NSSME | THE NATIONAL SURVEY OF SCIENCE & MATHEMATICS EDUCATION

The 2018 NSSME+

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Session Overview

- About the 2018 NSSME+
- Brief Overview of Current Status of Mathematics Instruction
- Resources for Instruction
- The Mathematics Teaching Force
- Professional Development Experiences
- Implications for Teacher Preparation and Support

About the 2018 NSSME+

- The 2018 NSSME+ is the sixth in a series of surveys dating back to 1977.

- It is the only survey specific to STEM education that provides nationally representative results.

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Topics Addressed

Six different survey instruments

- Characteristics of the science/math/computer science teaching force:
  - demographics
  - preparation for teaching
  - beliefs about teaching and learning
  - perceptions of preparedness
- Instructional practices
- Factors that shape teachers' decisions about content and pedagogy
- Use of instructional materials
- Opportunities teachers have for professional growth
- How instructional resources are distributed

Who's In the Sample

Two-stage random sample that targeted:

- 2,000 schools (public and private)
- Over 10,000 K–12 teachers

Very good response rate:

- 1,273 schools participated
- 86 percent of program representatives
- 78 percent of sampled teachers

Endorsing Organizations

- American Association of Chemistry Teachers
- American Association of Physics Teachers
- American Federation of Teachers
- **Association of Mathematics Teacher Educators**
- American Society for Engineering Education
- Association of State Supervisors of Mathematics
- Association for Science Teacher Education
- Council of State Science Supervisors
- Computer Science Teachers Association
- National Association of Biology Teachers
- National Association of Elementary School Principals
- National Association of Secondary School Principals
- National Council of Supervisors of Mathematics
- National Council of Teachers of Mathematics
- National Earth Science Teachers Association
- National Education Association
- National Science Education Leadership Association
- National Science Teachers Association

Interpreting Results

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

Why should you care?

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

www.horizon-research.com/NSSME

Current reports:

- Technical report
- Highlights report
- Compendium of Tables

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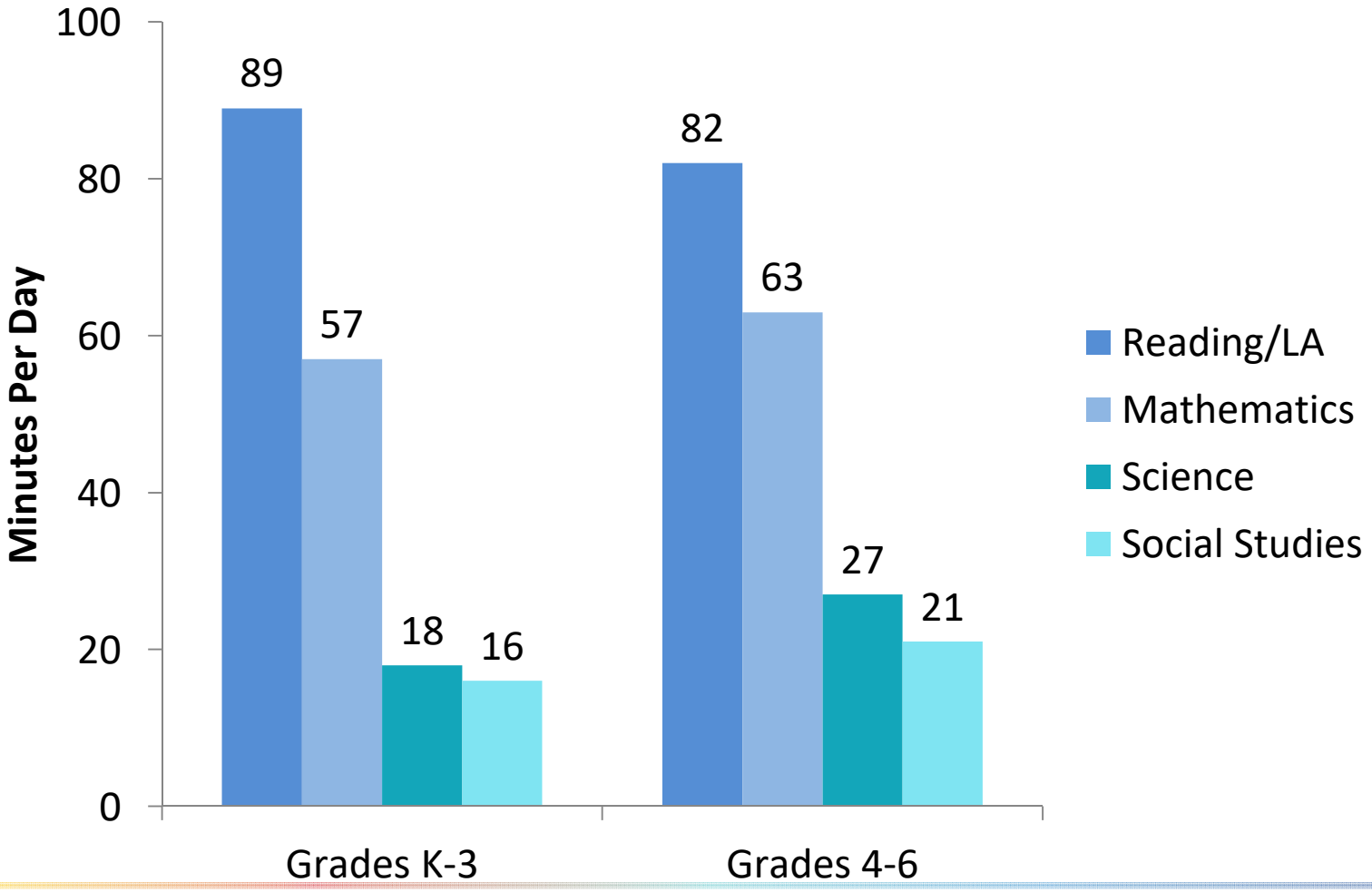
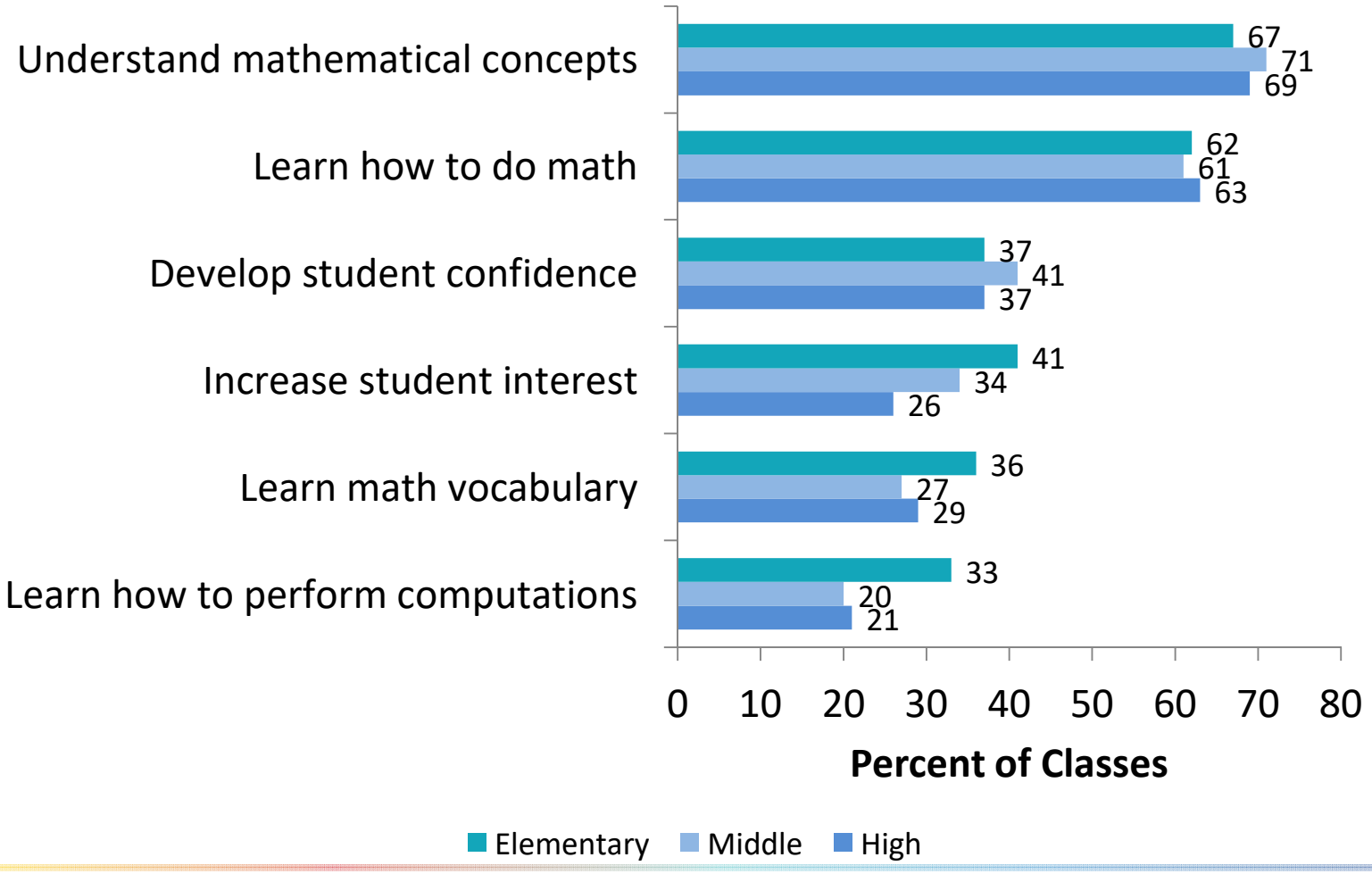
What mathematics instruction are students experiencing? *

