NSSME | THE NATIONAL SURVEY OF SCIENCE & MATHEMATICS EDUCATION

The 2018 NSSME+

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Presenting: Daniel Heck, Co-PI

Eric Banilower, PI
Kristen Malzahn, Co-PI
Sean Smith, Co-PI

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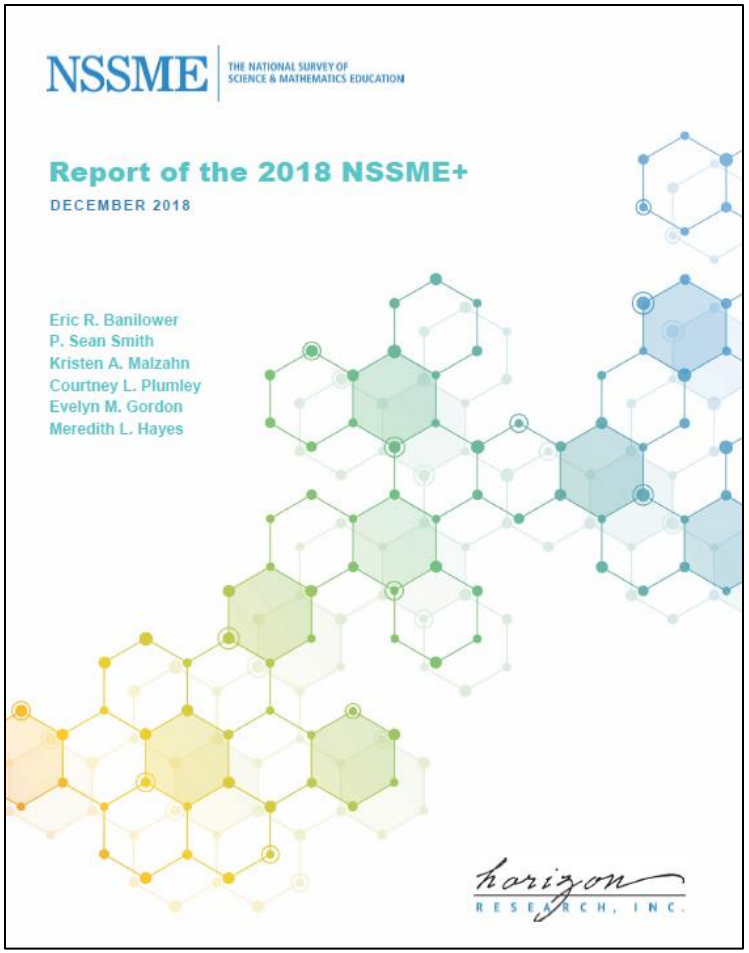
Current reports:

- Technical report
- Highlights report
- Compendium of tables

Upcoming:

- Subject/grade reports
- Trend report
- Equity reports
- Early career teachers
- Briefing book
- Public-release dataset



Session Overview

- About the 2018 NSSME+
- The Mathematics Teaching Force
- Teacher Preparation and Professional Development
- Mathematics Instruction
- Course Offerings, Enrollment, Completion

The 2018 NSSME+, and this presentation, is based upon work supported by the National Science Foundation under Grant No. DGE-1642413. Any opinions, findings, and conclusions or recommendations expressed are those of the authors and do not necessarily reflect the views of the National Science Foundation.

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 K-12 STEM education that provides nationally representative results.

Topics Addressed

Six different survey instruments

- Characteristics of the science/ mathematics/computer science teaching force
- Opportunities teachers have for professional growth
- Instructional practices
- Factors that shape teachers' decisions about content and pedagogy
- Resource availability including instructional materials
- Course offerings and enrollment

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.

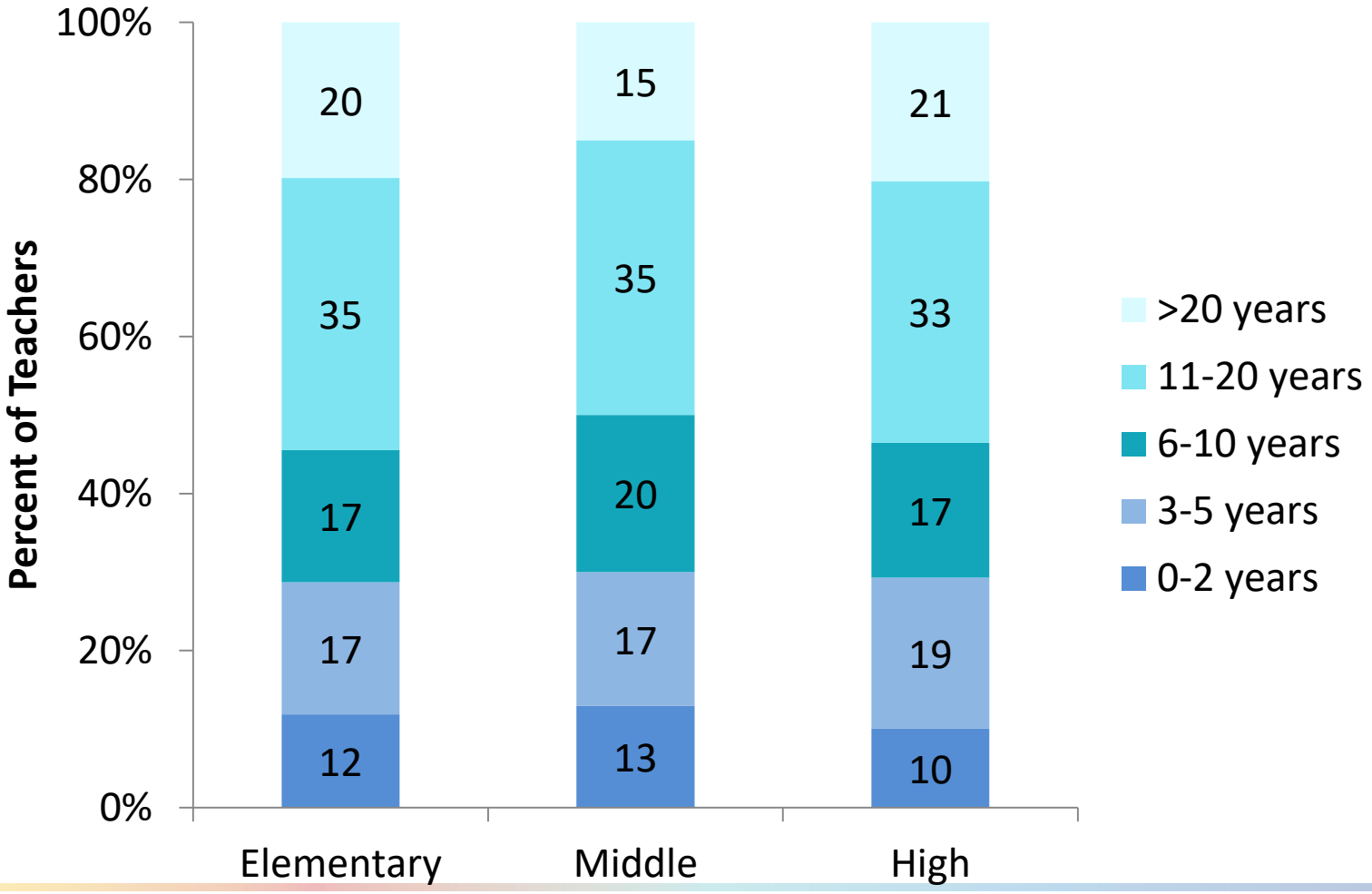
The sampling and weighting processes yield results that are national estimates of schools, teachers, and classes—not characteristics of just the respondents.

The Mathematics Teaching Force

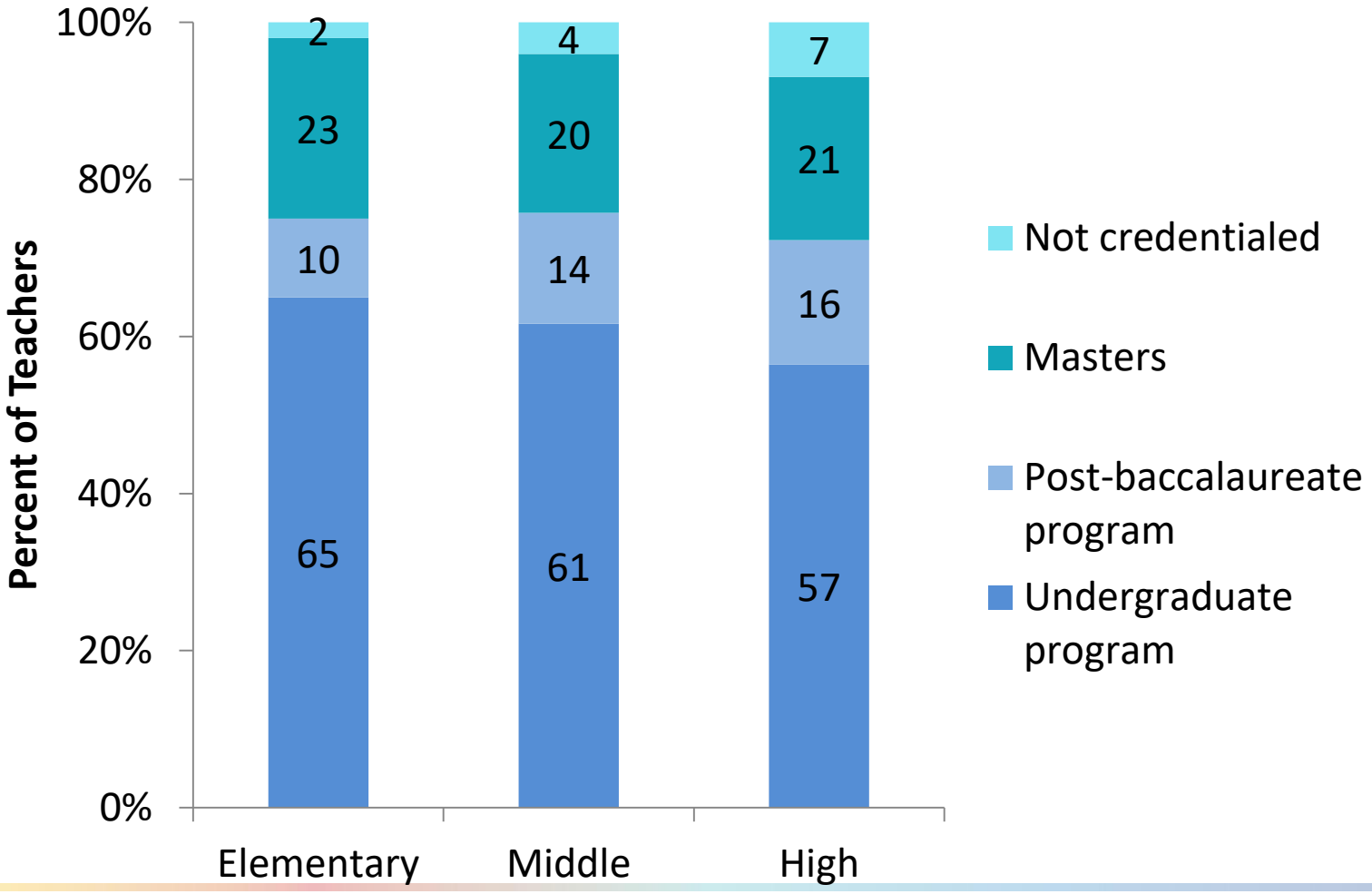
The 2018 NSSME+ collected data about:

