

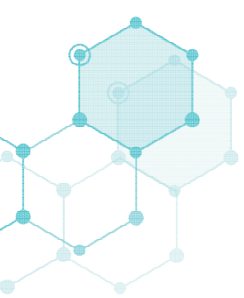
NSSME

THE NATIONAL SURVEY OF
SCIENCE & MATHEMATICS EDUCATION

Obstacles to and Progress Toward the Vision of the Framework

P. Sean Smith

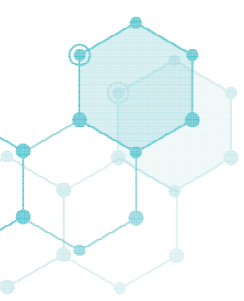
horizon
RESEARCH, INC.



Poll Question

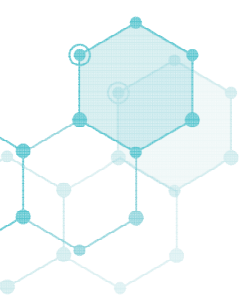
What percentage of high school life science teachers taught about COVID-19 in the first few months of the pandemic?

- A. Less than 60%
- B. 60% - 69%
- C. 70% - 79%
- D. 80% - 89%
- E. More than 90%



What percentage of high school life science teachers taught about COVID-19 in the first few months of the pandemic?

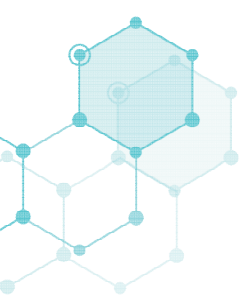
- A. Less than 60%
- B. 60% - 69%
- C. 70% - 79%
- D. 80% - 89%
- E. More than 90% 92%



Poll Question

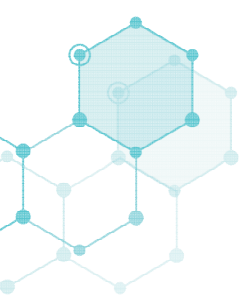
What percentage of high school non-life science teachers taught about COVID-19 in the first few months of the pandemic?

- A. Less than 60%
- B. 60% - 69%
- C. 70% - 79%
- D. 80% - 89%
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What percentage of high school non-life science teachers taught about COVID-19 in the first few months of the pandemic?

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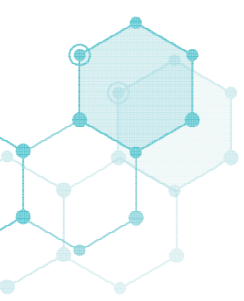
Why?

1. Why did some life science teachers NOT teach about COVID?

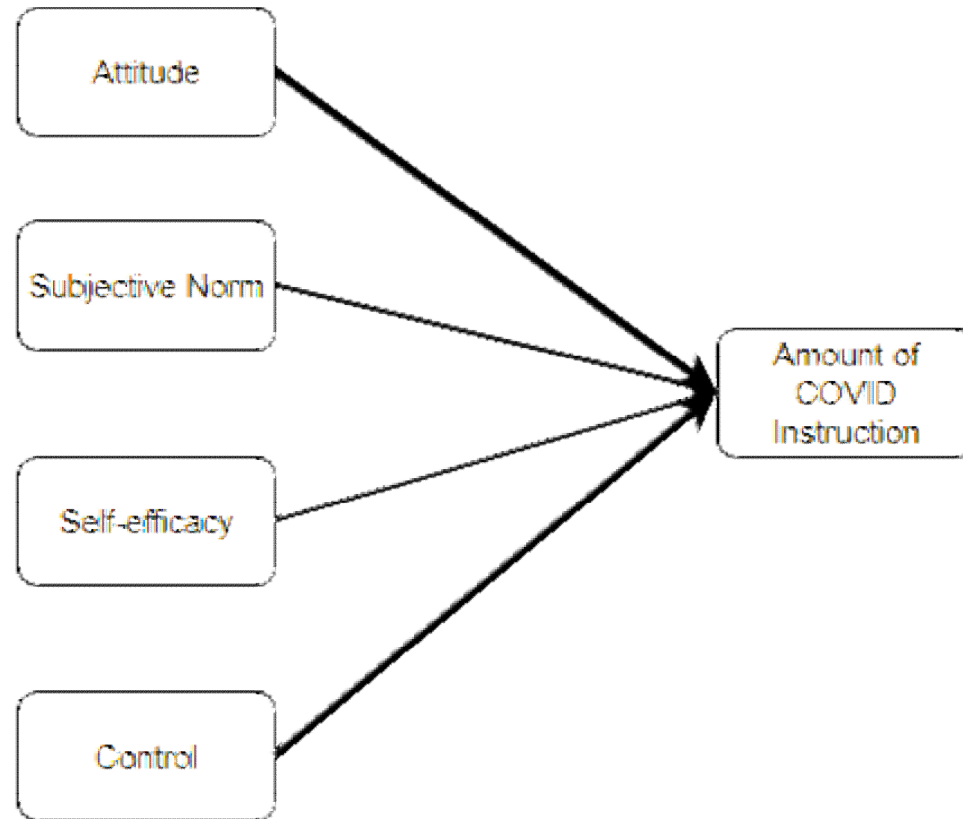
1. Lack of time
2. Not included in standards
3. Lack of stable knowledge about COVID-19
4. Prohibited
5. Oversaturation of COVID-19 news

2. Why DID more than two-thirds of non-life science teachers teach about COVID?

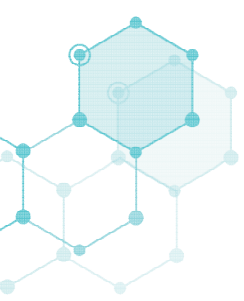
1. Relevant/current event
2. Student curiosity/interest/questions
3. Protect students and others
4. Address fear/anxiety
5. Address misconceptions/misinformation