- Instructional time
- Objectives
- Math Practices

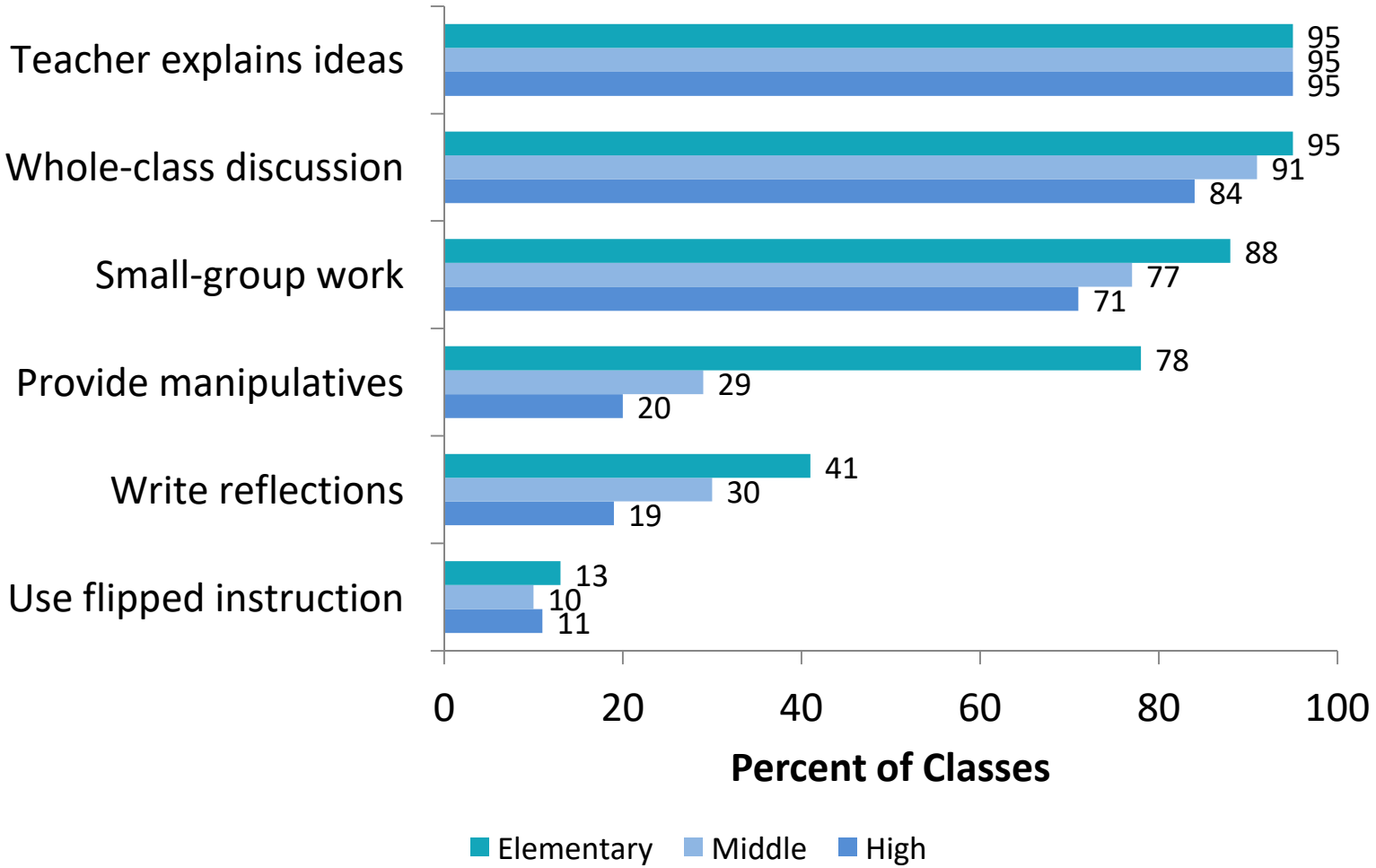
Instructional Time: Elementary



Objectives Receiving a Heavy Emphasis



Instructional Activities: Weekly



Engagement in Standards for Mathematical Practice

The 2018 NSSME+ included a series of items asking how often students were engaged in aspects of the mathematical practices:

1. Make sense of problems and persevere in solving them
2. Reason abstractly and quantitatively
3. Construct viable arguments/critique reasoning of others
4. Model with mathematics
5. Use appropriate tools strategically
6. Attend to precision
7. Look for and make use of structure
8. Look for and express regularity in repeated reasoning

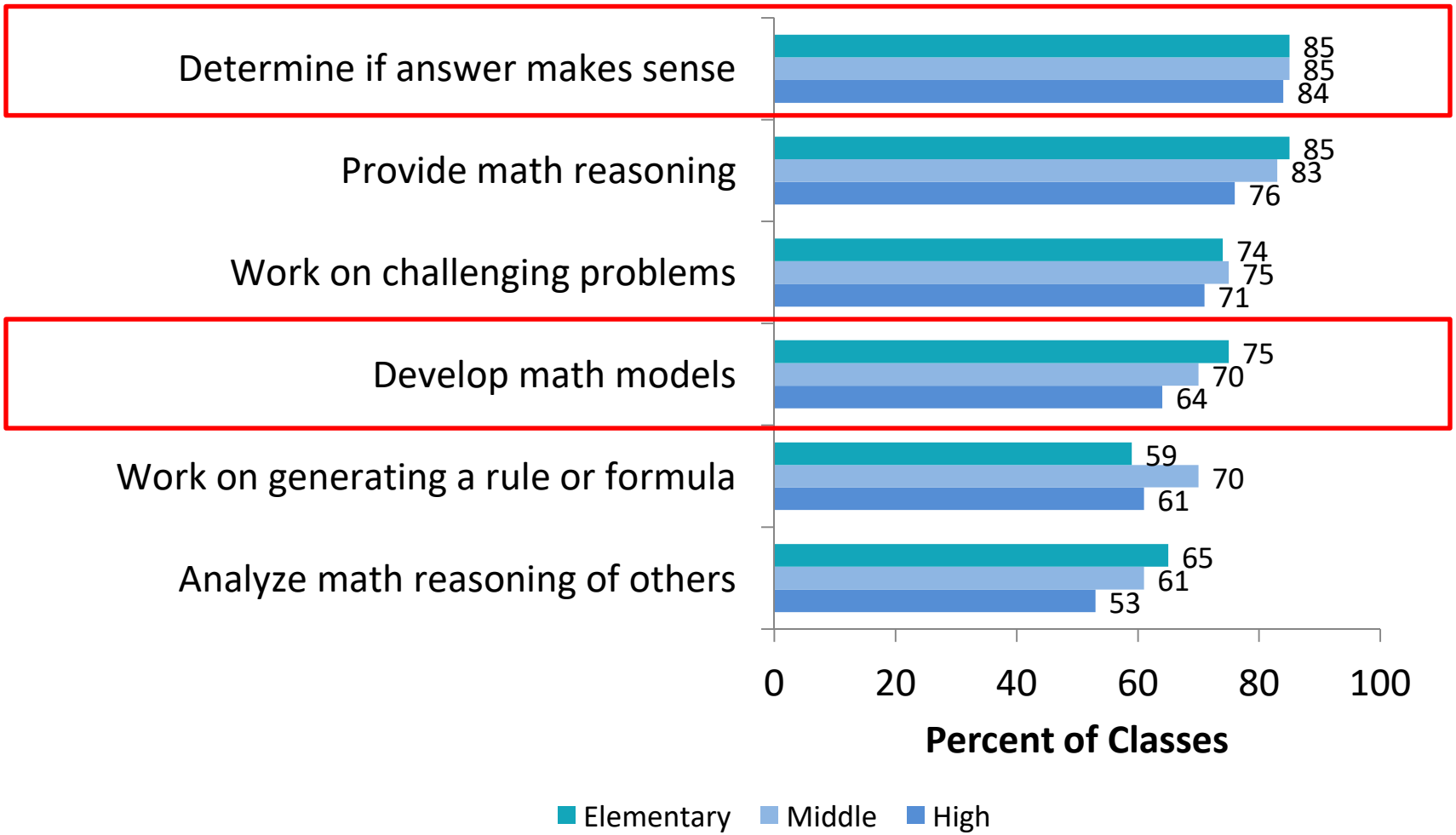
Engagement in Standards for Mathematical Practice

In the ideal, how often should students engage with these math practices?

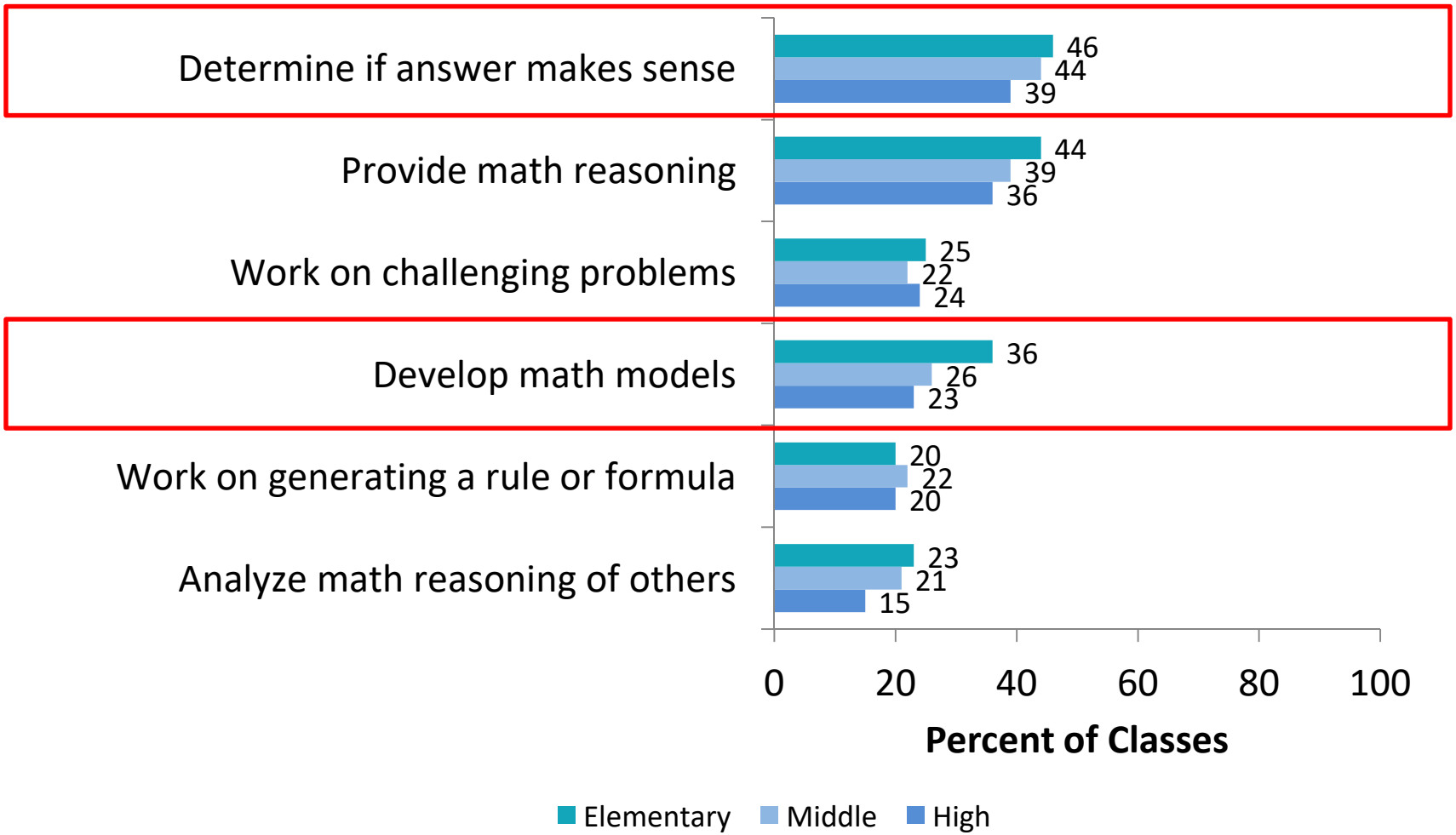
- Determine whether their answers make sense
- Develop a mathematical model to solve a mathematics problem

A. Daily
B. Weekly
C. Less often

Standards for Mathematical Practice: Weekly



Standards for Mathematical Practice: Daily



Why Might Instruction Look This Way?