- Demographics of teachers
- Path to certification
- Perceptions of preparedness
- College-level coursework

Teaching Experience



Paths to Certification



Perceptions of Preparedness

To teach grade-level content

Elementary

- Number and operation
- Early algebra
- Geometry
- Measurement and data representation

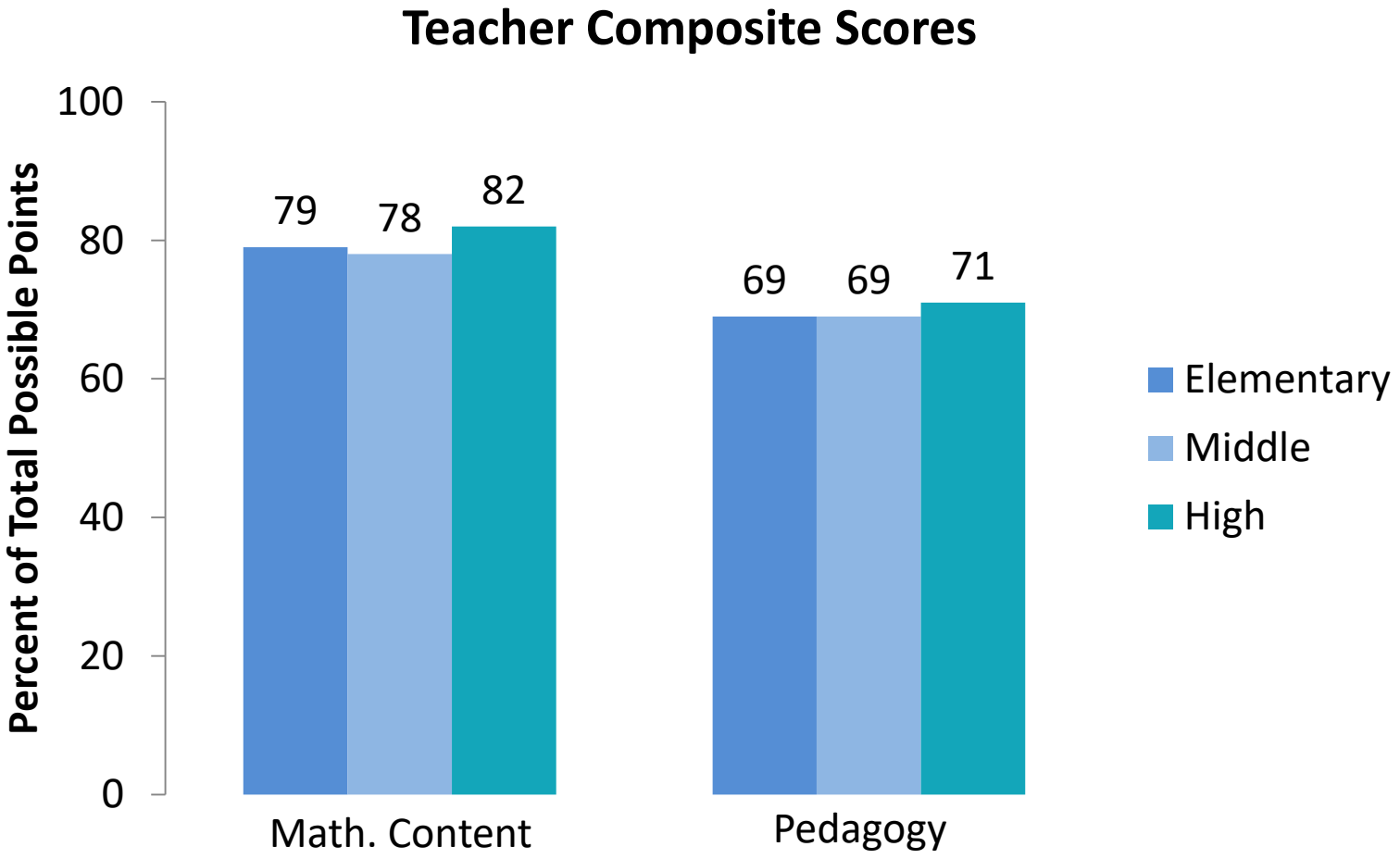
Secondary

- Number system
- Algebraic thinking
- Functions
- Modeling
- Geometry
- Statistics and probability
- Discrete mathematics

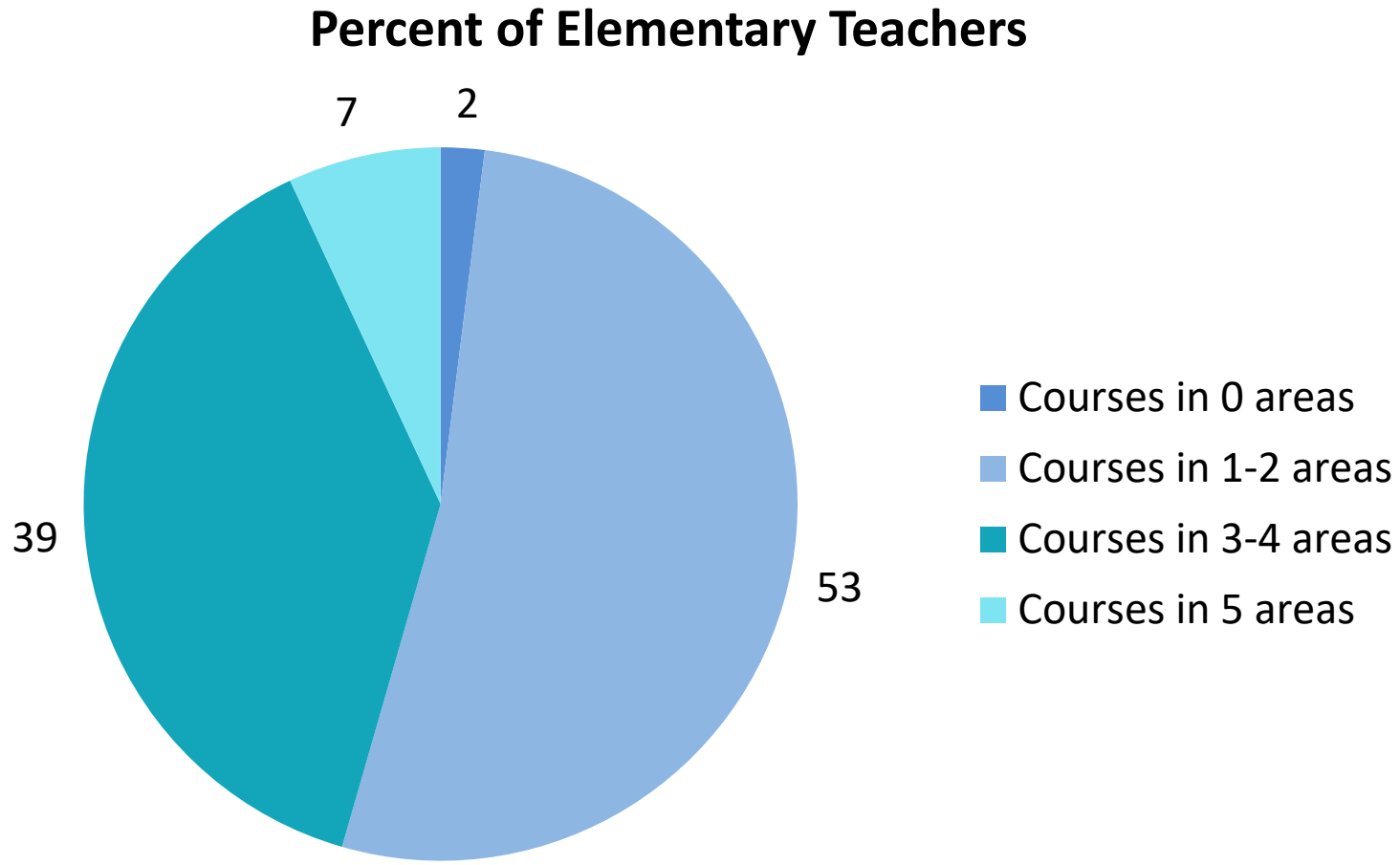
To use student-centered pedagogies

- Use formative assessment
- Develop student abilities to do math
- Encourage student interest in math
- Differentiate instruction
- Incorporate students' cultural backgrounds into instruction
- …