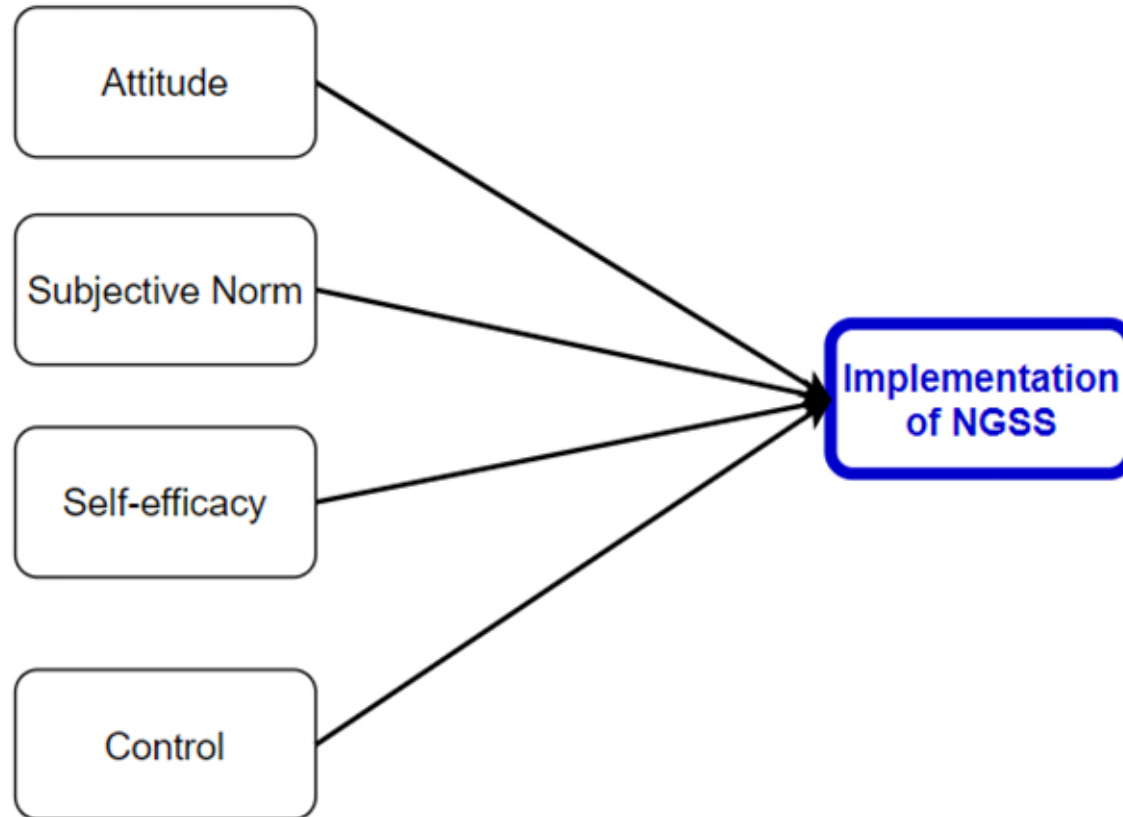
The Theory of Planned Behavior

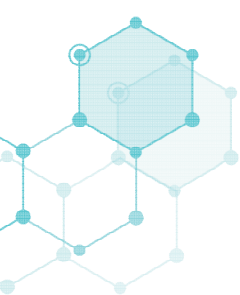


Ajzen, I., & Gilbert Cote, N. (2008). Attitudes and prediction of behavior. In W. D. Crano & R. Prislin (Eds.), *Attitudes and attitude change* (pp. 289–311). New York: Psychology Press.



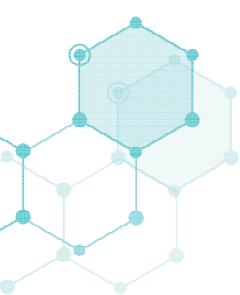
The Theory of Planned Behavior



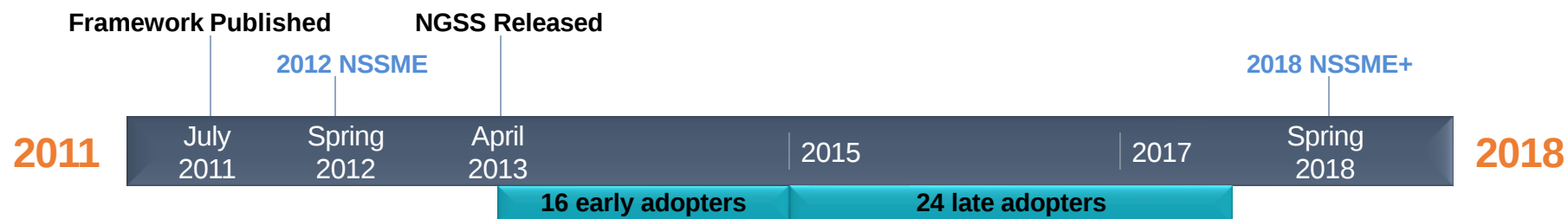


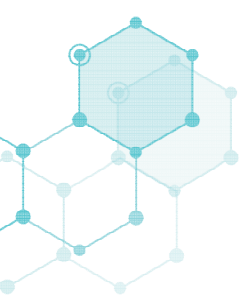
This presentation is based upon work supported by the National Science Foundation under Grant Nos. DGE-1642413 and DRL-2027397 Any opinions, findings, and conclusions or recommendations expressed are those of the author and do not necessarily reflect the views of the National Science Foundation.





NGSS and the NSSME





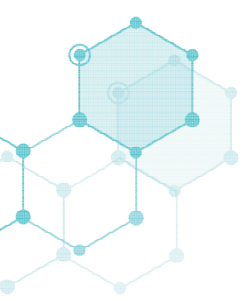
Who's In the Sample

Two-stage random sample that targeted:

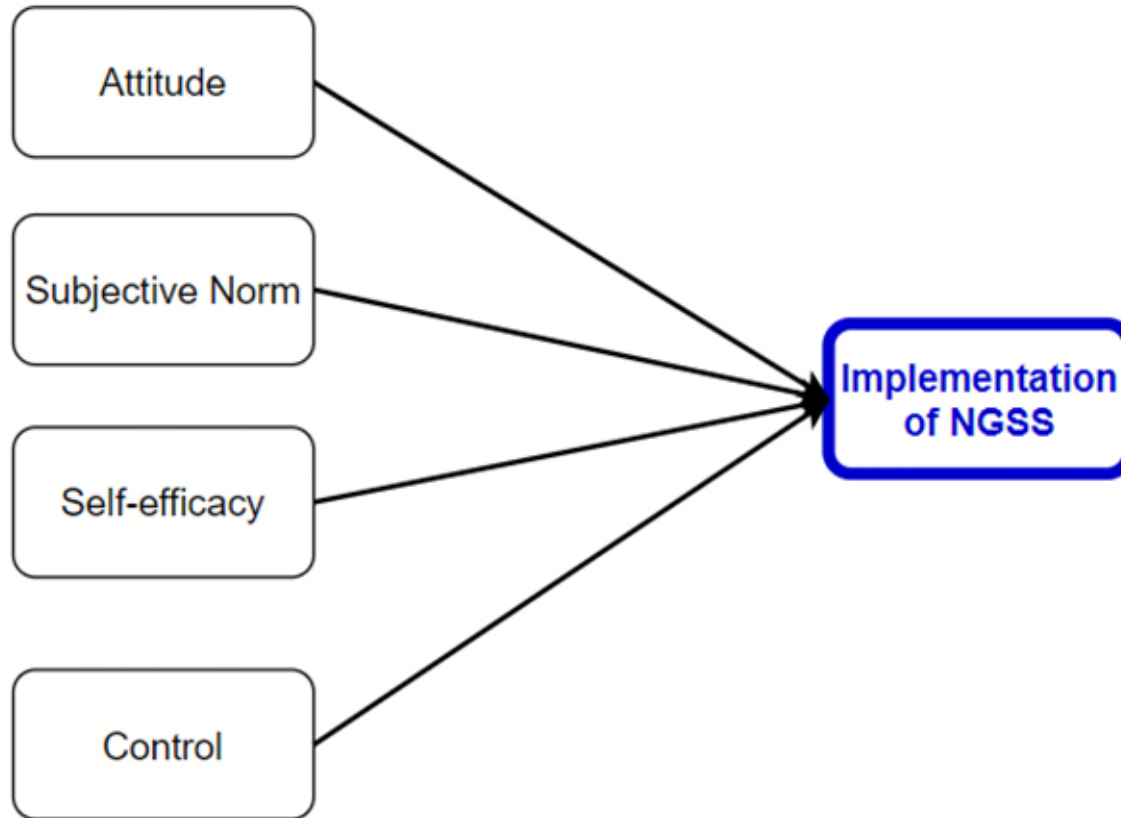
- 2,000 schools (public and private)
- Over 10,000 K–12 teachers

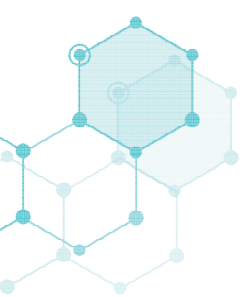
Very good response rate:

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

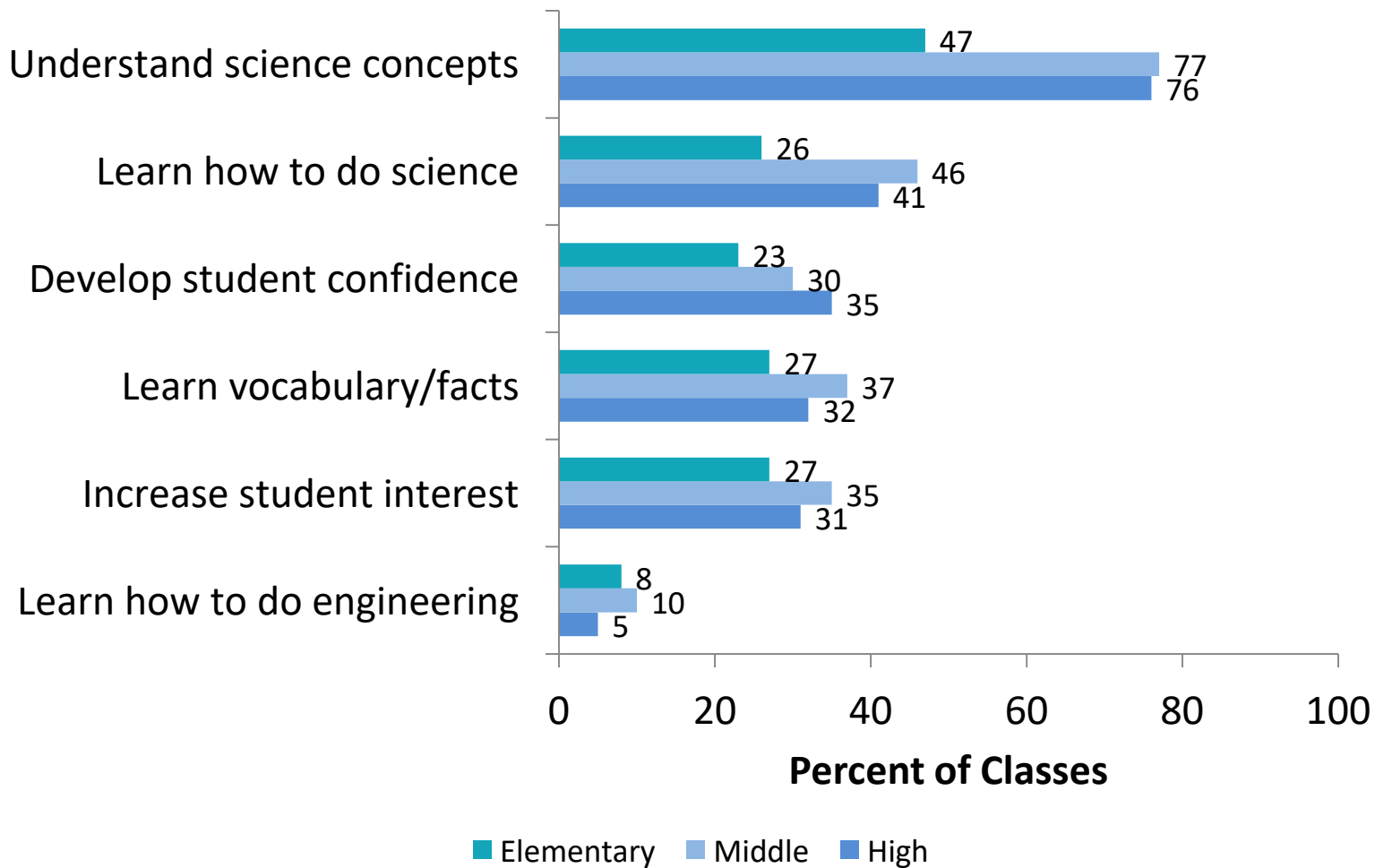


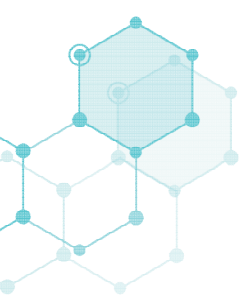
Science Instruction



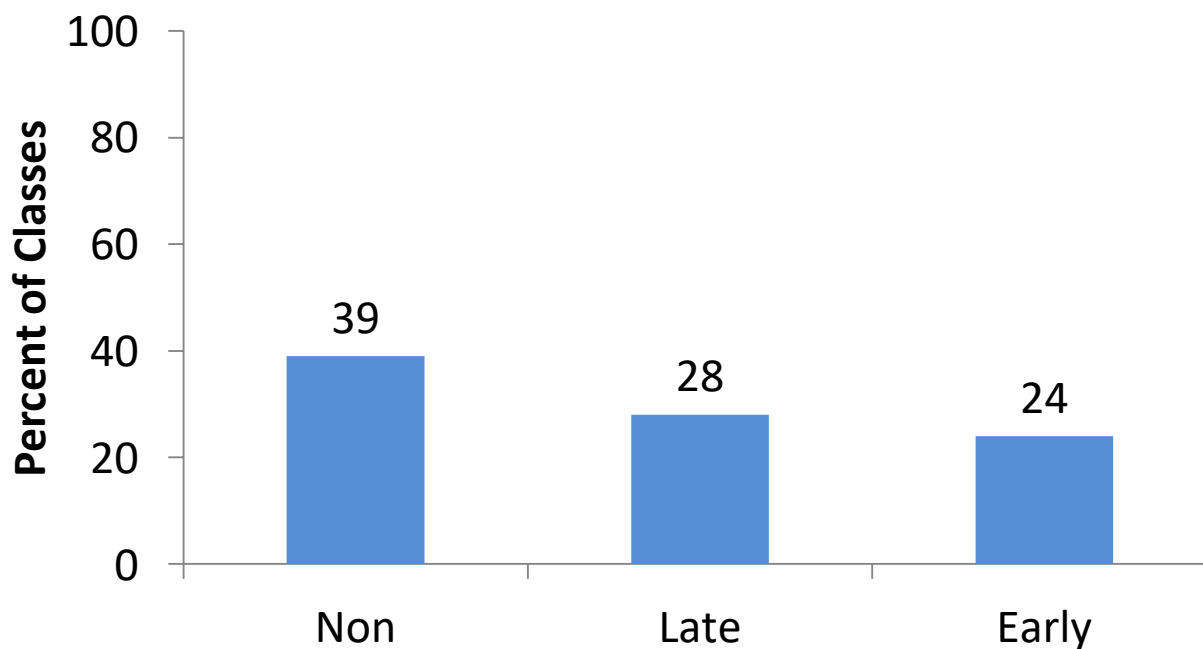


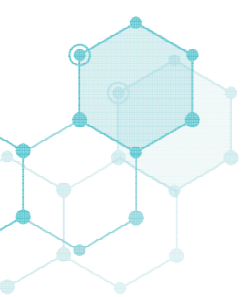
Objectives Receiving a Heavy Emphasis



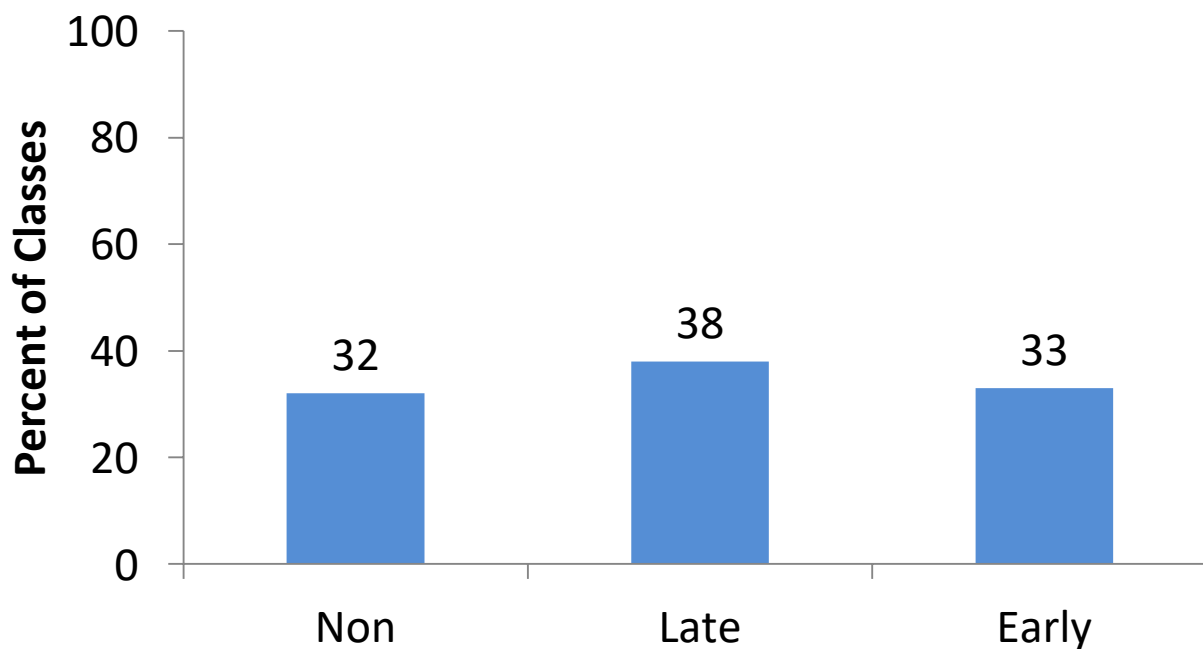


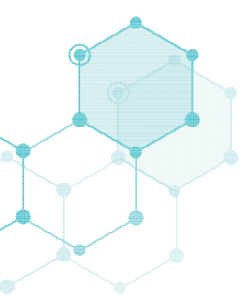
Heavy Emphasis on Learning Science Vocabulary/Facts