- State, district, school policies
- Availability of resources, including instructional materials

State, District, and School Policies

What percentage of elementary classes are required to take three or more state/district mathematics assessments in a year?

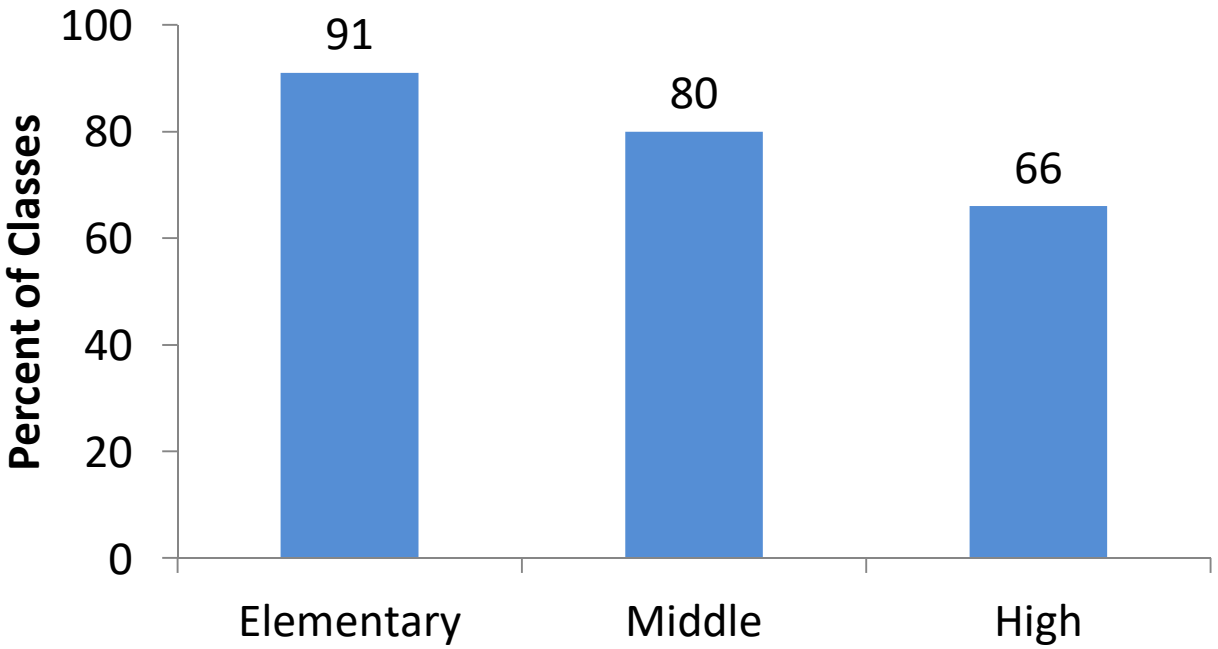
A. 25%
B. 50%
C. 75%
D. 100%

Required External Mathematics Testing

	Percent of Classes		
	Elementary	**Middle**	**High**
Never	9	1	20
Once a year	9	12	25
Twice a year	9	11	22
Three or four times a year	48	43	24
Five or more times a year	25	33	10

Instructional Materials

For most classes, districts designate instructional materials to be used:



What Is Designated

	Percent of Classes		
	Elementary	Middle	High
Commercially published textbooks	89	88	91
State, county, or district-developed units or lessons	44	37	32
Lessons or resources from websites that are free	28	30	24
Lessons or resources from websites that have a subscription fee or cost	31	22	15
Self-paced online courses or units	33	33	13

What Teachers Use (Weekly)

	Percent of Classes		
	Elementary	**Middle**	**High**
Commercially published textbooks	76	65	61
Teacher-developed units or lessons	44	65	78
Units or lessons from other sources (e.g., conferences, colleagues)	30	31	35
Lessons or resources from websites that are free	37	39	27
State, county, or district-developed units or lessons	41	26	23
Lessons or resources from websites that have a cost	54	34	19
Self-paced online courses or units	36	24	12

Instruction Take-Aways

Developing conceptual understanding and learning how to do math receive heavy emphases in most classes across grade bands

Lecture, whole class discussion, and small group work are all common activities in most mathematics classes

Most math classes engage with the Standards for Mathematical Practice on a weekly basis, but most do not engage with them daily

Most math classes, particularly at the elementary and middle school level, have a lot of external assessments

Teachers use a hodgepodge of instructional materials raising questions about quality and coherence

The Mathematics Teaching Force

The 2018 NSSME+ collected data about:

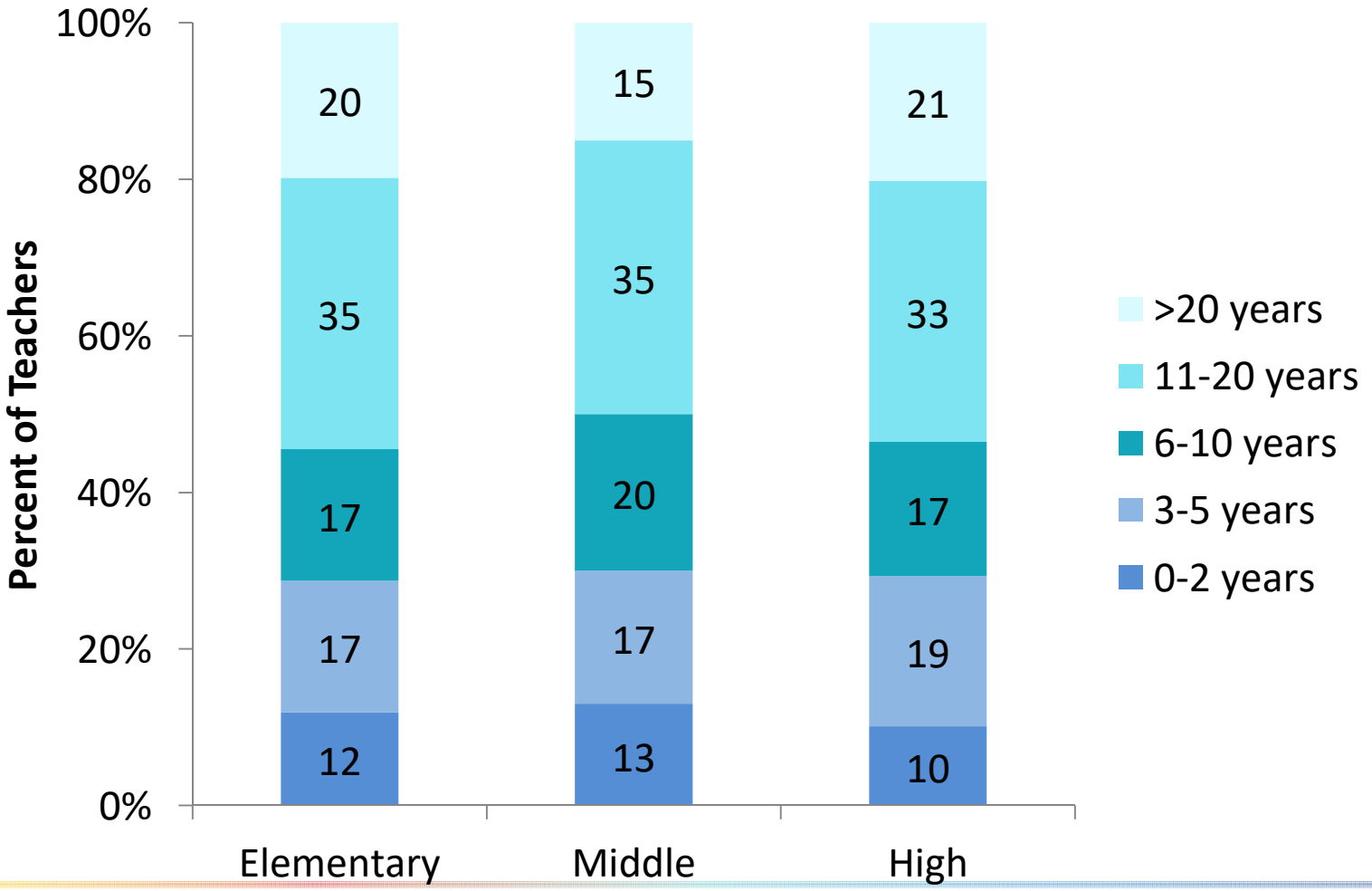
- Demographics of teachers
- Path to certification
- College coursework
- Beliefs about teaching and learning
- Feelings of preparedness

Teacher Experience

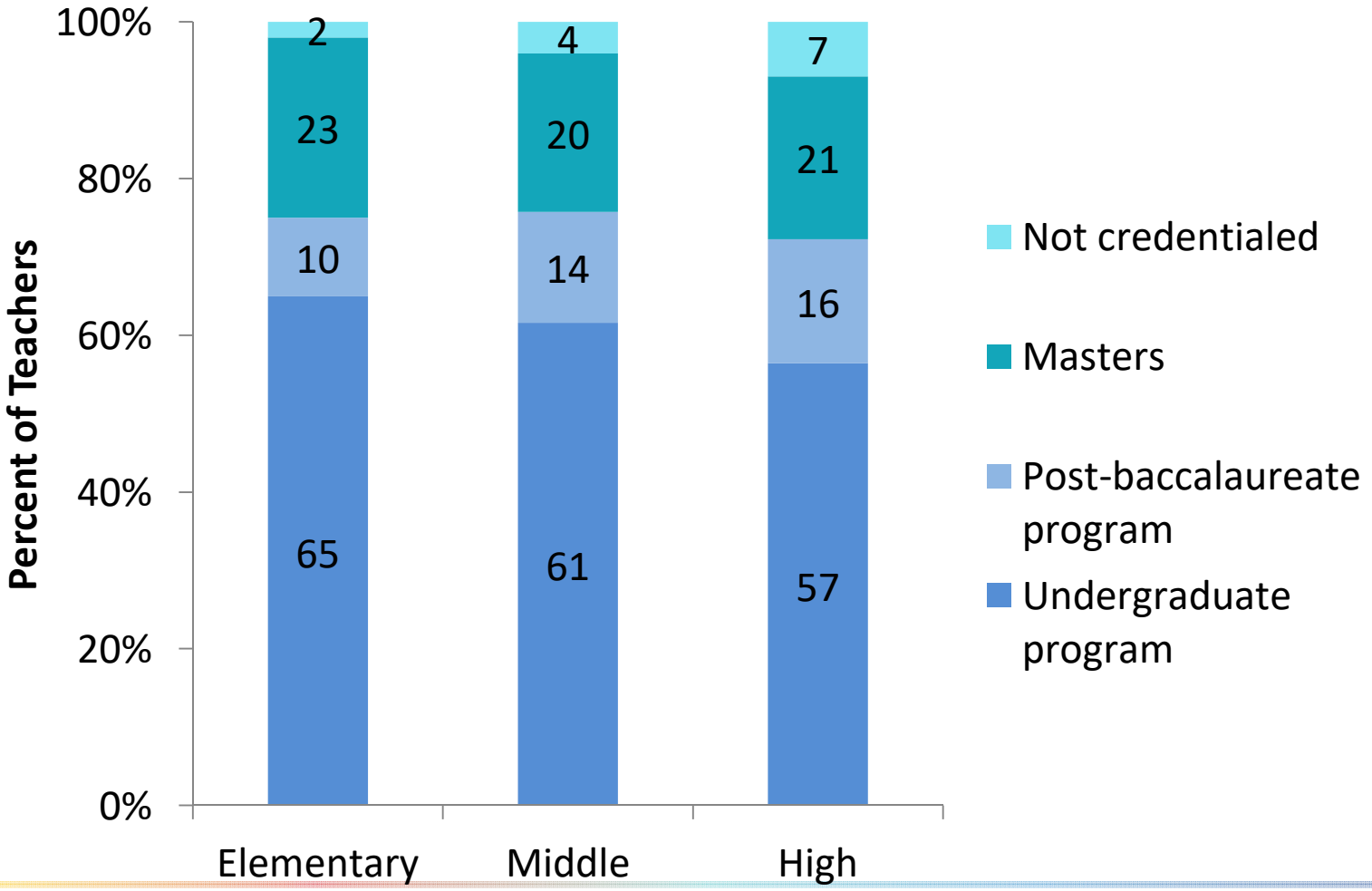
True or False?