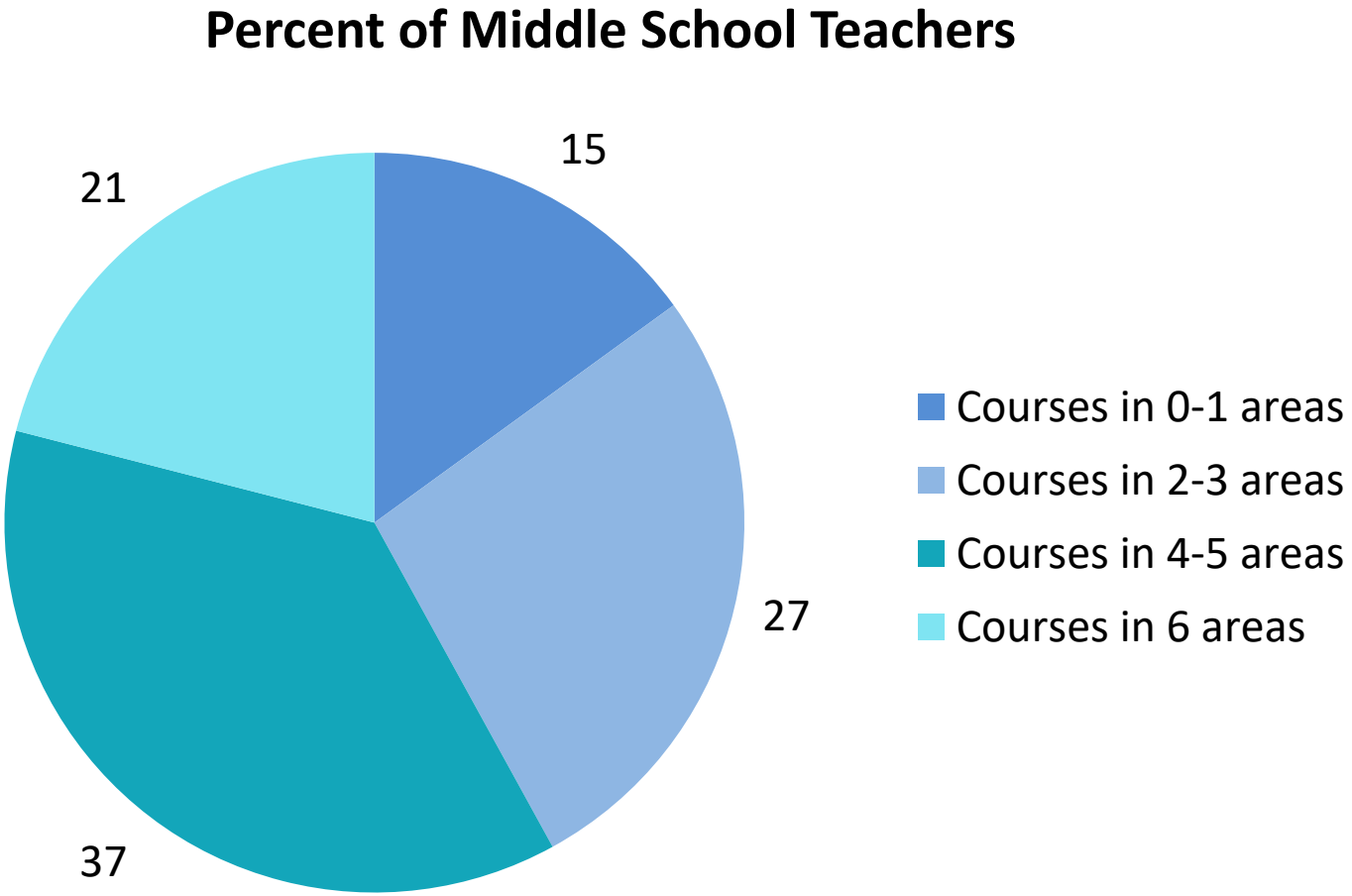
Perceptions of Preparedness



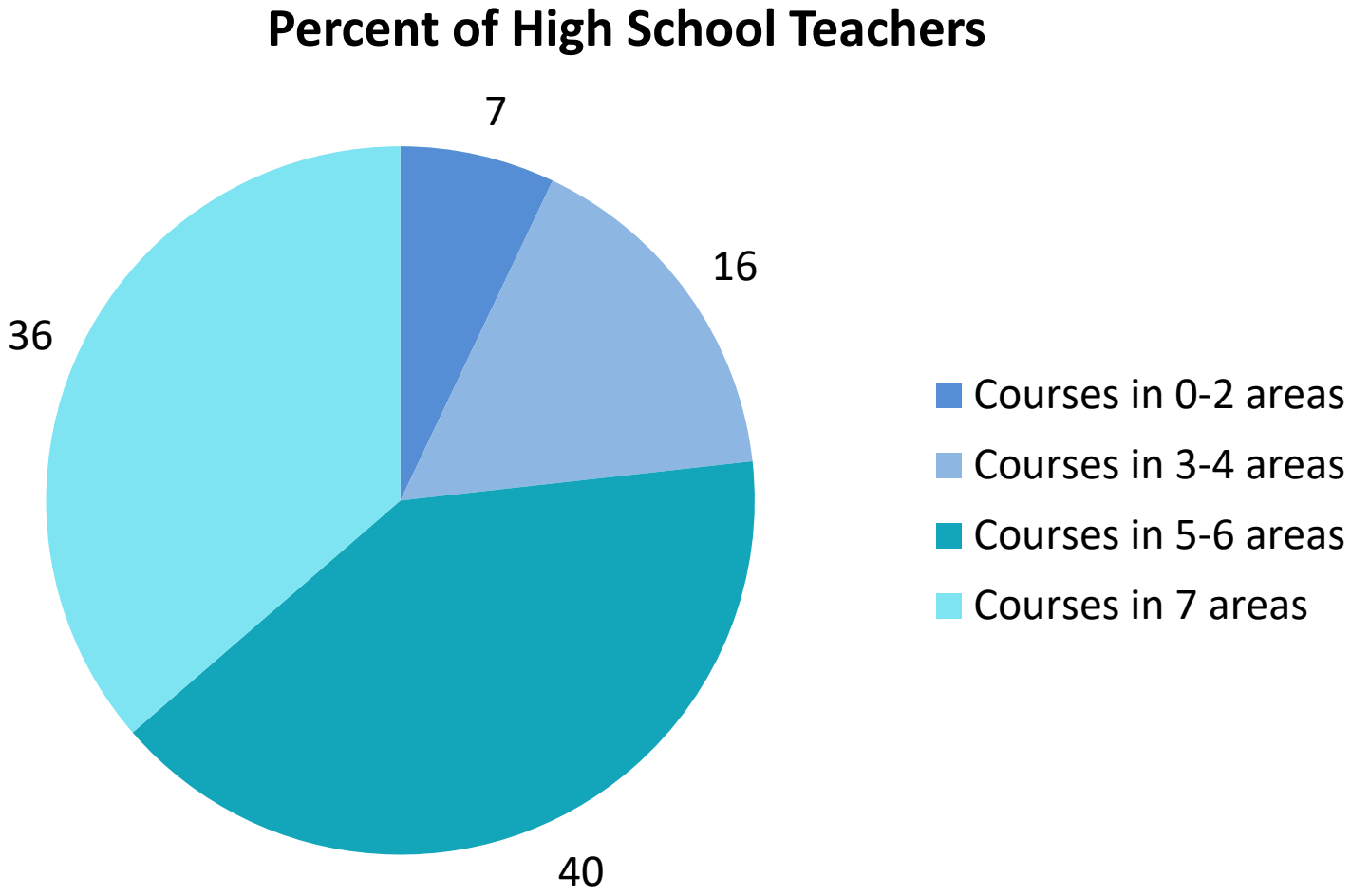
Elementary Mathematics Teachers' Coursework Related to Preparation Standards



Middle School Mathematics Teachers' Coursework Related to Preparation Standards



High School Mathematics Teachers' Coursework Related to 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' sense of their content and pedagogical preparedness is encouraging but still an important concern.

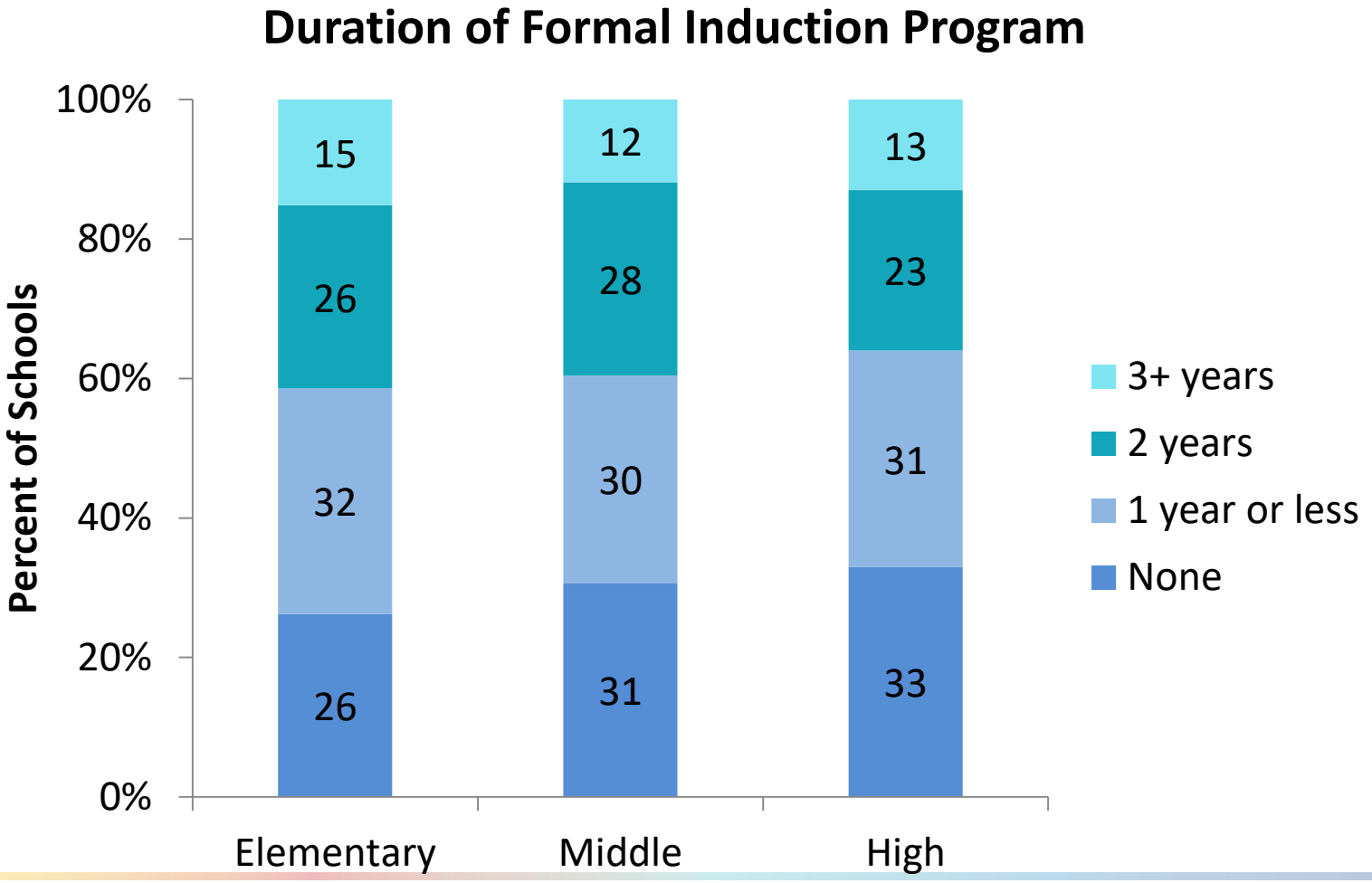
Across grade levels, although teachers generally perceive they are well prepared regarding the mathematics content they teach, many lack the breadth and extent of formal preparation that is currently recommended.

