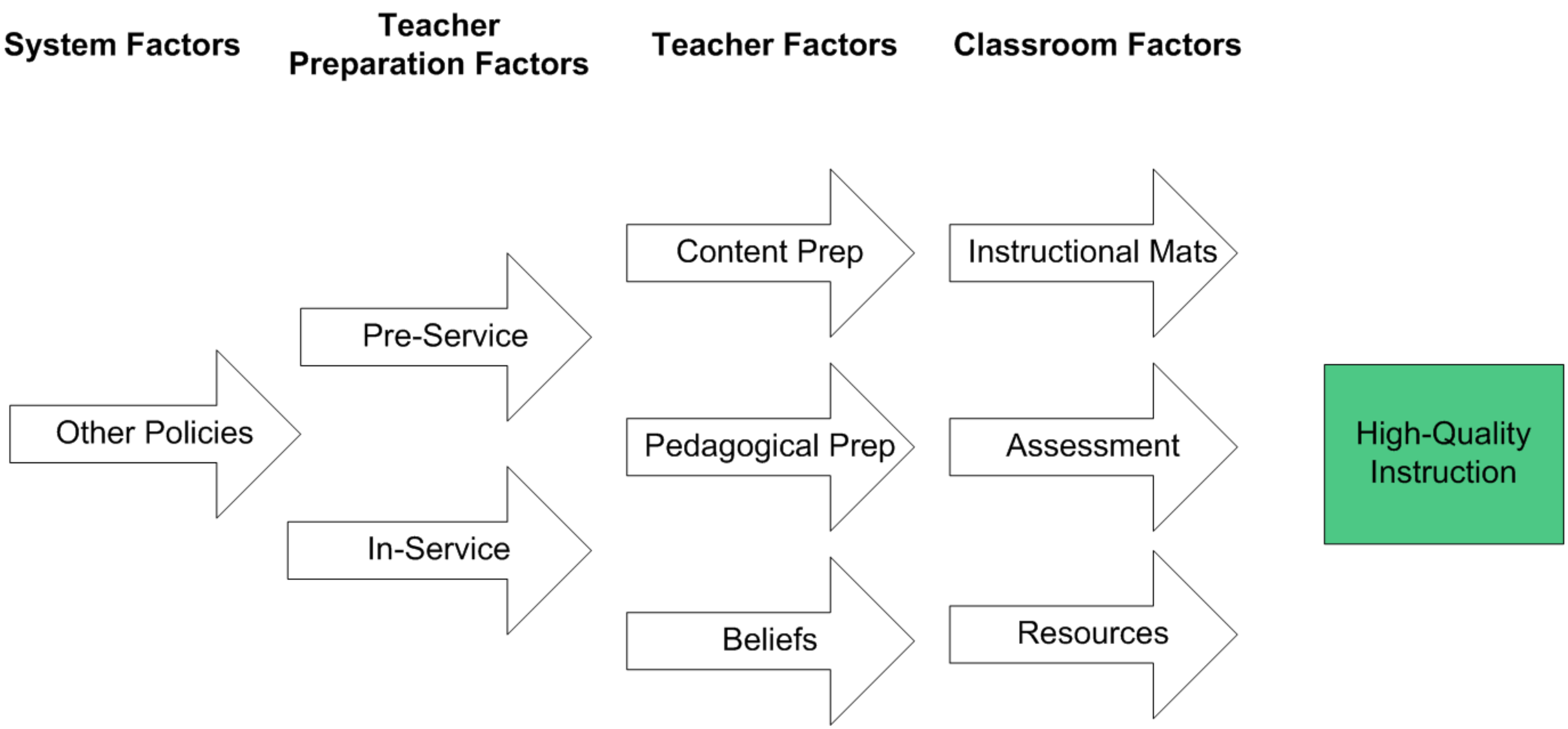
Translating Research to Practice

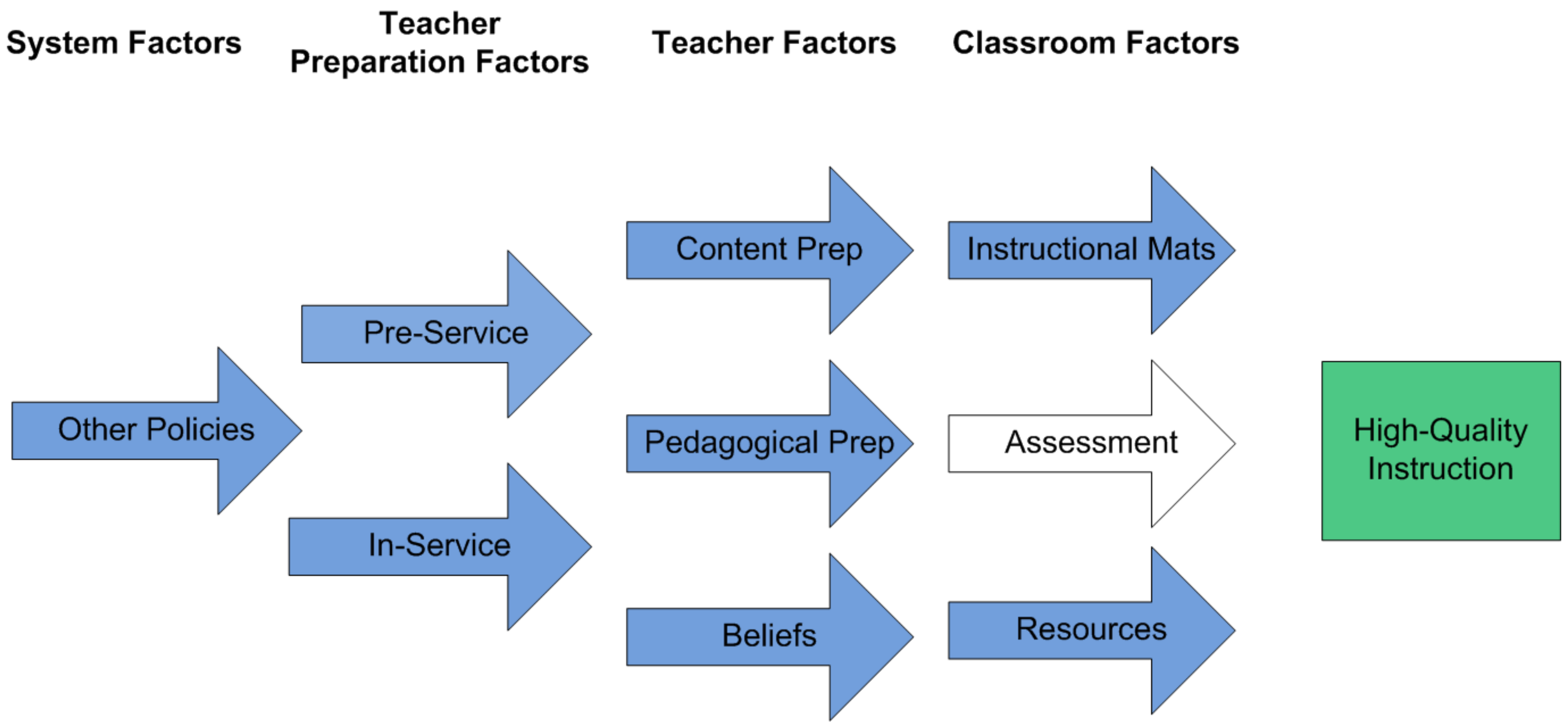
To fully realize the goal of providing all students with a high-quality STEM education requires alignment of many aspects of the education system:

- Teacher preparation (pre-service and in-service)
- Teacher knowledge, skills, and beliefs
- Classroom Resources
- Other policies

System Factors | Teacher Preparation Factors | Teacher Factors | Classroom Factors




System Factors
Teacher Preparation Factors
Teacher Factors
Classroom Factors
Other Policies
Pre-Service
In-Service
Content Prep
Pedagogical Prep
Beliefs
Instructional Mats
Assessment
Resources
High-Quality Instruction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Small Group Discussion

Consider the system factors that influence high quality instruction in science, mathematics, engineering, and CS:

- What strategies would be most likely to facilitate widespread impact of research on teachers' practice? Please share any examples you have from your own work.
- What aspects of the system are most difficult to align to what we learn from research? Why?

https://tinyurl.com/translatingr2p

Contact Information

Please feel free to reach out to either of us or anyone else on our team:

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Our website has more information:

https://www.horizon-research.com/NSSME/