The majority of teachers of mathematics have 11 or more years of teaching experience.

Teaching Experience



Paths to Certification

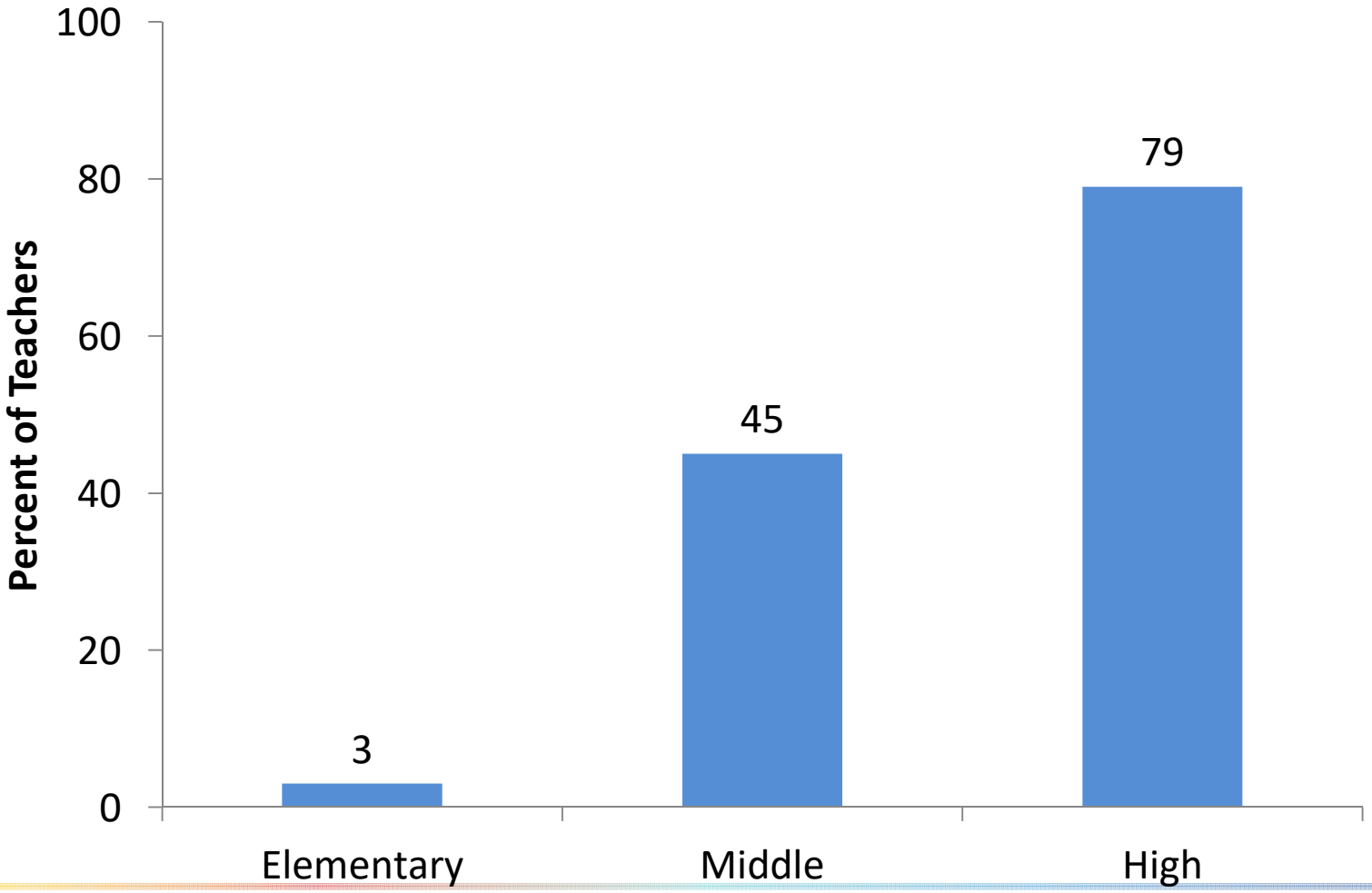


College Degrees

About what percentage of middle school mathematics teachers hold a degree in mathematics or mathematics education?