Inservice Teacher Support

The 2018 NSSME+ asked about:

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

Induction Programs



Induction Programs

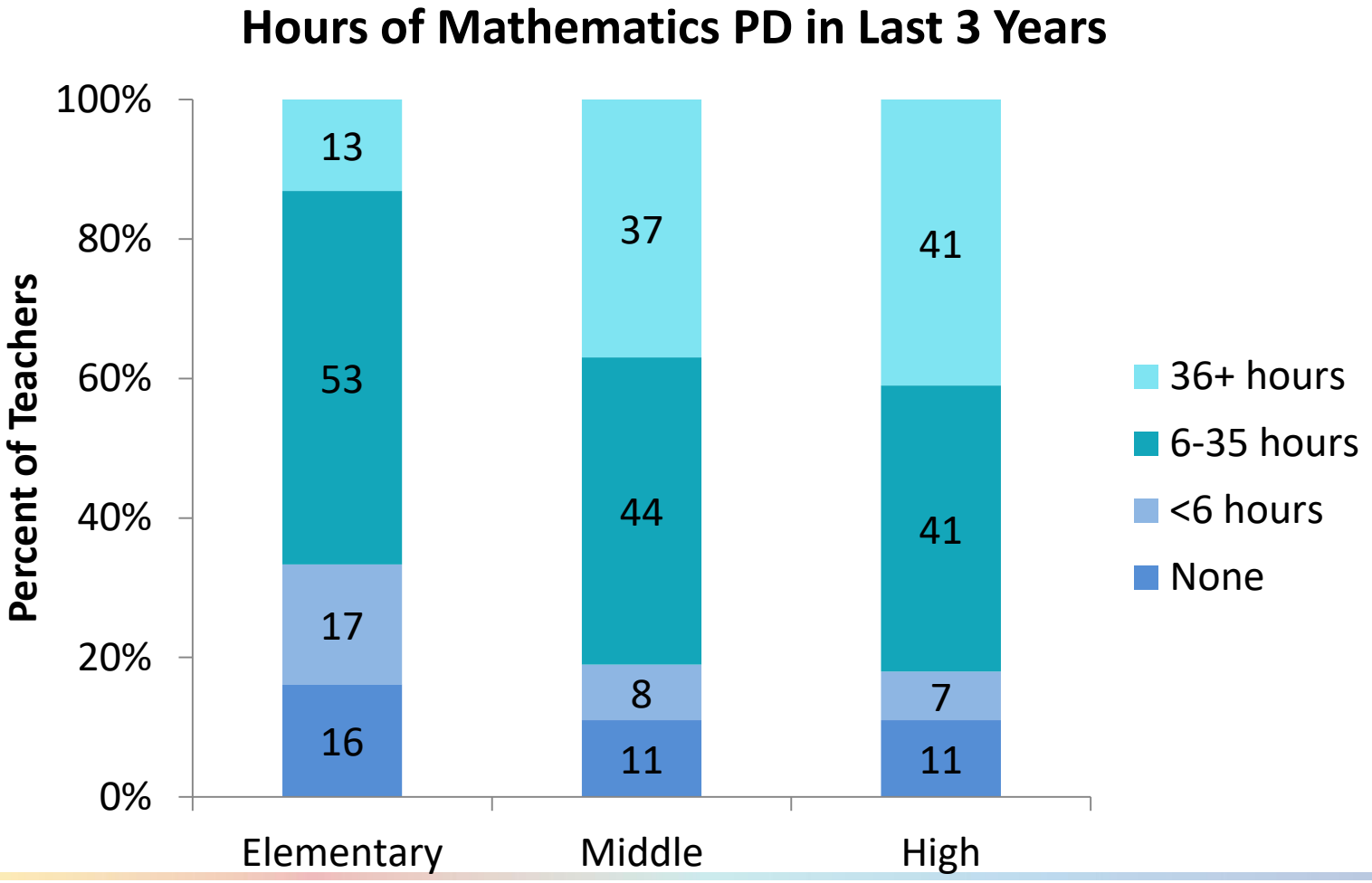
Common features

- 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

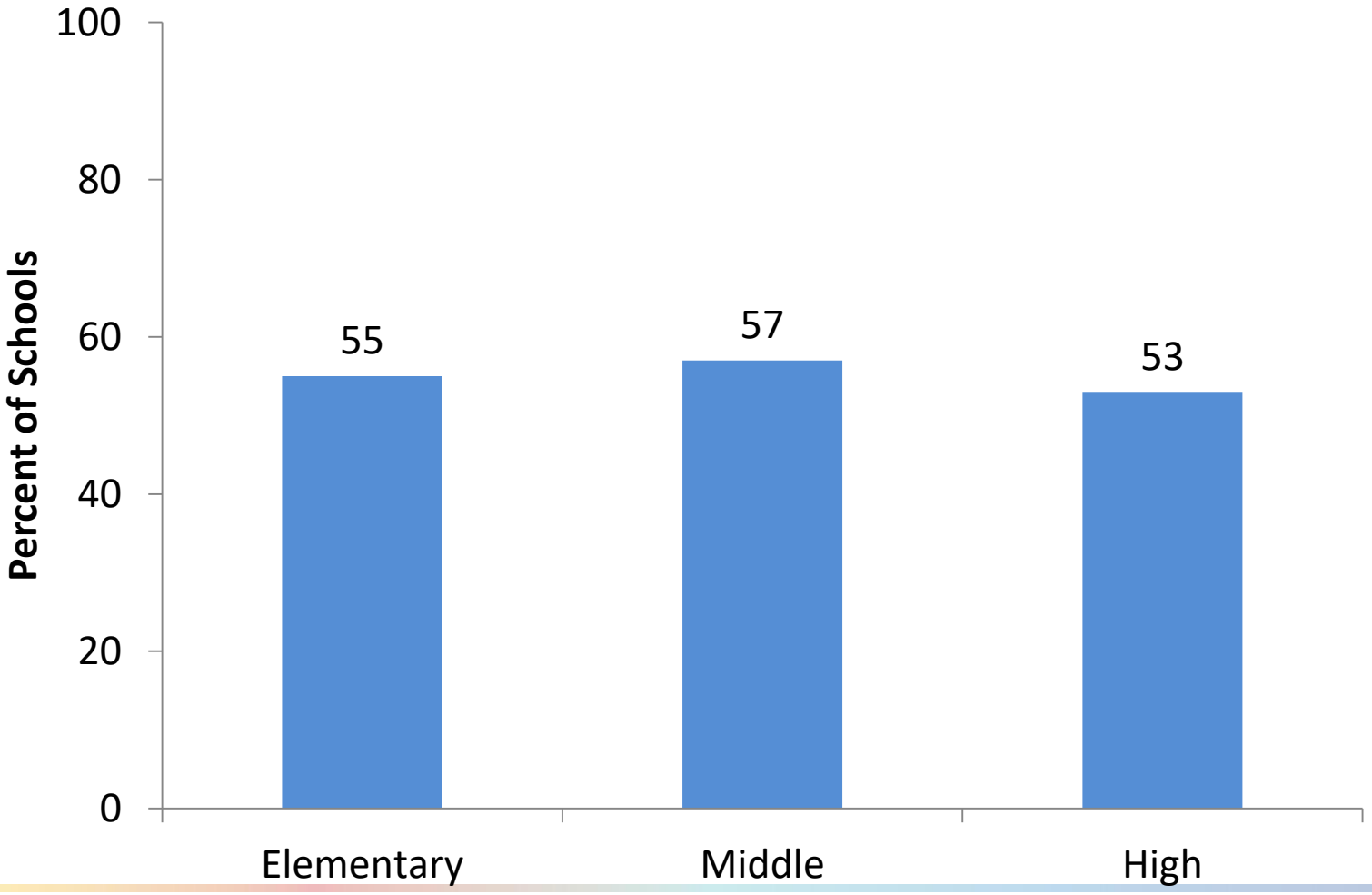
Professional Development



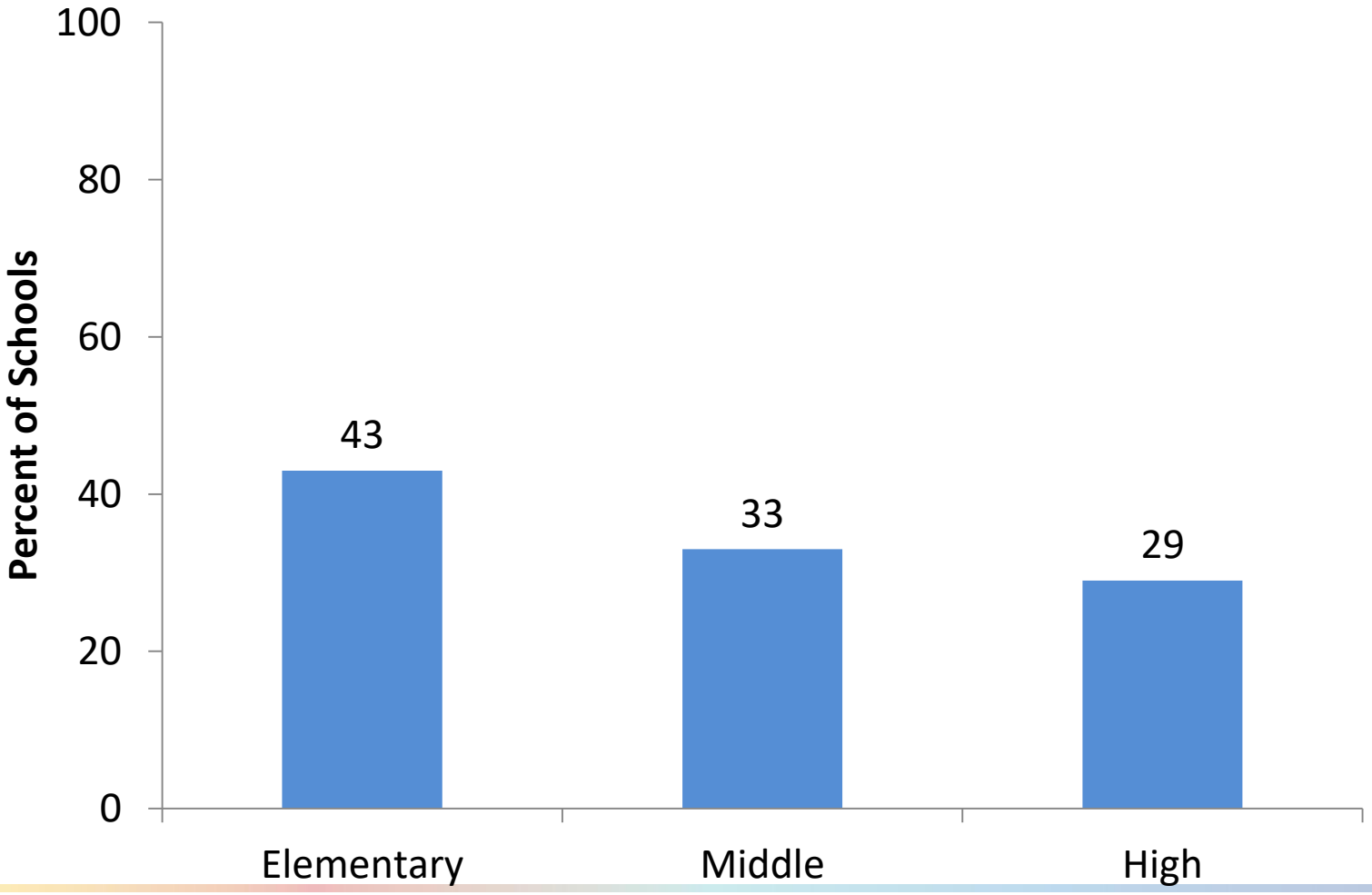
Characteristics of PD

	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 mathematics investigations	46	47	43
Experience lessons as students	48	45	42
Rehearse instructional practices	35	34	32