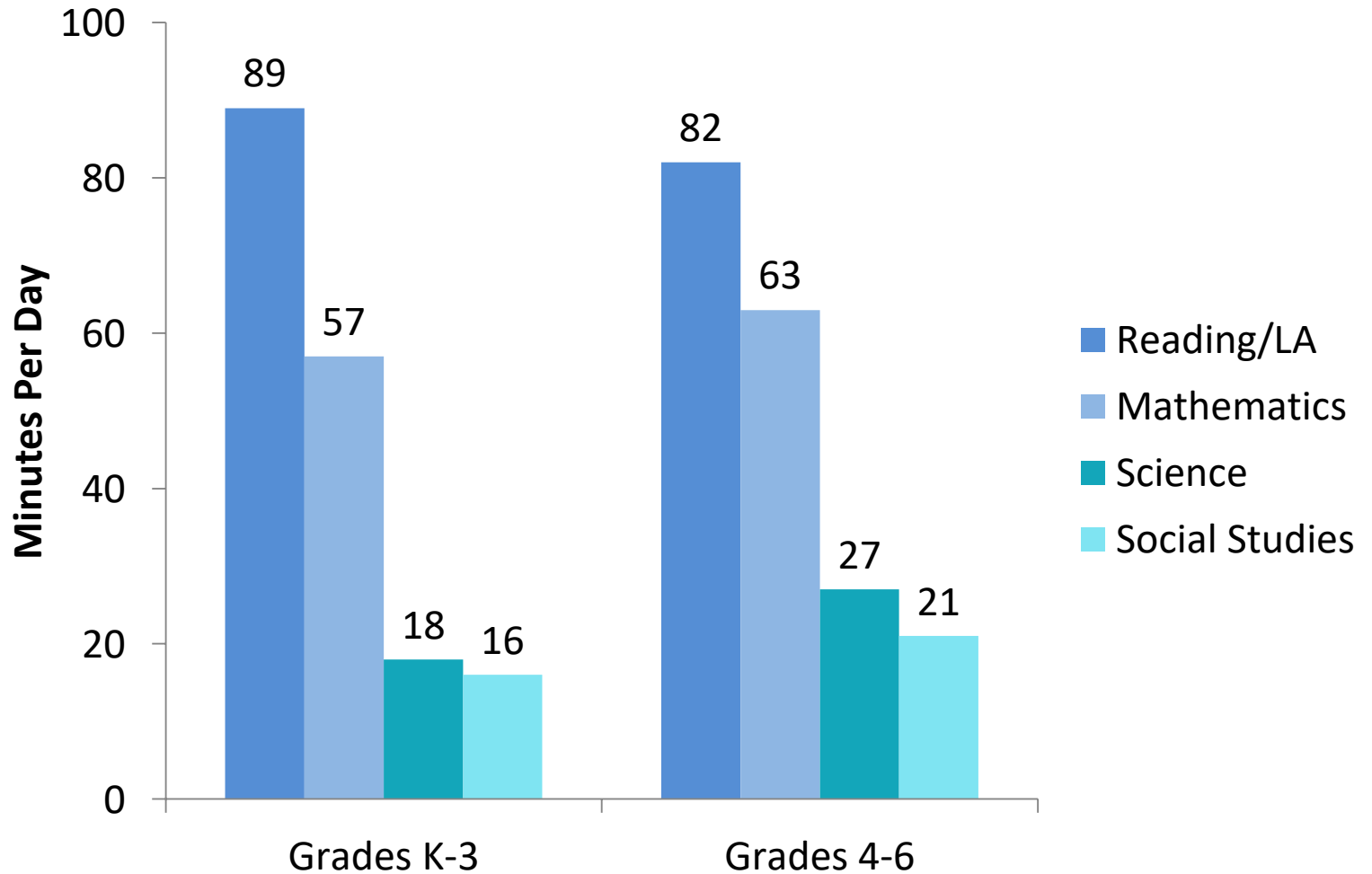


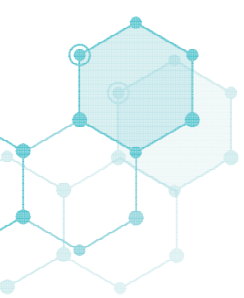
Heavy Emphasis on Learning How To Do Science