A. 25%
B. 50%
C. 75%
D. 100%

Degree in Mathematics or Mathematics Education

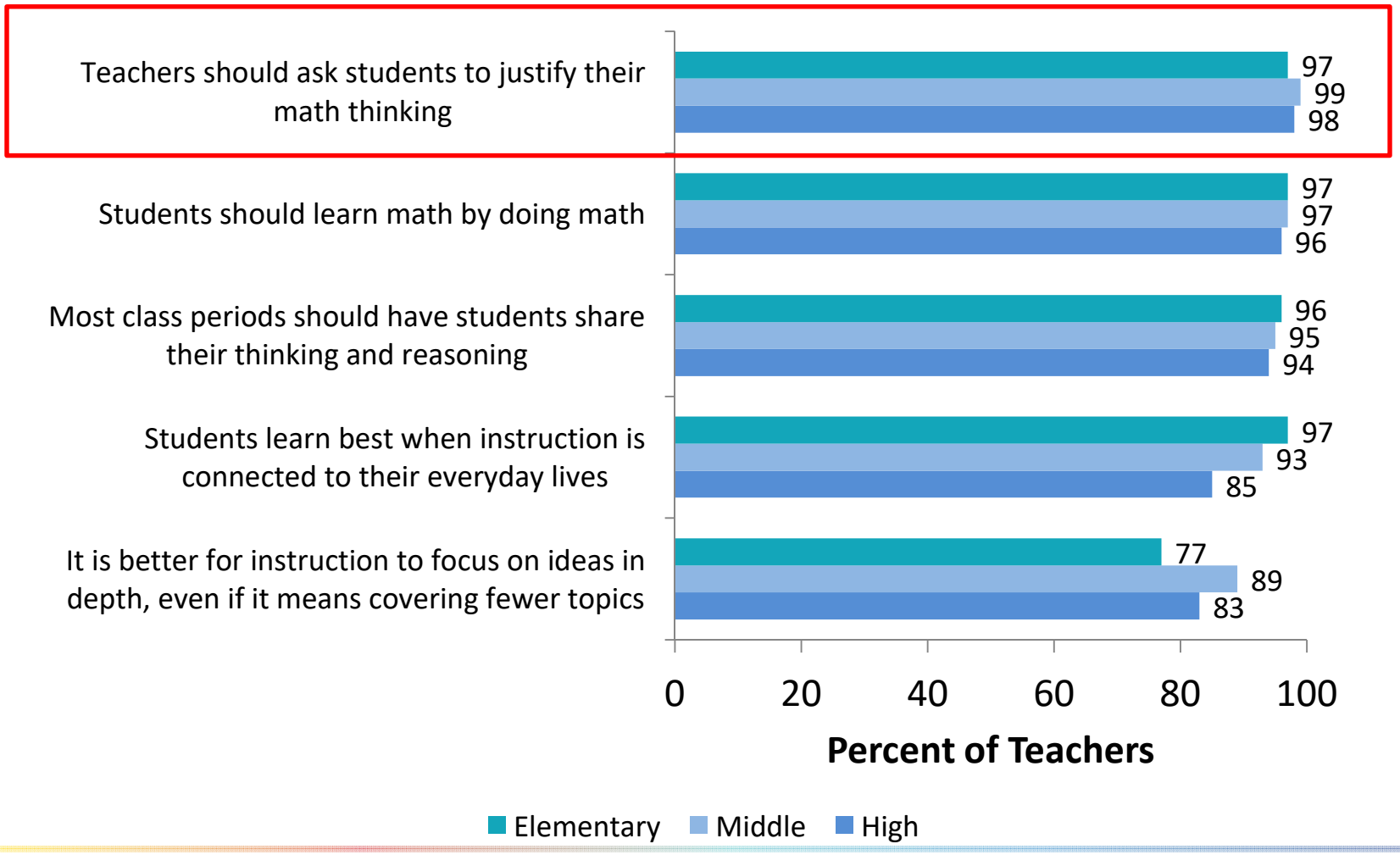


Teacher Beliefs

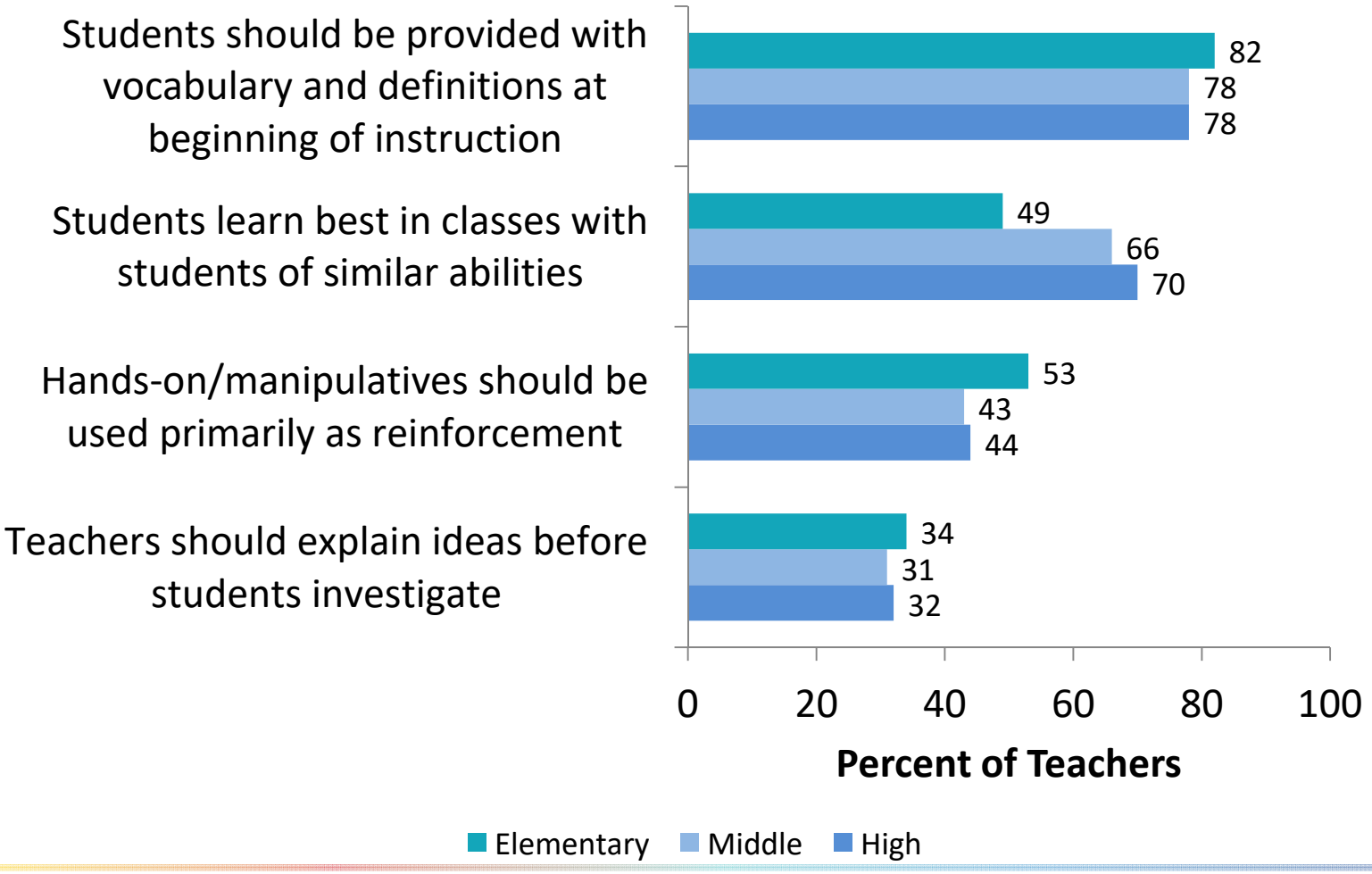
What percentage of teachers believe they should ask students to justify their mathematical thinking?

A. 25%
B. 50%
C. 75%
D. 100%

Teacher Beliefs



Teacher Beliefs

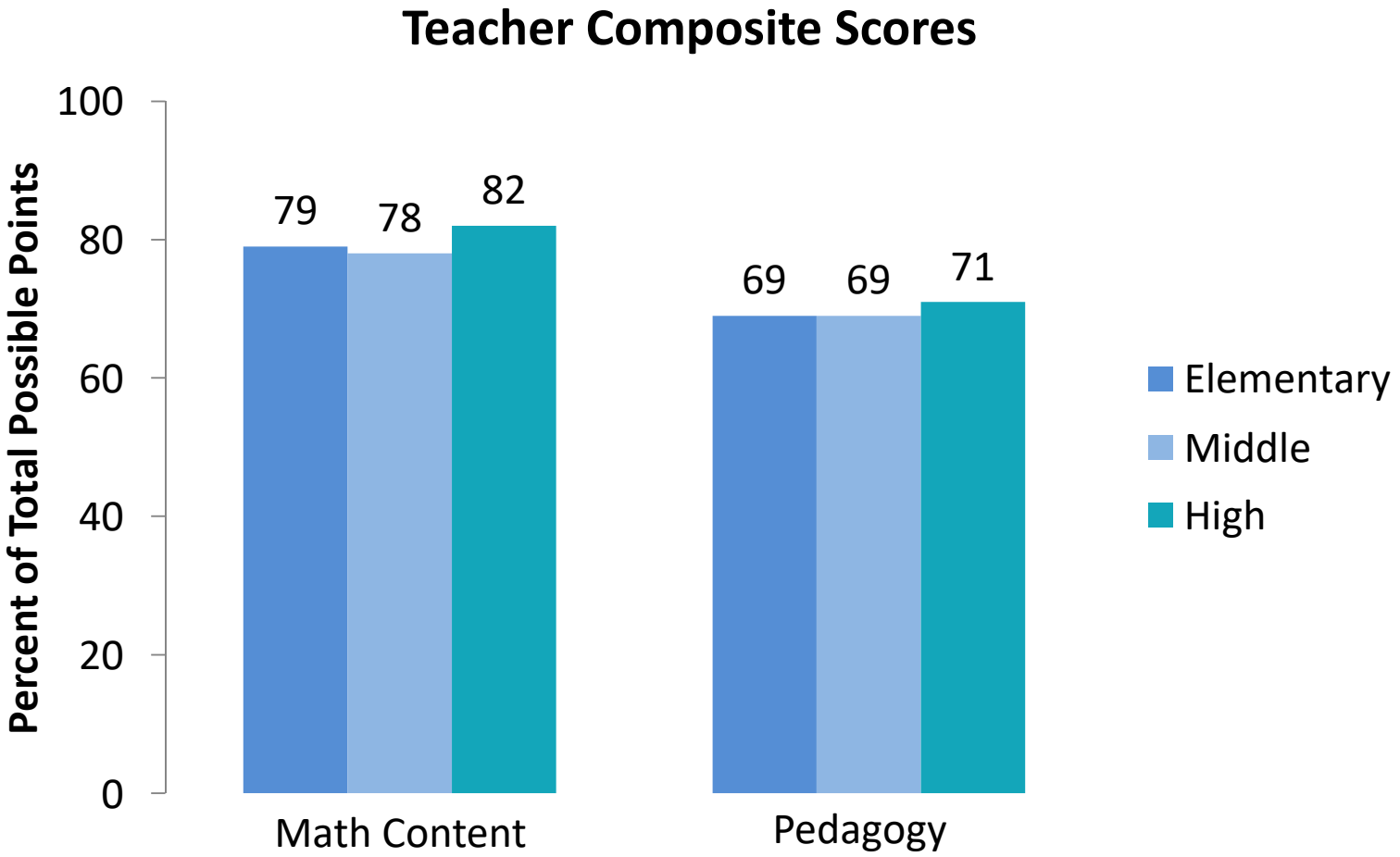


Perceptions of Preparedness

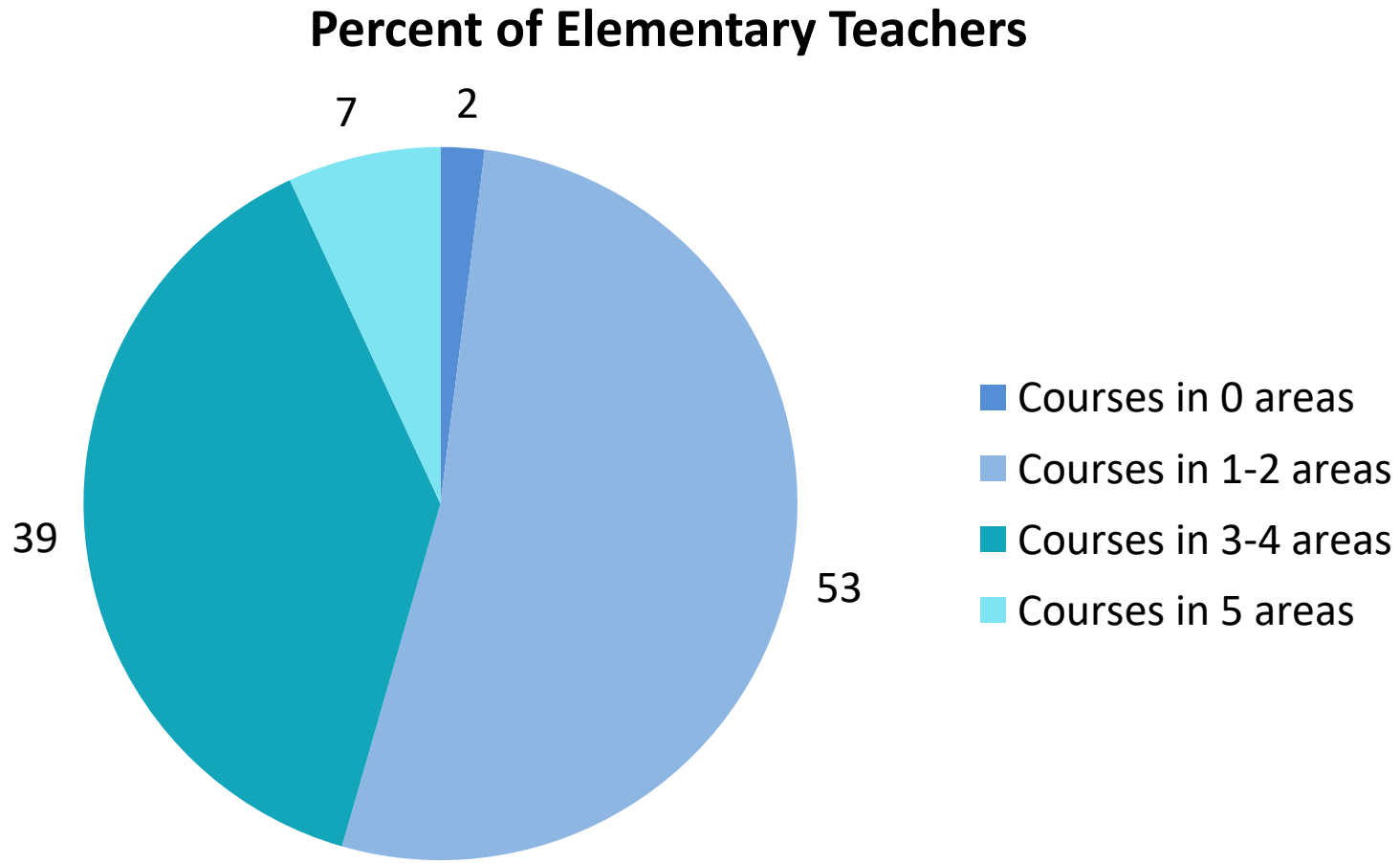
The 2018 NSSME+ included items about teachers' feelings of preparedness to:

- Teach various math topics
- Use student-centered pedagogies, e.g.;
  - Use formative assessment
  - Develop student abilities to do math
  - Encourage student interest in math
  - Differentiate instruction
  - Incorporate students' cultural backgrounds into instruction

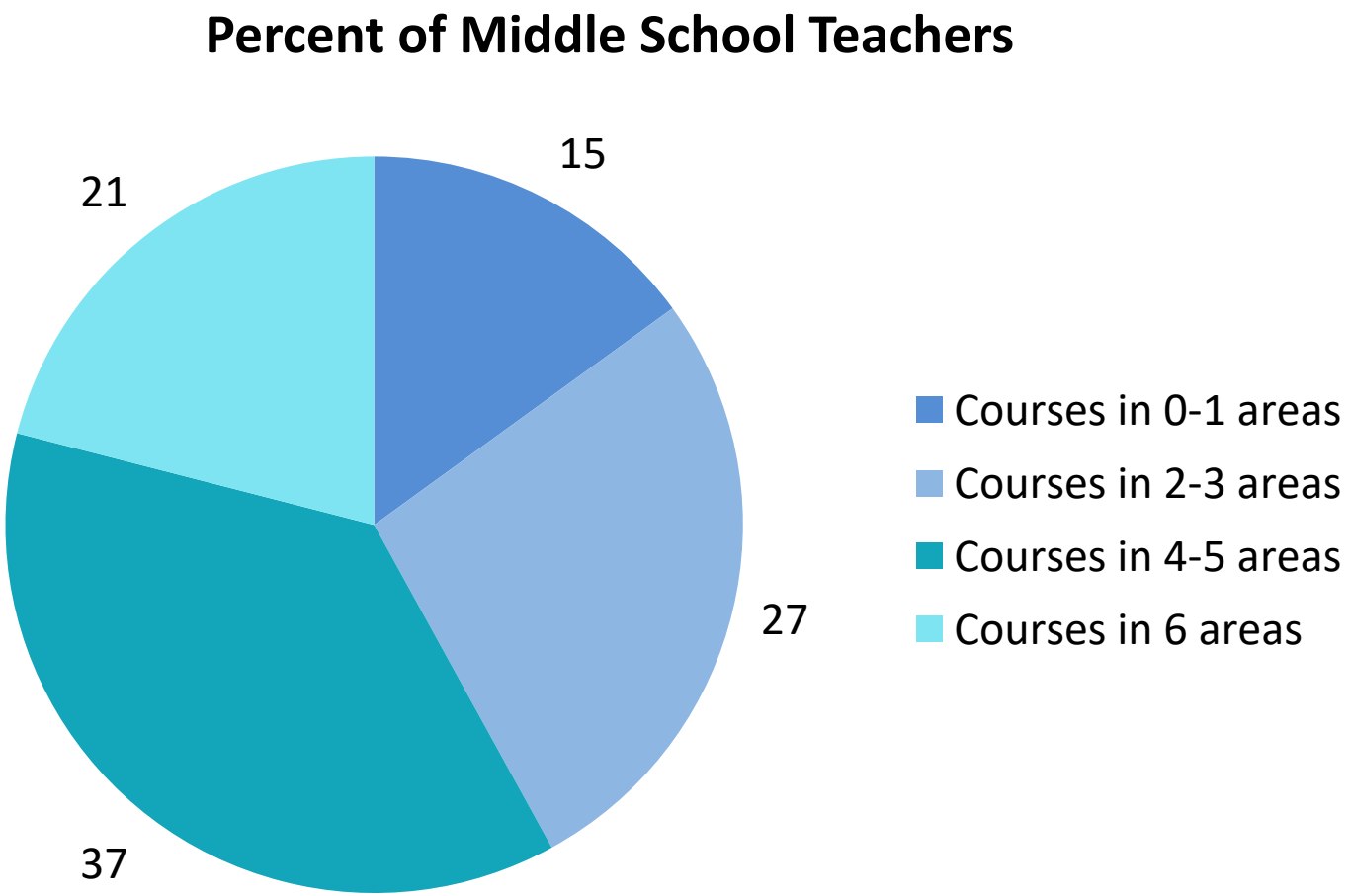
Perceptions of Preparedness



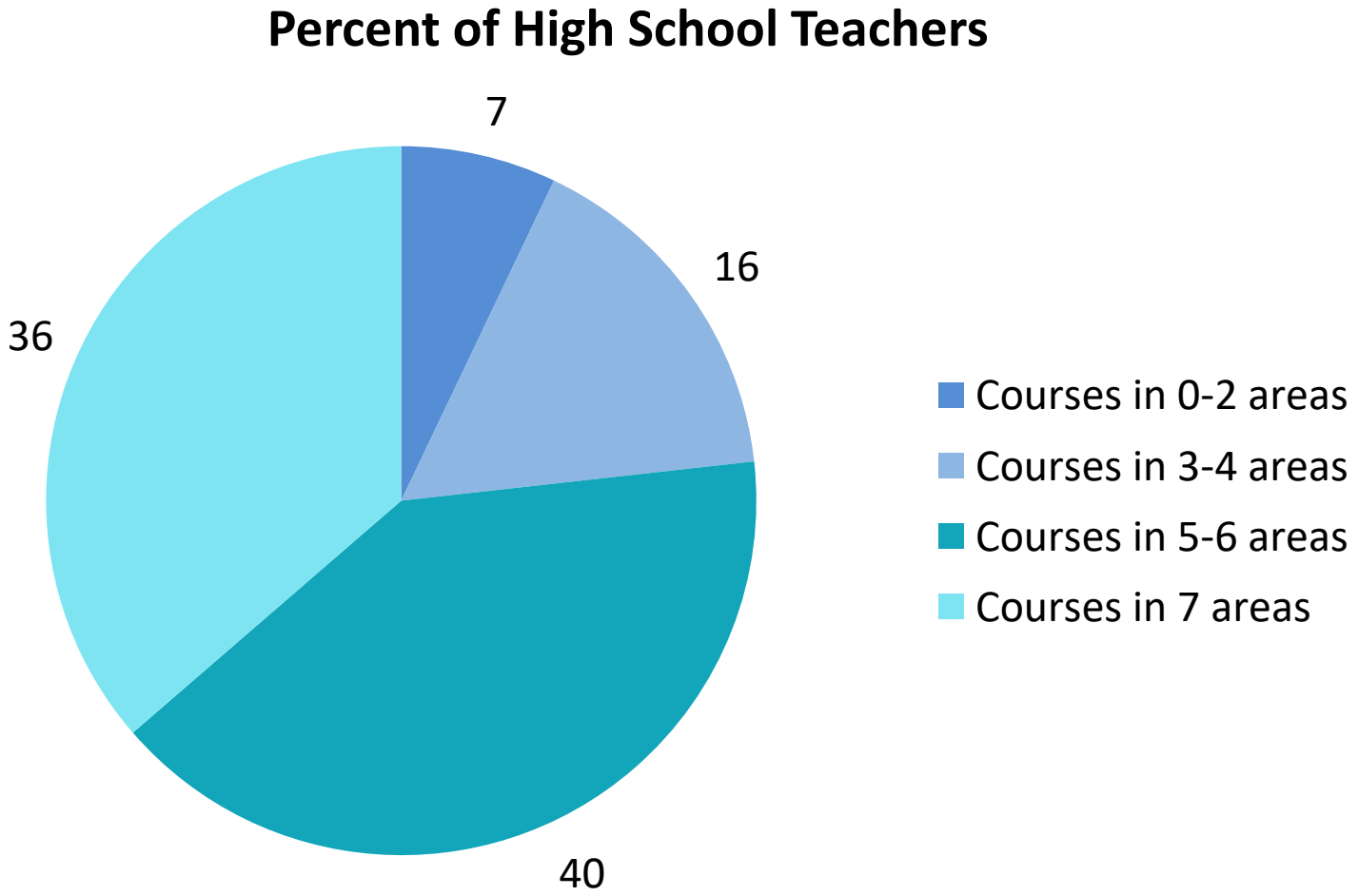
Elementary Mathematics Teachers' Coursework Related to NCTM Preparation Standards



Middle School Mathematics Teachers' Coursework Related to NCTM Preparation Standards



High School Mathematics Teachers' Coursework Related to NCTM Preparation Standards



Mathematics Teaching Force Take-Aways

A sizeable proportion of the mathematics teaching force is newer. Retention, professional development, and support for these teachers now is essential for the long term stability of the teaching force

Teachers' beliefs about teaching and learning indicate only partial alignment with what is known about how students best learn mathematics.

Teachers' sense of their pedagogical preparedness is encouraging but still an important concern.

Across grade levels, teachers generally perceive they are well prepared regarding the math content they teach, although many lack the breadth and extent of formal preparation that is recommended.

Inservice Support

The 2018 NSSME+ asked about:

- School/district-offered induction programs
- School/district-offered professional development (workshops, study groups/PLCs, coaching)
- Teacher PD experiences