Schools Offering Teacher Study Groups in Mathematics in Last 3 Years



Schools Providing One-on-One Coaching in Mathematics



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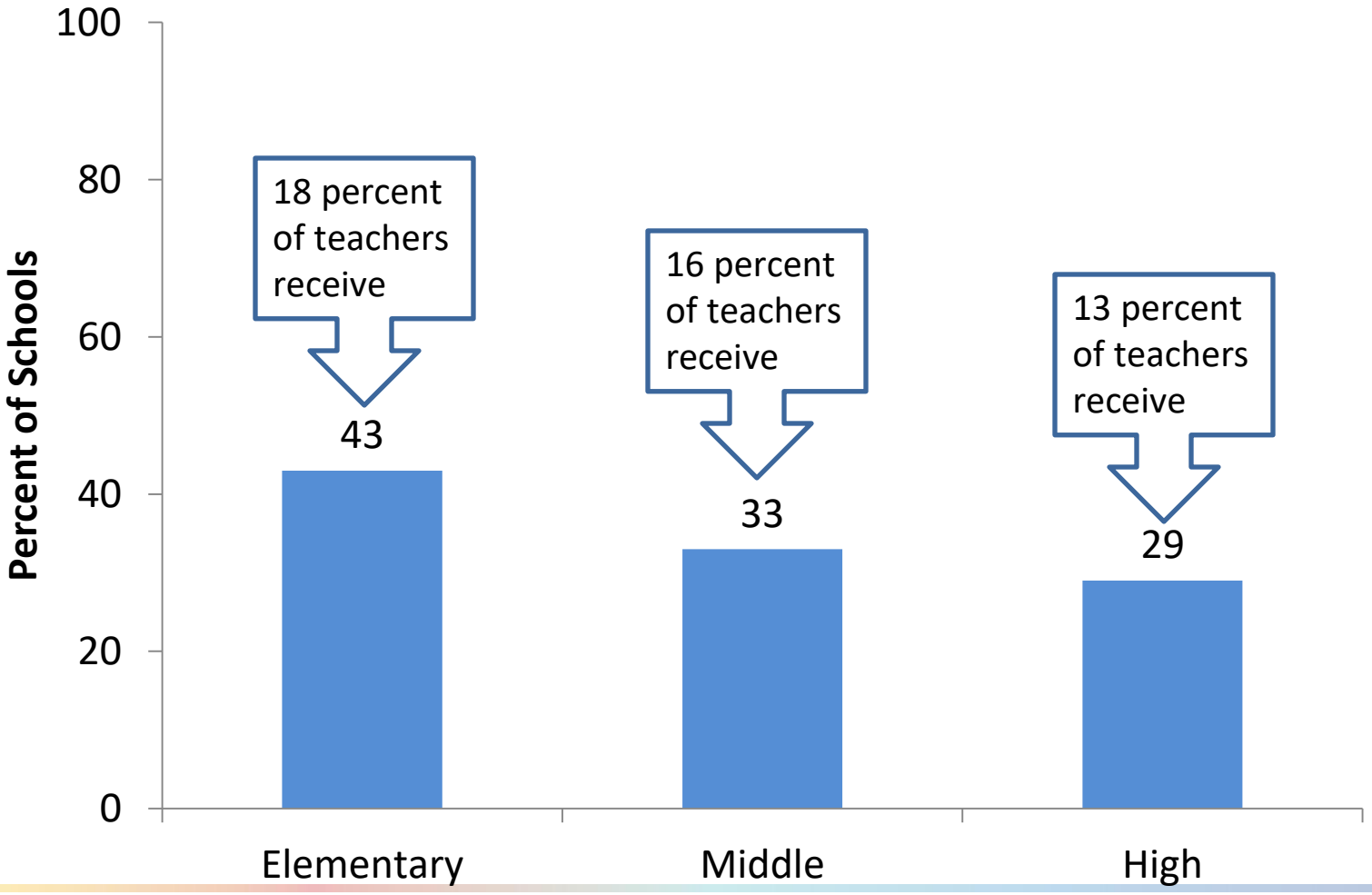


Inservice Support Take-Aways

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

PD programs often have characteristics identified as high quality, but teachers' extent of opportunity/participation varies widely.

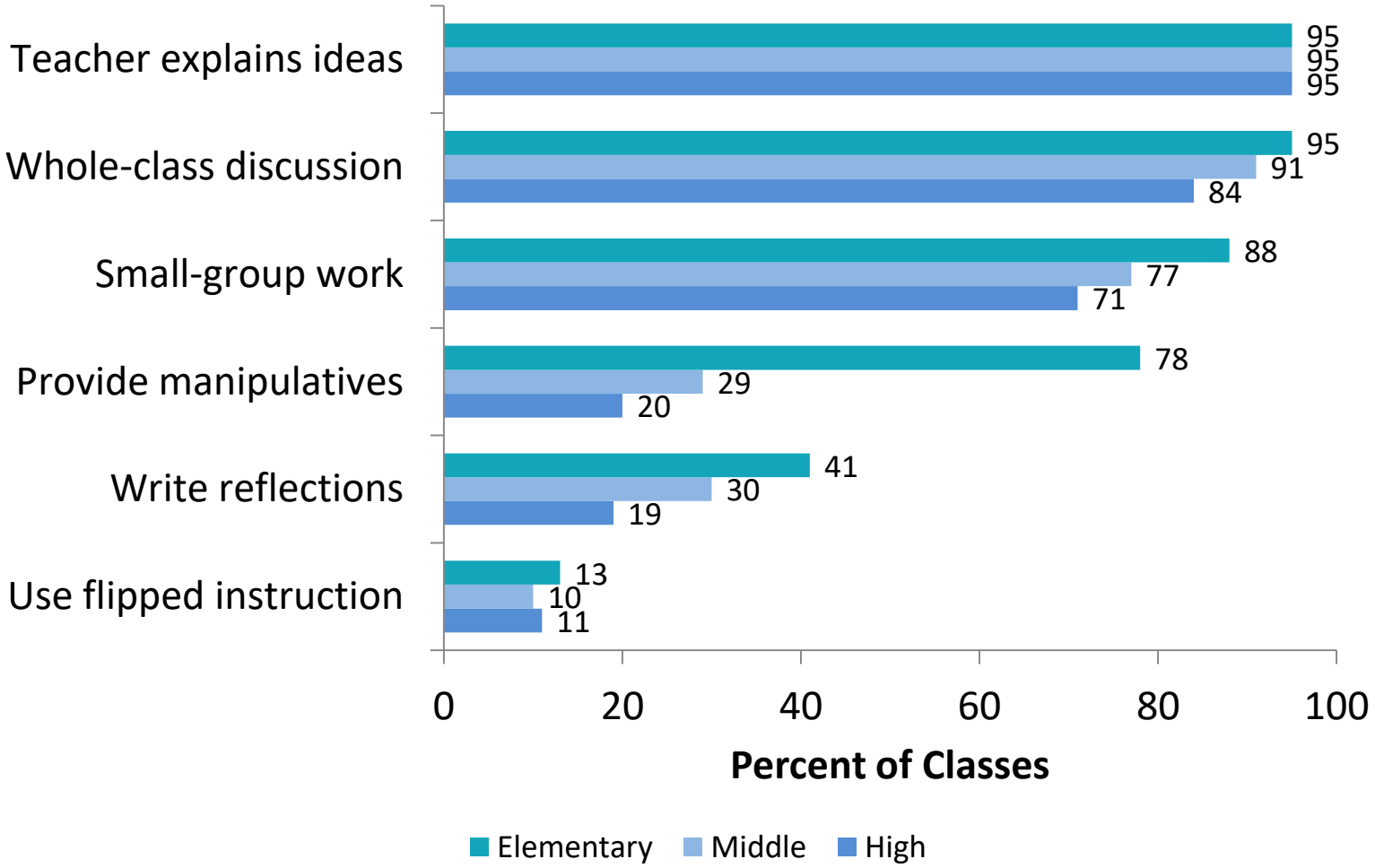
School-based mathematics PD is far from universal.

What mathematics instruction are students experiencing?