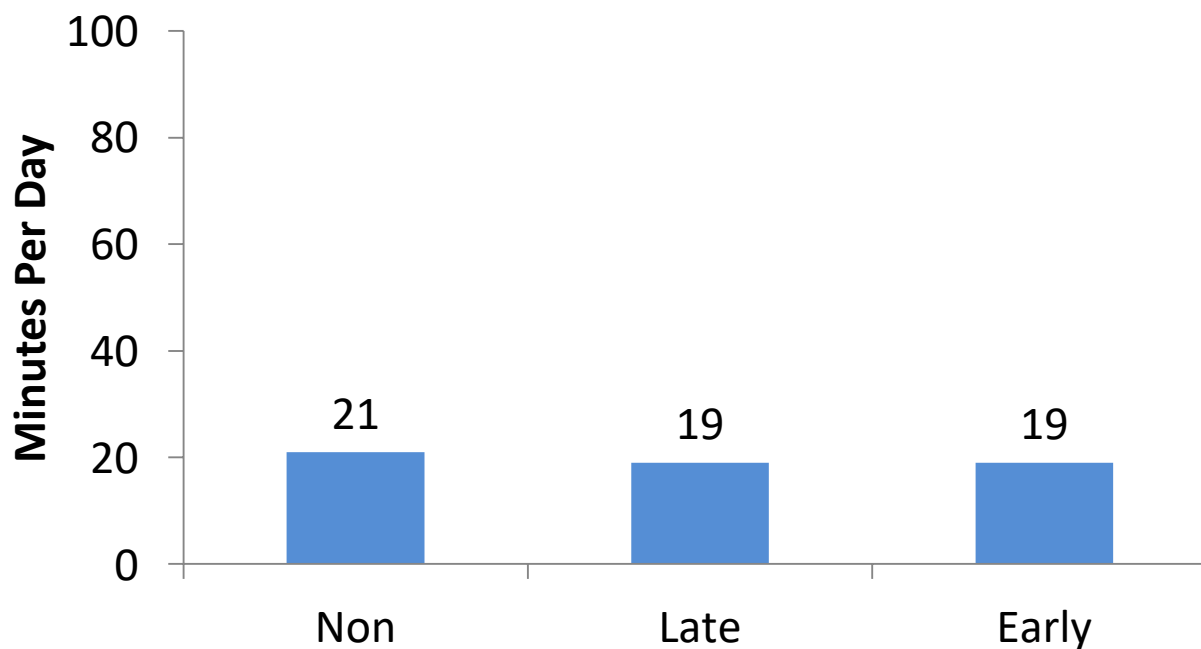


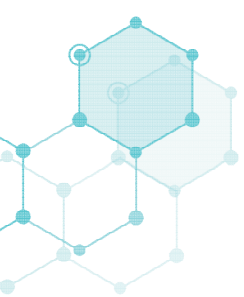
Instructional Time: Elementary



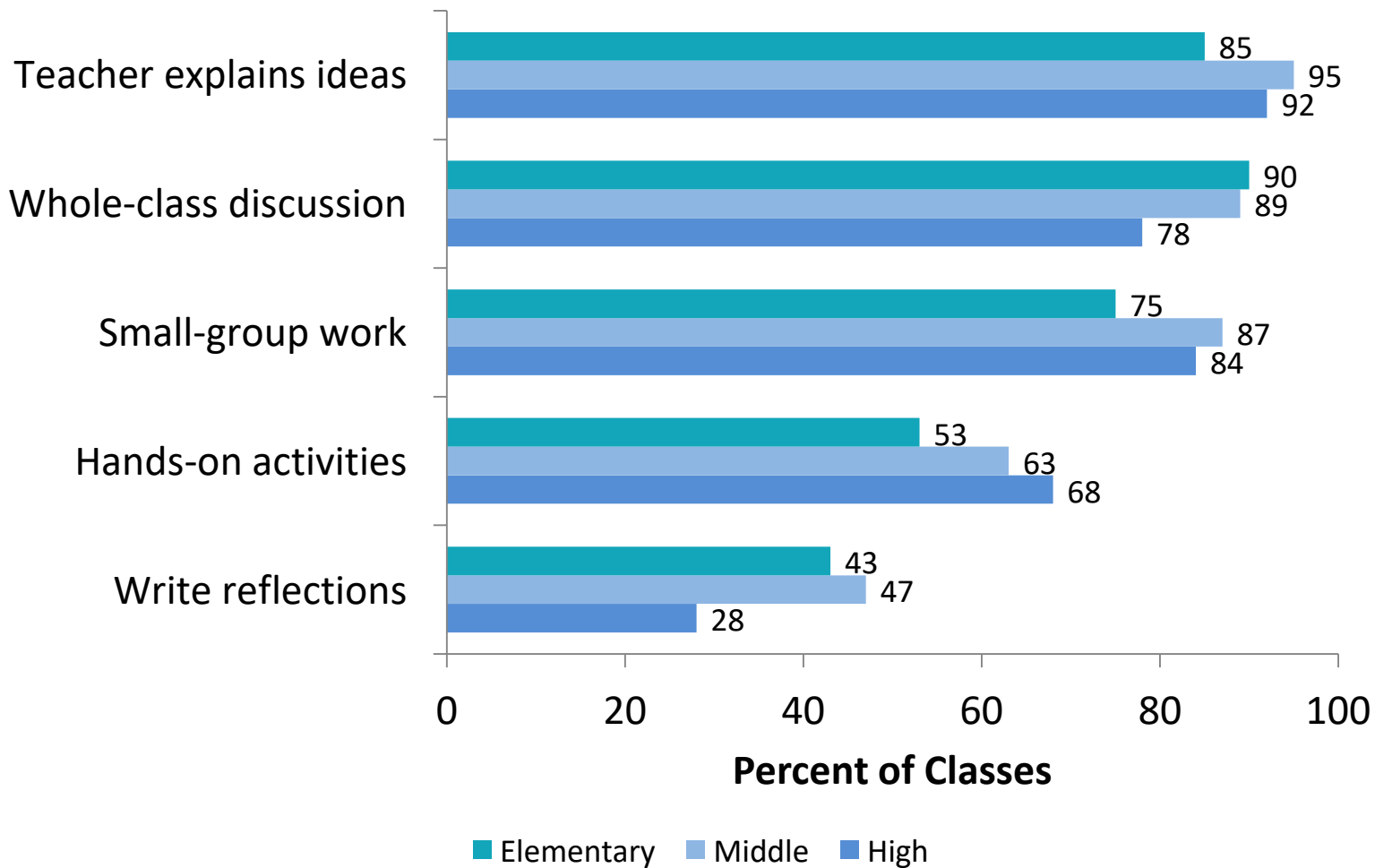


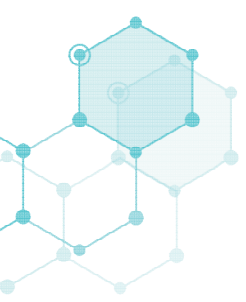
Minutes Per day on Science: Elementary



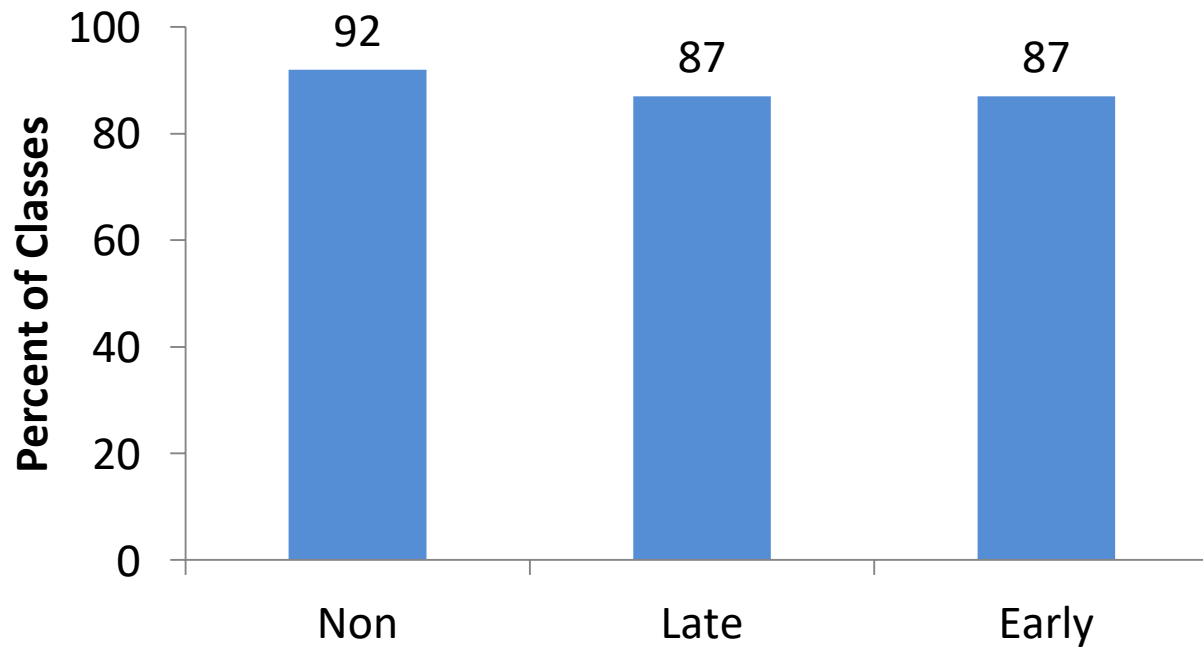


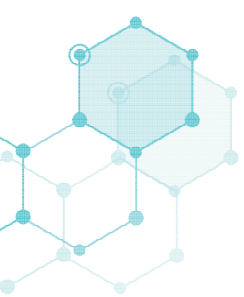
Instructional Activities (Weekly)