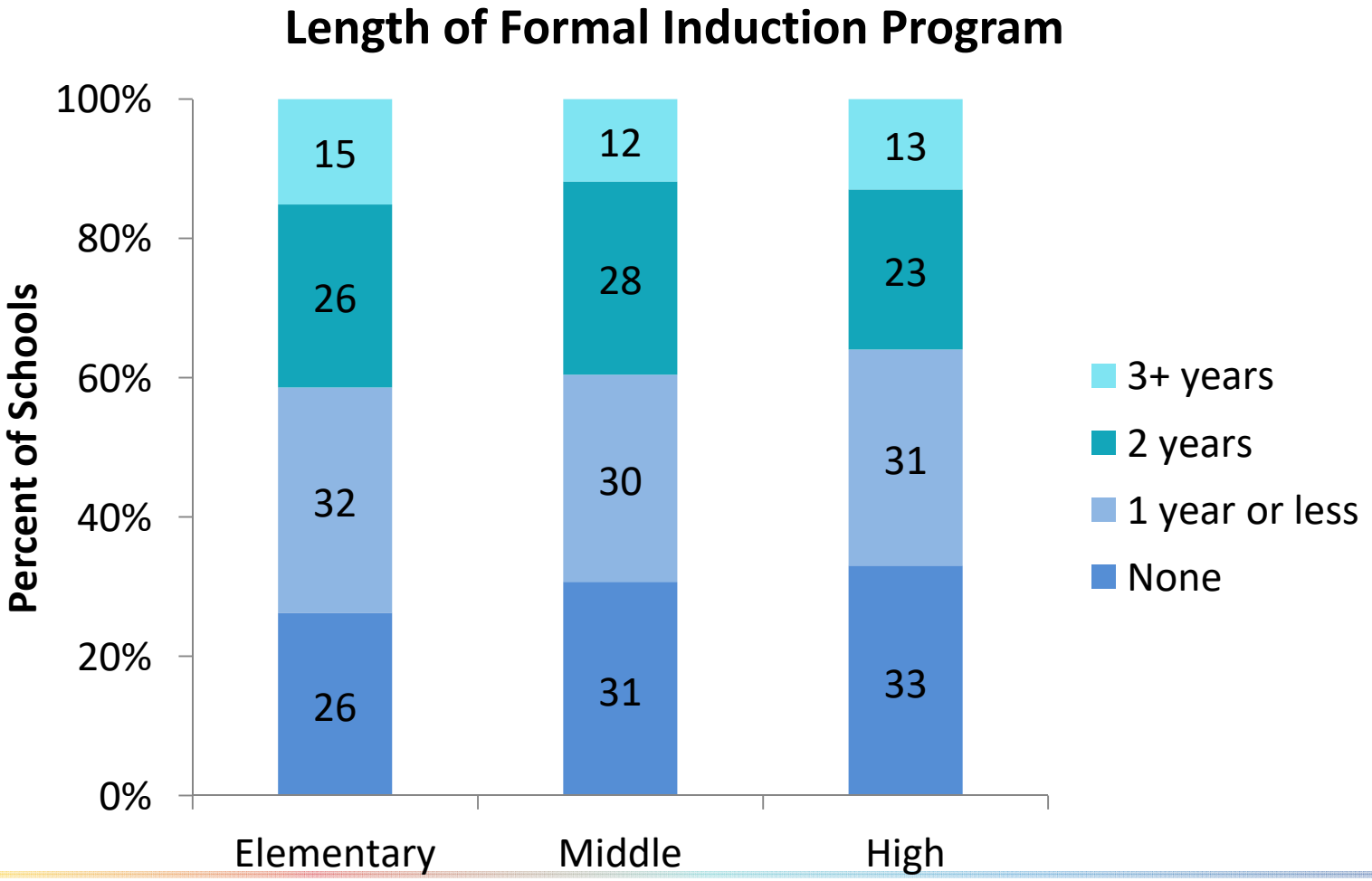
Induction Programs

Ideally, how long should induction programs last?

A. One year or less
B. Two years
C. Three or more years

Ideally, what supports should be provided?

Induction Programs



Induction Programs

Common features

- An orientation meeting
- Formal school-based mentor
- Subject-specific PD opportunities
- Release time to observe other teachers
- Common planning time with experienced teachers

Uncommon features

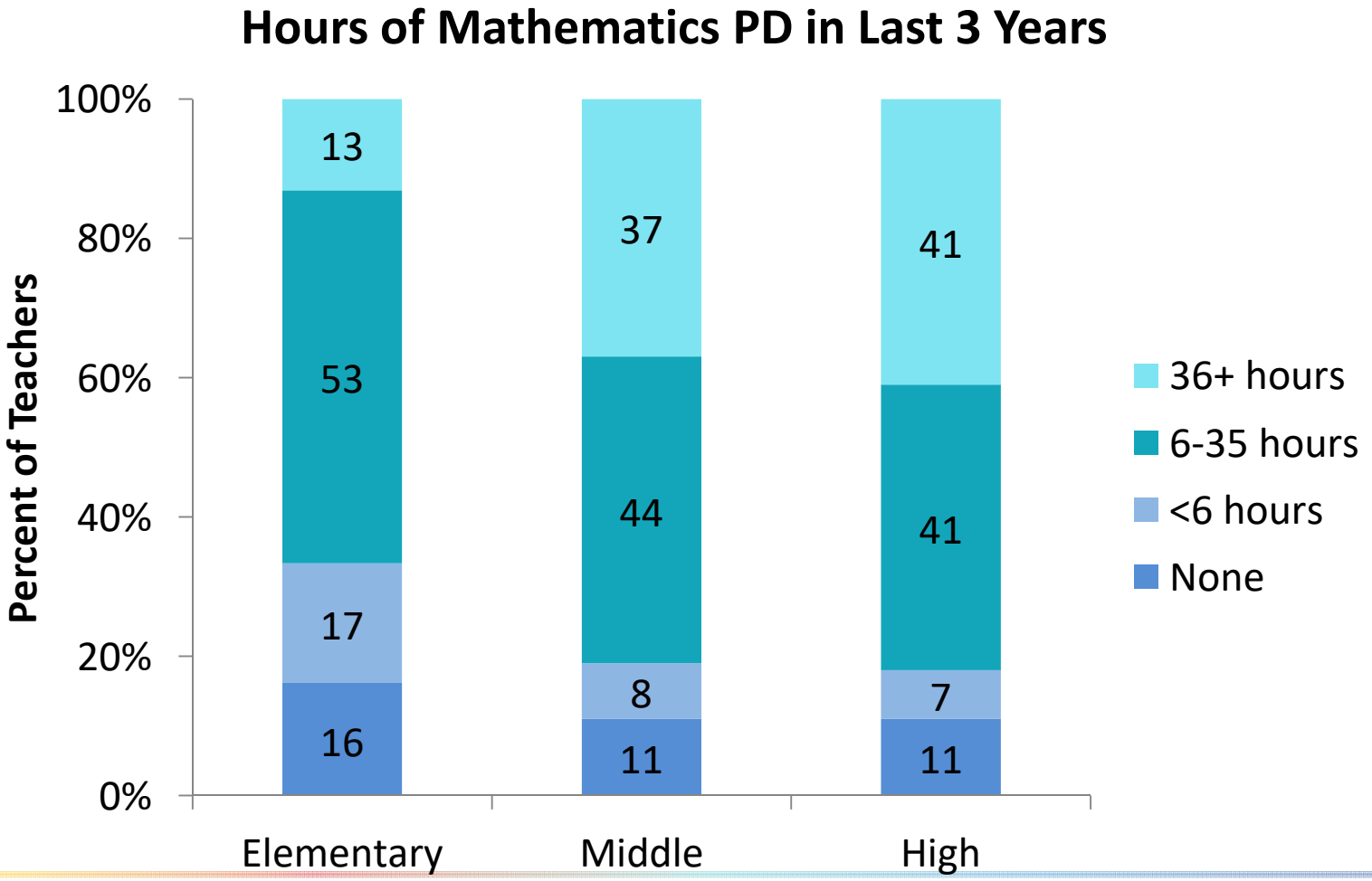
- Classroom aide/teaching assistant
- Reduced number of preparations
- Reduced course load
- Reduced class size

Professional Development

About what percentage of elementary teachers have had <u>any</u> mathematics-related PD in the last three years?

A. 40%
B. 60%
C. 80%
D. 100%

Professional Development



Characteristics of PD

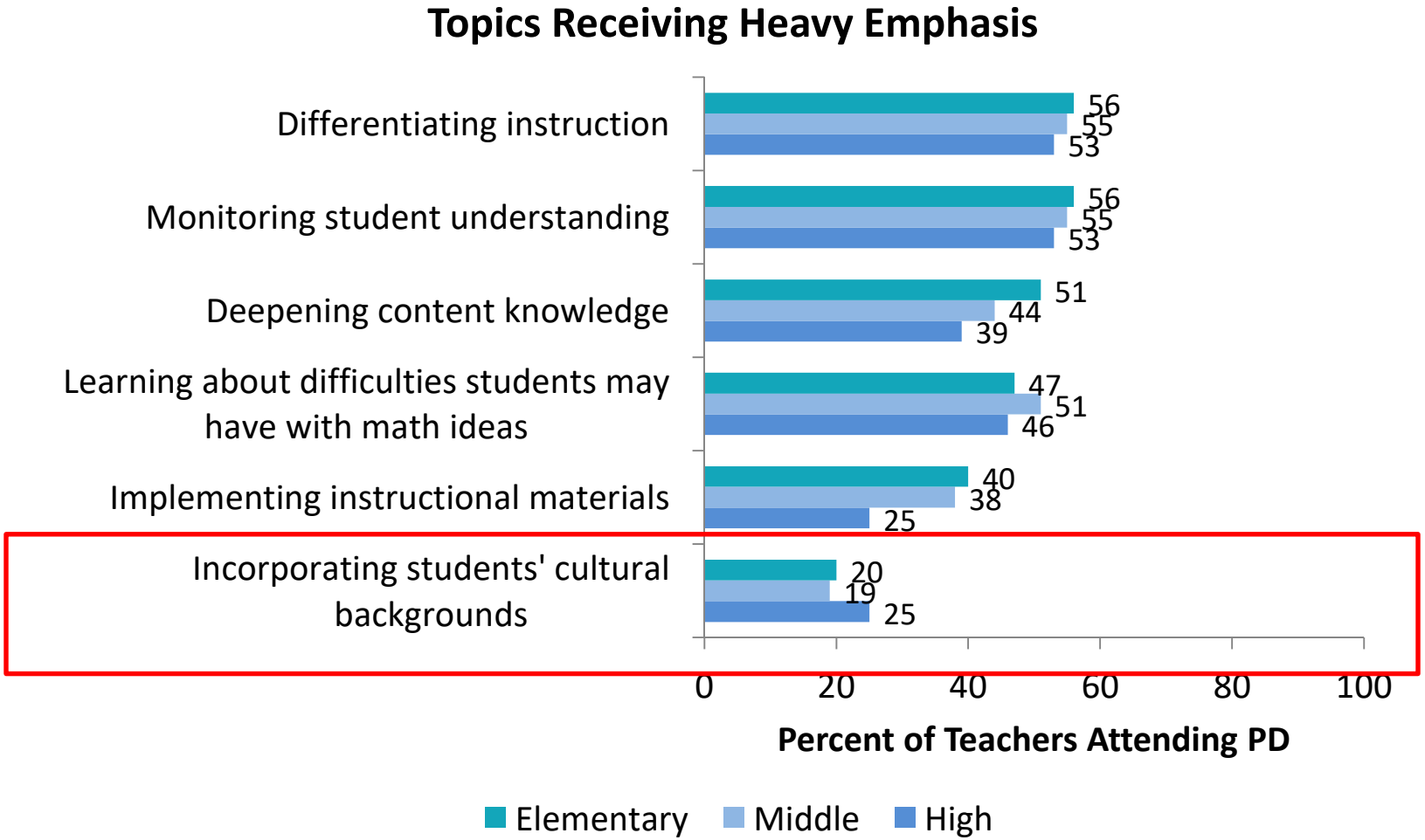
	Percent of Teachers Attending PD		
	Elementary	**Middle**	**High**
Work closely with teachers in school	69	72	67
Work with those teaching same subject or grade level	56	58	57
Apply what they learn in classroom and come back to discuss	44	46	46
Examine classroom artifacts	46	49	44
Engage in math investigations	46	47	43
Experience lessons as students	48	45	42
Rehearse instructional practices	35	34	32