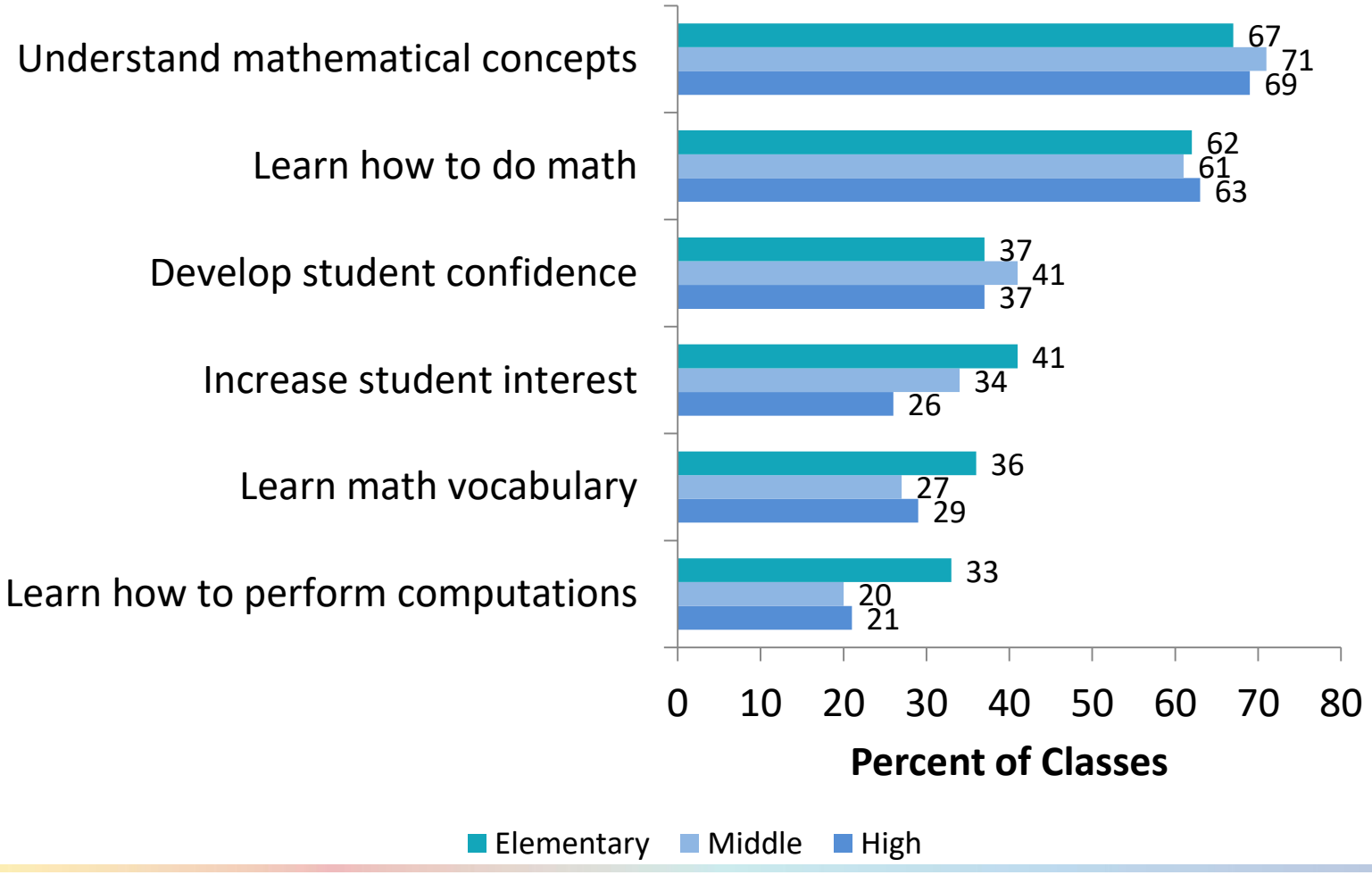
The 2018 NSSME+ asked about:

- Instructional formats
- Instructional objectives
- Mathematical practices
- Instructional materials

Instructional Formats: Weekly



Objectives Receiving a Heavy Emphasis

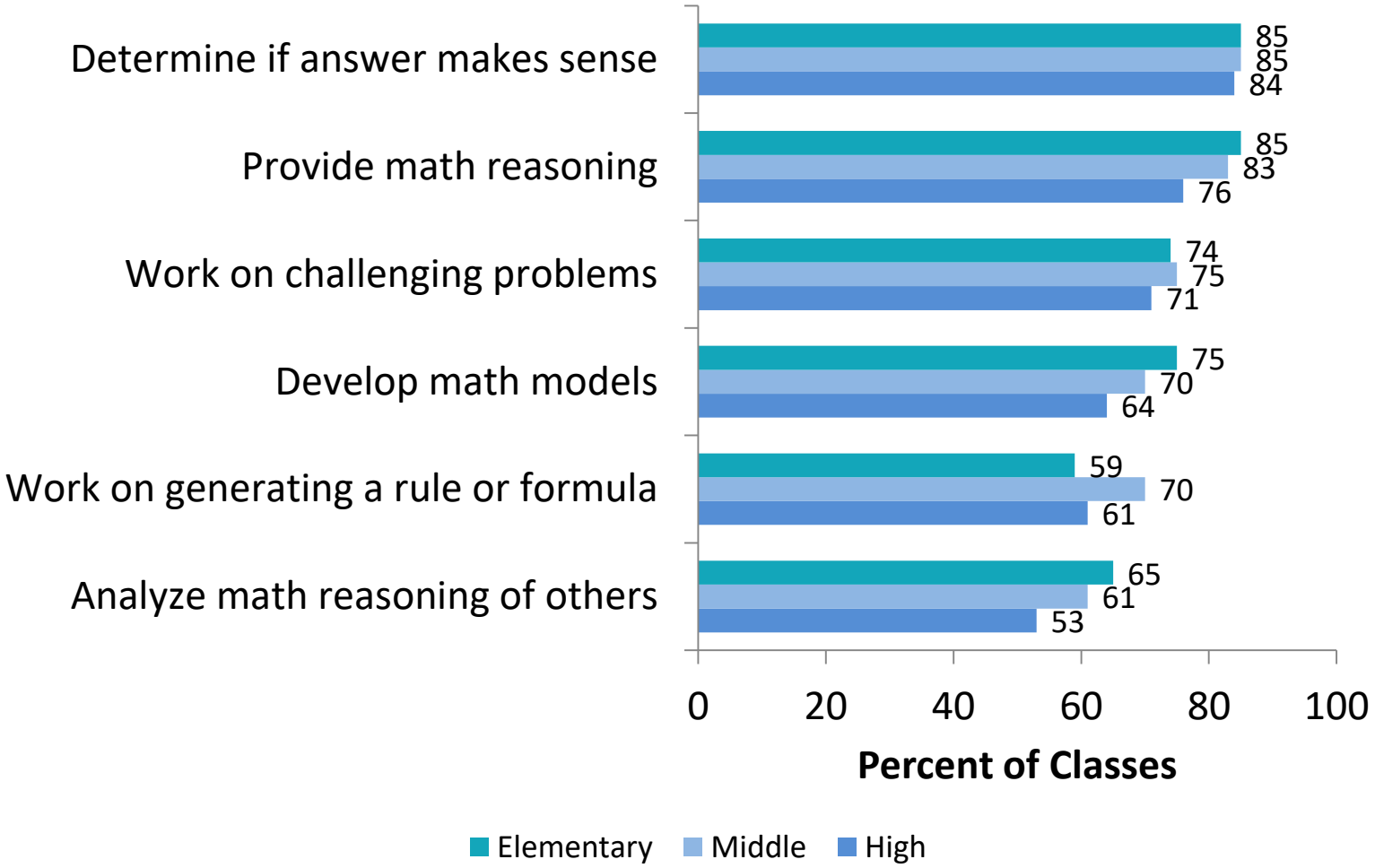


Engagement in Standards for Mathematical Practice

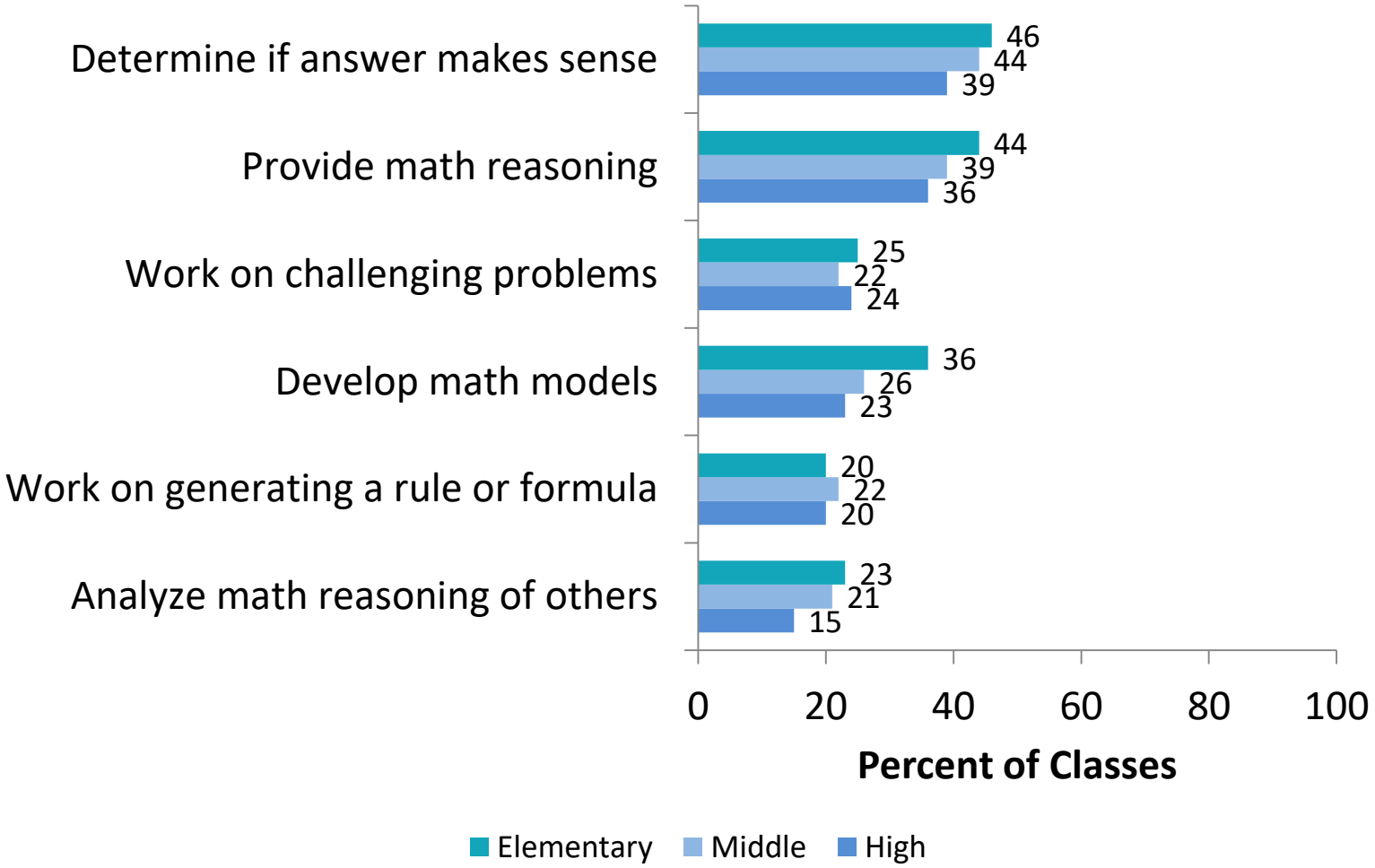
The 2018 NSSME+ included a series of items asking how often students were engaged in aspects of the mathematical practices:

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

Standards for Mathematical Practice: Weekly

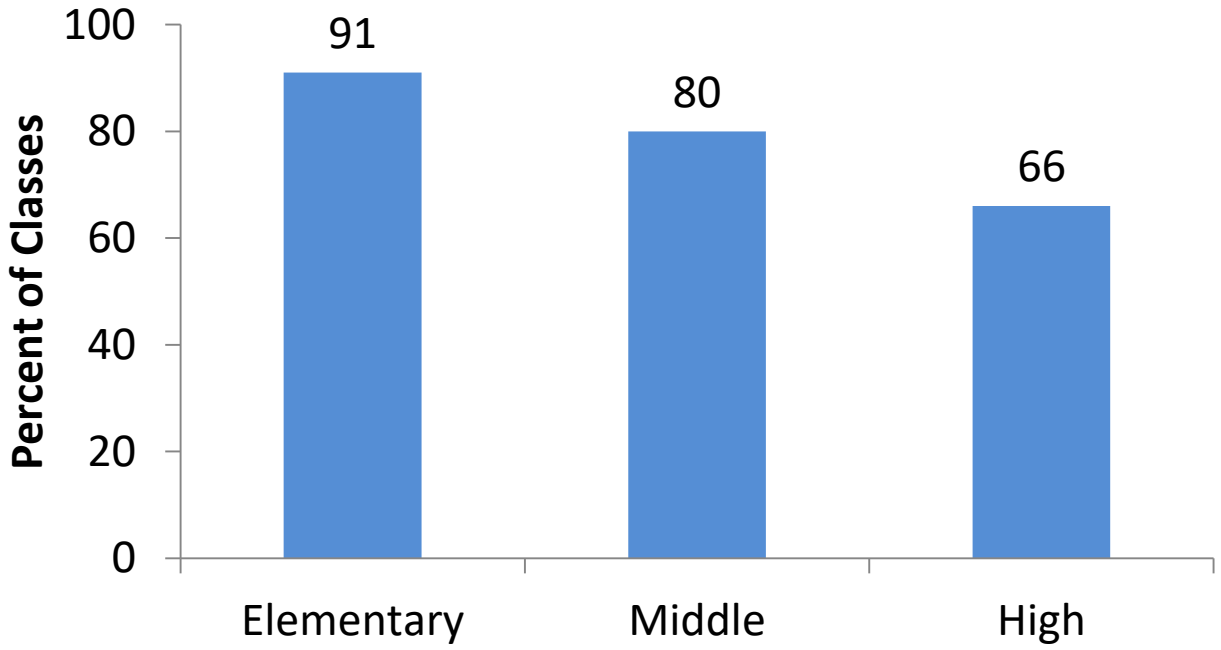


Standards for Mathematical Practice: Daily



Instructional Materials

For most classes, districts/dioscese 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 Are Teachers Using? (weekly)

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

Instruction Take-Aways

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

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

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

Teachers use an array of instructional materials, raising questions about quality and coherence

Approach to examining equity

Equitable distribution with respect to:

- **Mathematics teaching contexts**
- **Well-prepared teachers**
- **Nature of instruction**
- **Course offerings and enrollment**

Factors Associated with Differences in Educational Opportunities

Class-level Factors

- Prior achievement level of students in the class
- Percentage of students in the class from race/ethnicity groups historically underrepresented in STEM (HU)

School-level Factors

- Percentage of students in the school eligible for free or reduced-price lunch (FRL)
- School size
- School community type (rural, urban, suburban)

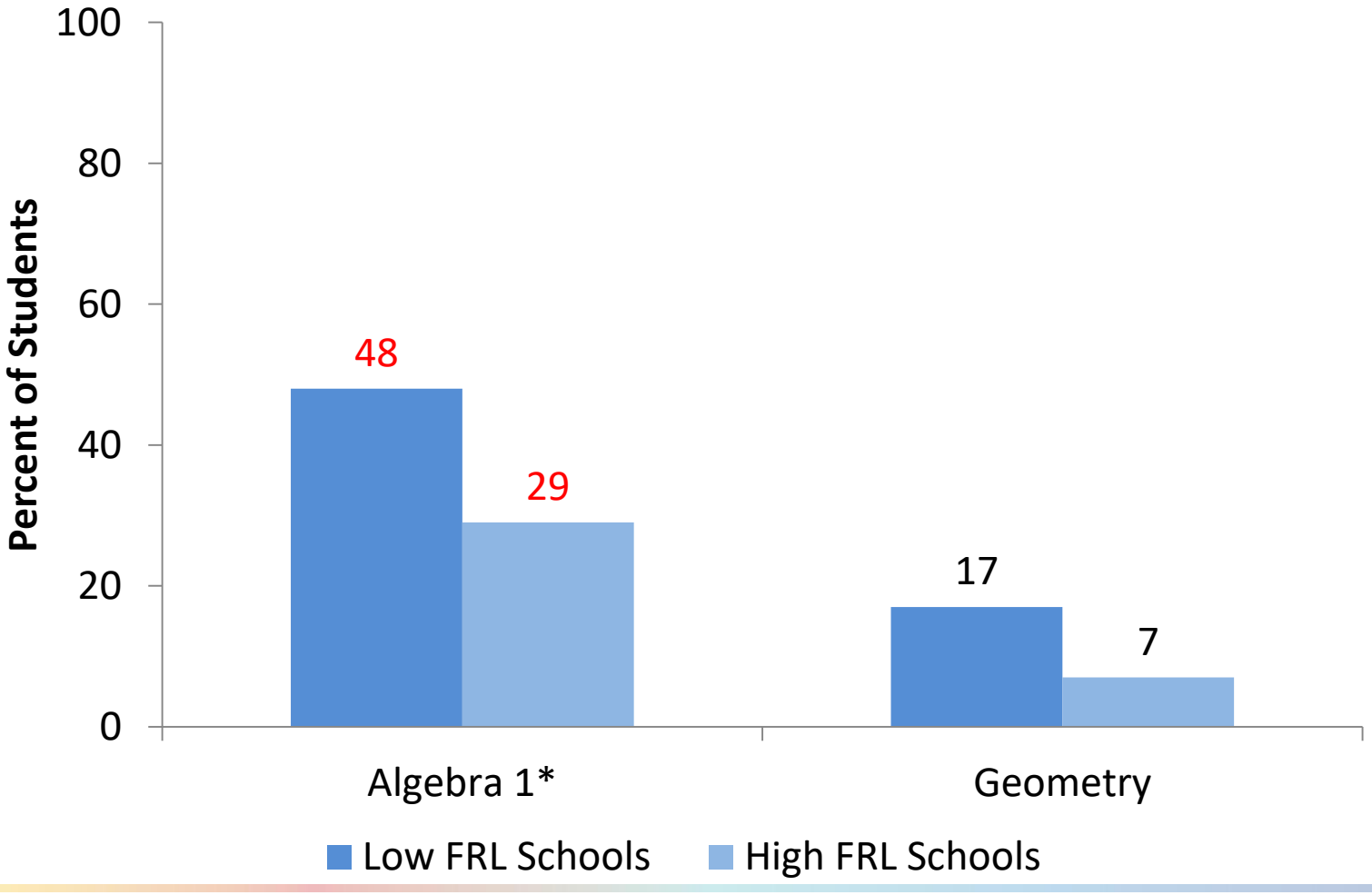
Course Offerings and Enrollment

- 8th grade students completing Algebra 1, Geometry
- High schools offering formal advanced mathematics courses (e.g., Algebra 2, pre-calculus, AP Calculus)
- Availability of AP courses
- Enrollment in high school mathematics courses

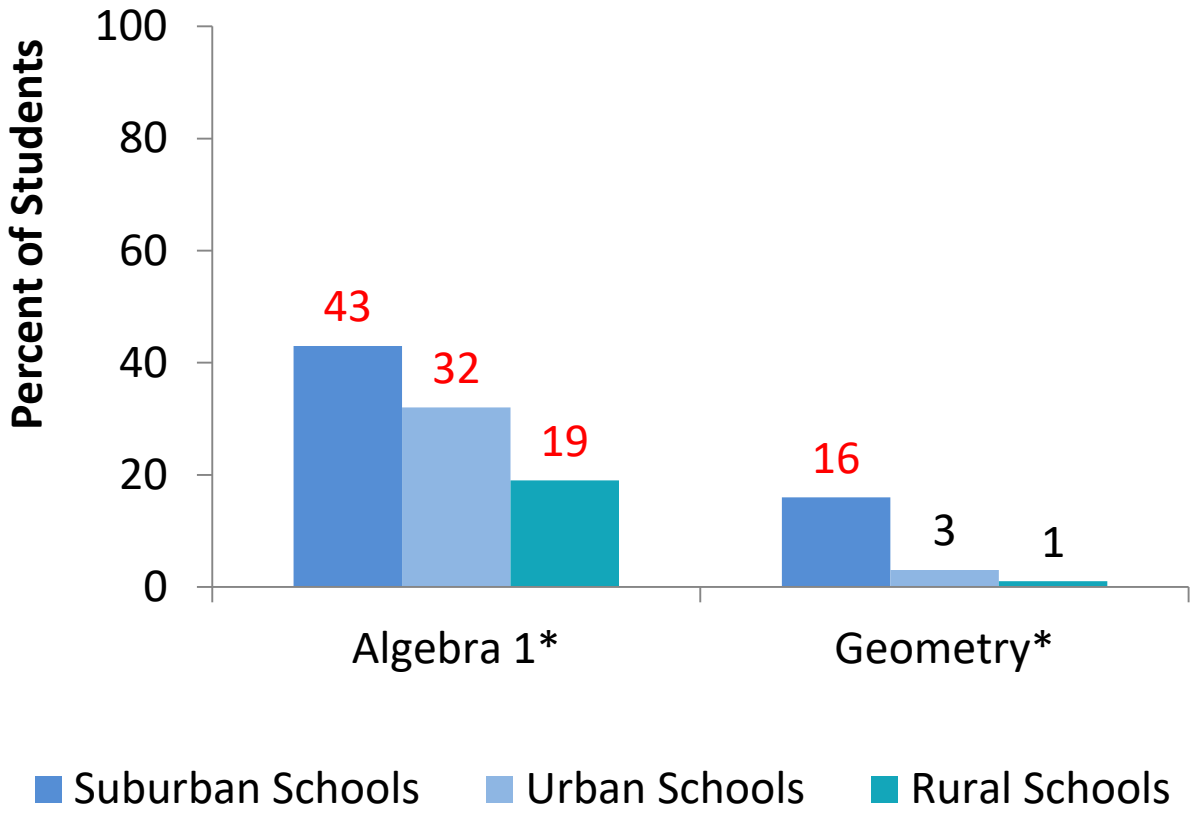
Middle School Students Completing Algebra 1 and Geometry