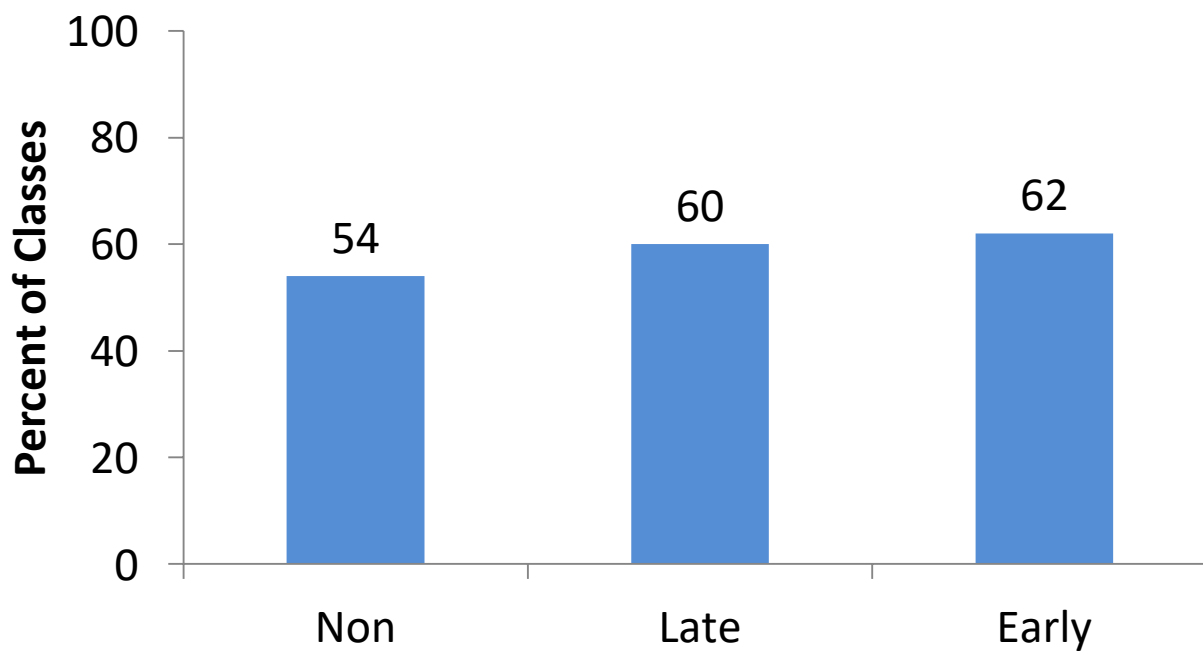


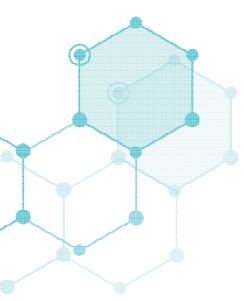
Teacher Explains Ideas (Weekly)





Hands-On Activities (Weekly)