Emphasis of PD

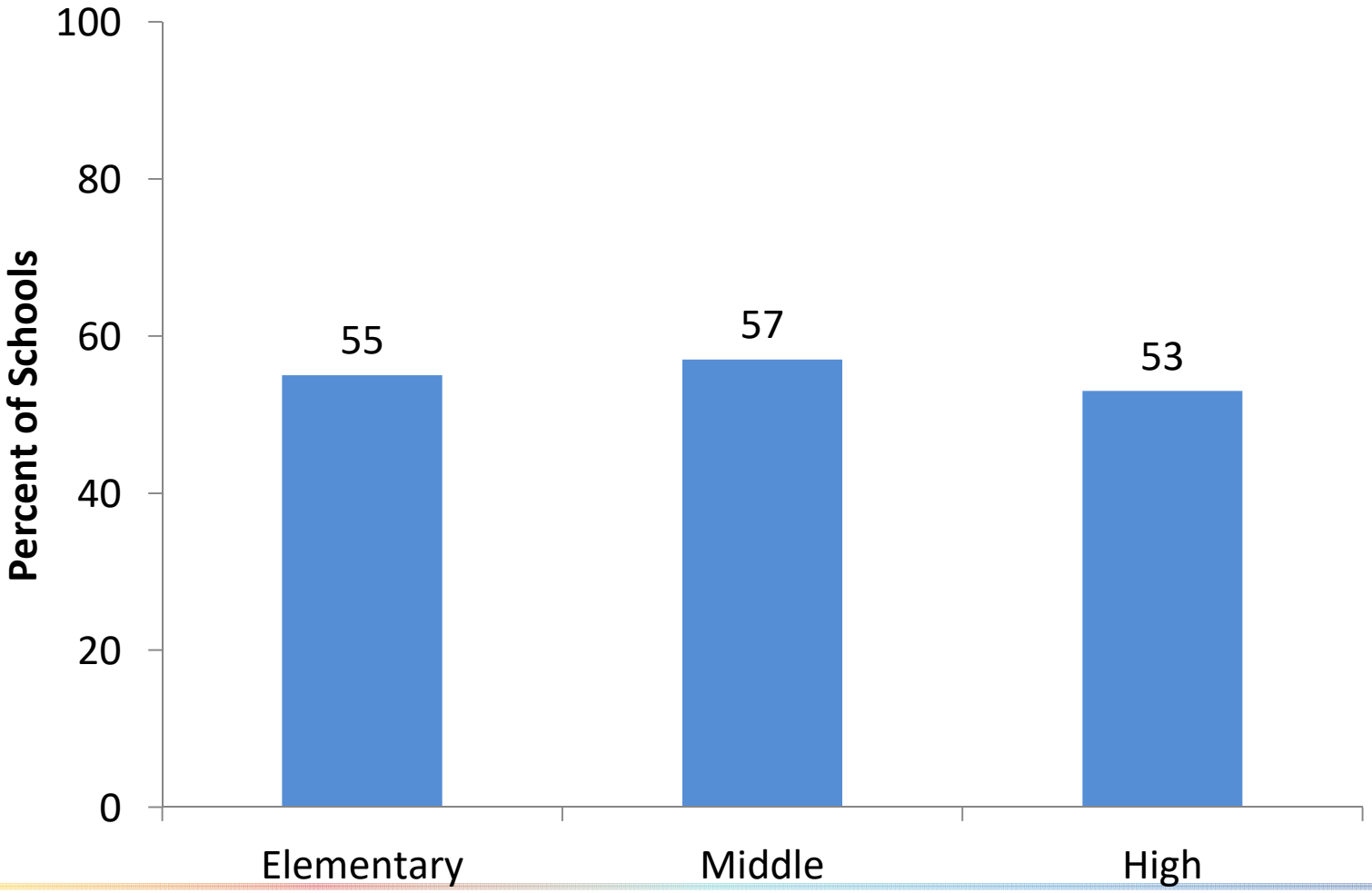
Given what you know, what area(s) do you think require the greatest emphasis in PD for mathematics teachers?

1. Deepening teachers' content knowledge
2. Differentiating instruction
3. Implementing instructional materials
4. Learning about difficulties students may have with mathematical ideas
5. Making instruction culturally relevant
6. Monitoring student understanding

Emphasis of PD



Schools Offering Teacher Study Groups in Math in Last 3 Years



Teacher Study Groups

Common activities

- Analyze student math assessment results (81%)
- Plan lessons together (63%)
- Analyze instructional materials (60%)

Uncommon activities

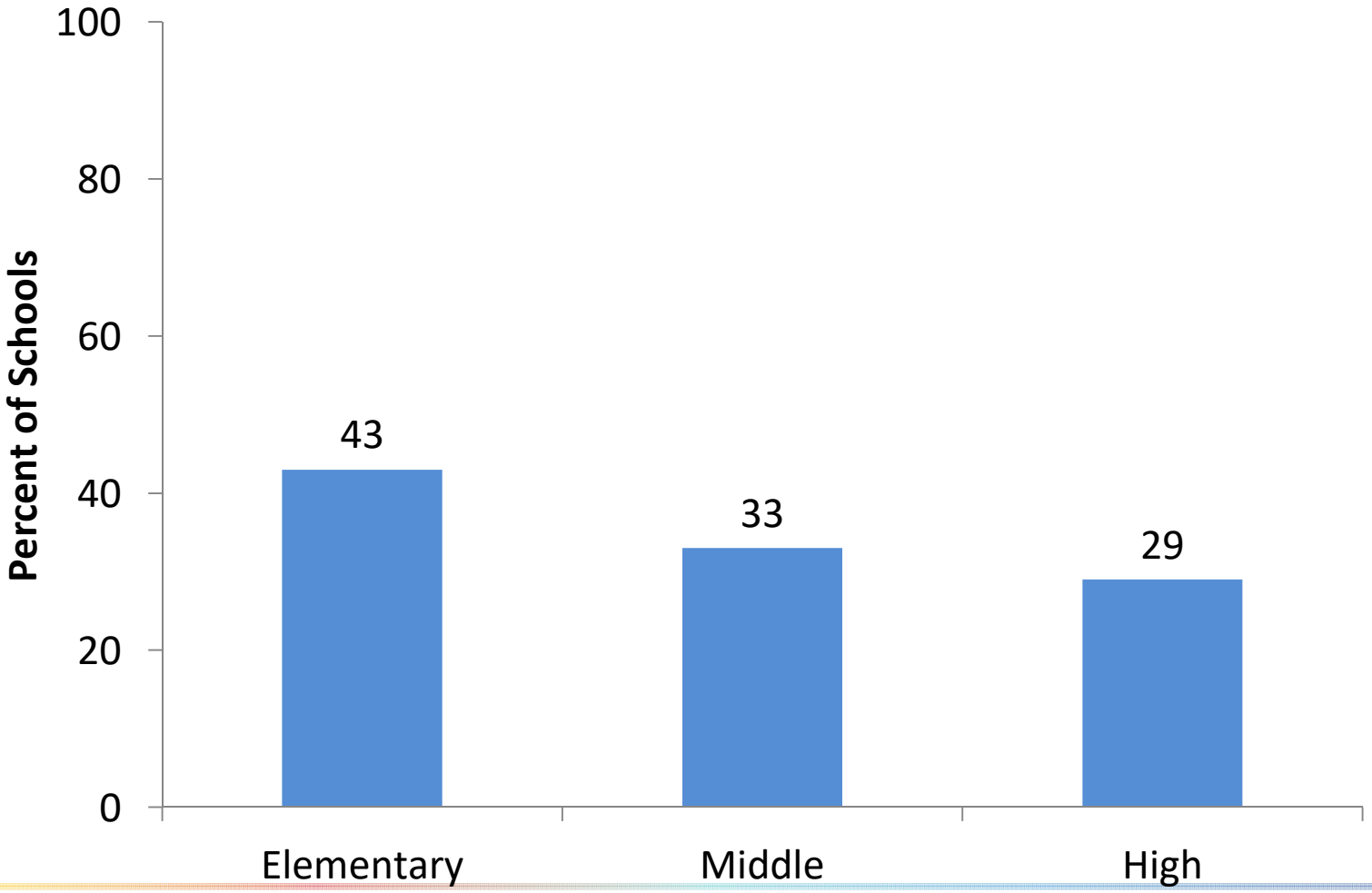
- Provide feedback on math instruction (30%)
- Rehearse instructional practices (28%)
- Observe each others' math instruction (26%)

One-on-one Coaching

Approximately what percent of elementary schools offer one-on-one coaching focused on mathematics?

A. 20%
B. 40%
C. 60%
D. 80%

Schools Providing One-on-One Coaching in Math



Inservice Support Take-Aways

A large majority of schools have new teacher induction programs, though duration and nature vary

PD often has characteristics identified as high quality

PD is emphasizing key areas such as differentiating instruction and monitoring student understanding, but is less likely to focus on culturally responsive teaching

One-on-one coaching is a somewhat uncommon practice in schools and is not reaching a high proportion of teachers

Implications

Reflecting on these findings in relation to the AMTE *Standards for Preparing Teachers of Mathematics* (SPTM)

Nadine Bezuk

San Diego State University

Leader of the AMTE Standards' Writing Team

Standards for Preparing Teachers of Mathematics

Comprehensive, aspirational standards describing a national vision for the initial preparation of all teachers PreK-12 who teach mathematics.

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Purposes of the AMTE *Standards*

- Improve individual teacher preparation programs
- Inform the accreditation process
- Promote national dialogue and action related to mathematics teacher preparation

- www.amte.net/standards

Foundational Assumptions of the AMTE *Standards*

#1: Deep, integrated focus on equity

#2: Career-long learning

#3: Central focus on mathematics

#4: Responsibility of multiple stakeholders

#5: Commitment to improving effectiveness

Foci of the AMTE *Standards*

- Standards for Well-prepared Beginning Teachers of Mathematics:
  - Candidate Knowledge, Skills, and Dispositions (4 standards)
- Standards for Effective Programs for Preparing Beginning Teachers of Mathematics:
  - Program Characteristics (5 standards)

Candidate Knowledge, Skills, and Dispositions

Standards:

C.1. Mathematics Concepts, Practices, and Curriculum

C.2. Pedagogical Knowledge and Practices for Teaching Mathematics

C.3. Students as Learners of Mathematics

C.4. Social Contexts of Mathematics Teaching and Learning

Program Characteristics

Standards:

P.1. Partnerships

P.2. Opportunities to Learn Mathematics

P.3. Opportunities to Learn to Teach Mathematics

P.4. Opportunities to Learn in Clinical Settings

P.5. Recruitment and Retention of Teacher Candidates

Improvement Requires Engagement of Multiple Constituencies

1. Collaborate with mathematics educators, mathematicians and statisticians
2. Close, respectful, bidirectional relationships with Pre-K–12 schools and districts
3. Focus on the Standards by the research community
4. Collaborations across programs
5. Support of administrators
6. Focus on the Standards by AMTE
7. Engagement of other organizations