- About ¾ of middle schools have at least some students completing Algebra 1 prior to 9th grade
- About ¼ of middle schools have at least some students completing Geometry prior to 9th grade

Average Percentage of 8th Graders Completing Algebra 1 & Geometry



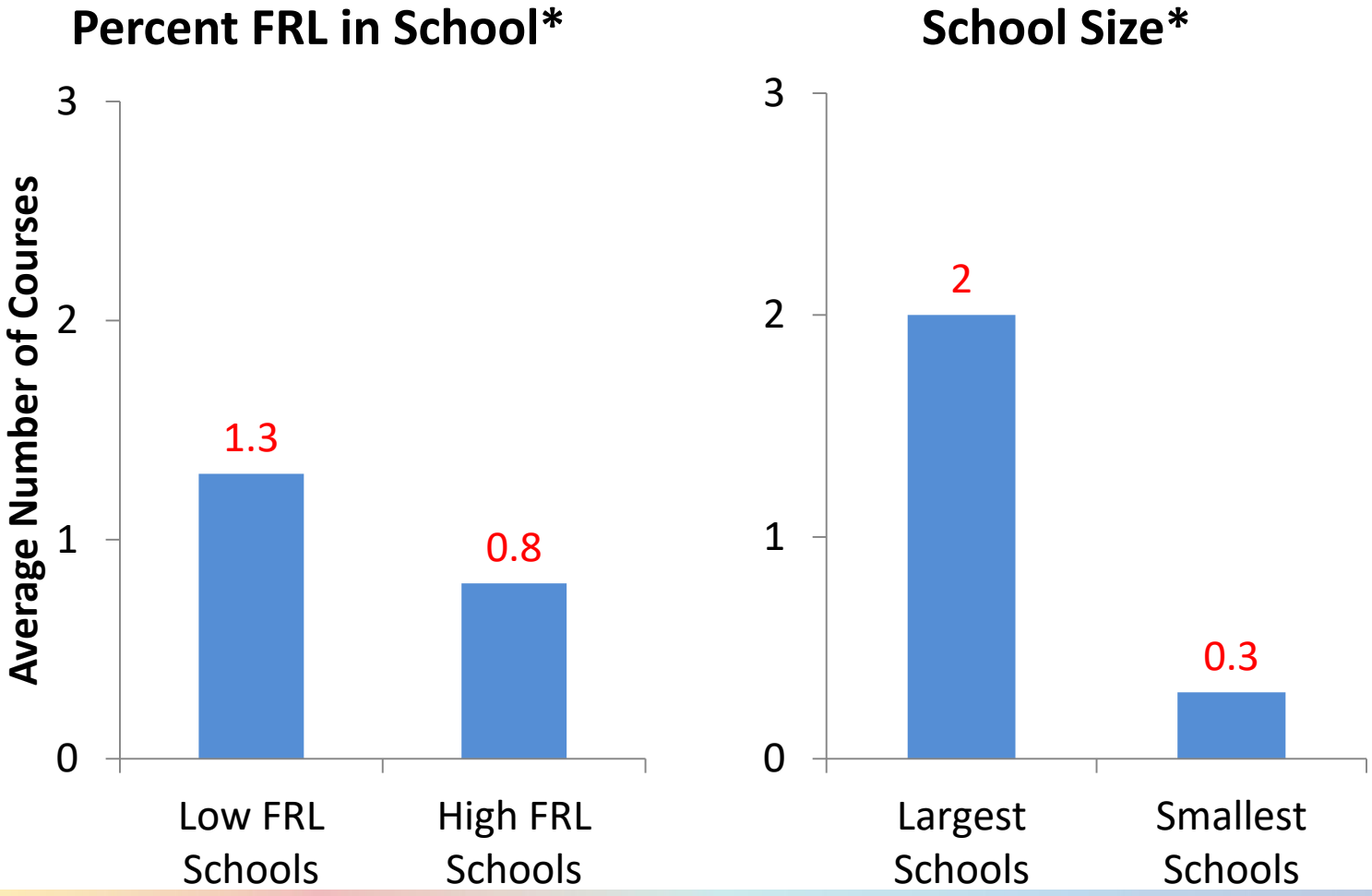
Average Percentage of 8th Graders Completing Algebra 1 & Geometry



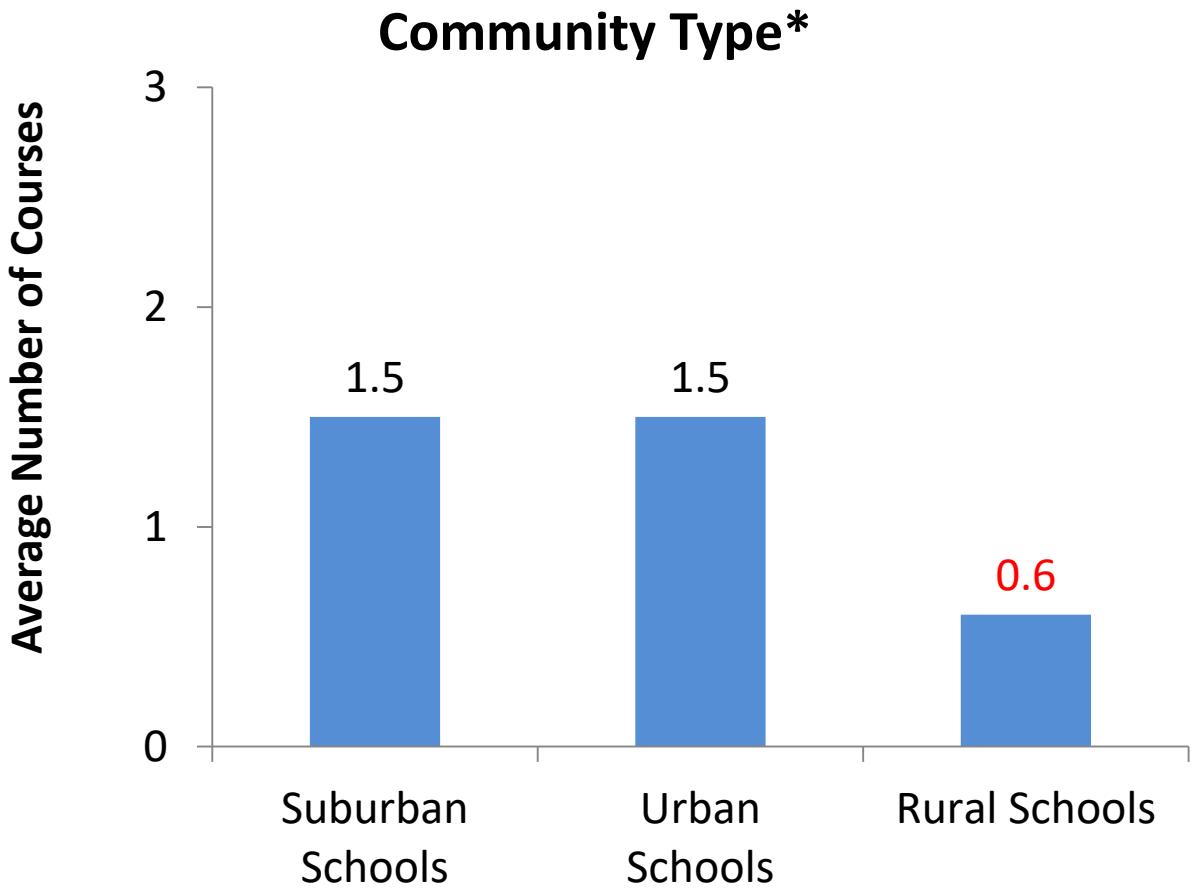
High Schools Offering Various Mathematics Courses

	Percent of Schools
Non-college prep (e.g., Remedial Math, General Math, Consumer Math)	79
Formal/College prep level 1 (e.g., Algebra 1, Integrated Math 1)	98
Formal/College prep level 2 (e.g., Geometry, Integrated Math 2)	93
Formal/College prep level 3 (e.g., Algebra 2, Algebra and Trigonometry)	91
Formal/College prep level 4 (e.g., Pre-Calculus, Algebra 3)	90
Courses that might qualify for college credit (e.g., AP Calculus, AP Statistics)	72

Average Number of AP Mathematics Courses Offered



Average Number of AP Mathematics Courses Offered



Average Percentages of Historically Under-represented Students in High School Courses

	Percent HU
Non-college prep (e.g., Remedial Math, General Math, Consumer Math)	53
Formal/College prep level 1 (e.g., Algebra 1, Integrated Math 1)	38
Formal/College prep level 2 (e.g., Geometry, Integrated Math 2)	39
Formal/College prep level 3 (e.g., Algebra 2, Algebra and Trigonometry)	37
Formal/College prep level 4 (e.g., Pre-Calculus, Algebra 3)	33
Courses that might qualify for college credit (e.g., AP Calculus, AP Statistics)	22

Closing Thoughts

- Important limitations

- NSSME+ provides an opportunity to examine some questions of access at national scale
- Some hopeful findings
- Also evidence that historic inequities persist

- What implications do you see for your work?
- What implications do you see for improving mathematics education more broadly?

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