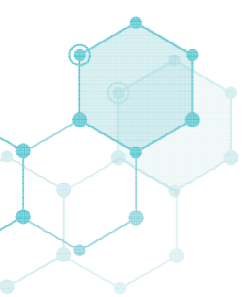




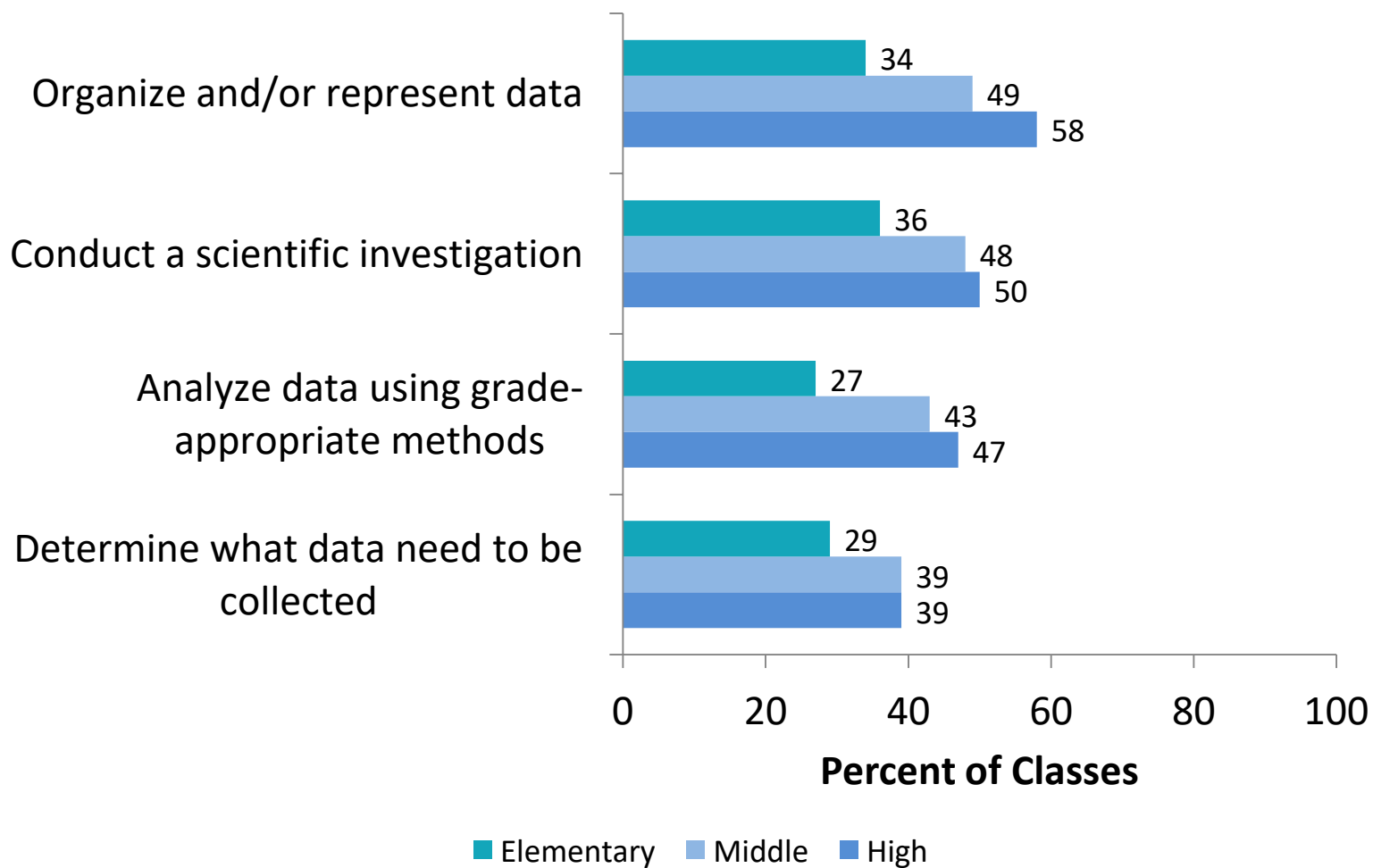
Engagement in Science Practices

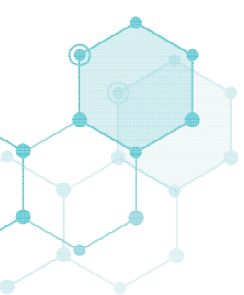
The 2018 NSSME+ included a series of items asking how often students were engaged in aspects of the science practices:

1. Asking questions/defining problems
2. Developing and using models
3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Using mathematics and computational thinking
6. Constructing explanations/designing solutions
7. Engaging in argument from evidence
8. Obtaining, evaluating, and communicating information

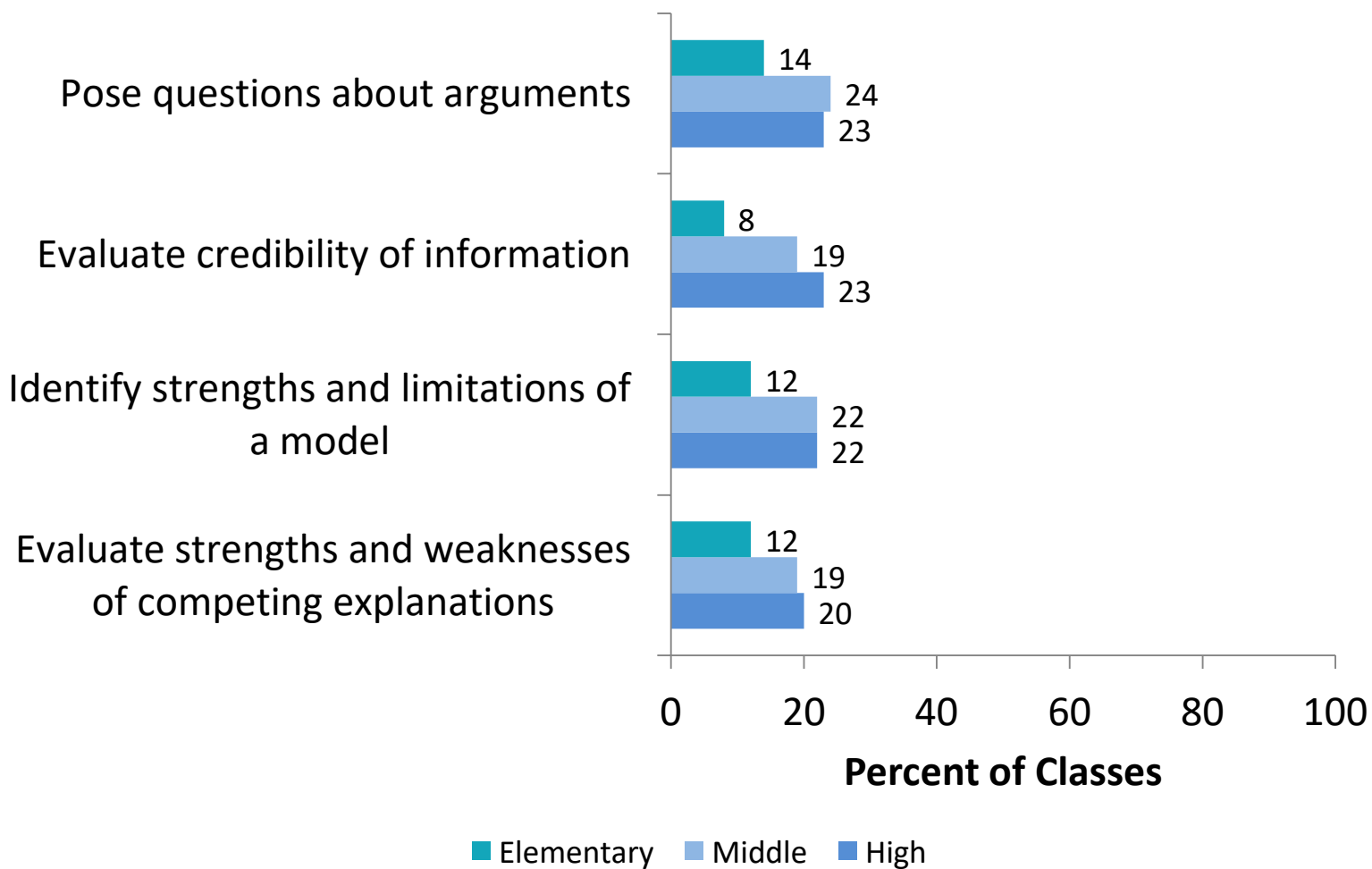


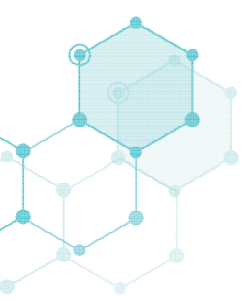
Conducting Investigations and Analyzing Data (Weekly)





Evaluating Evidence and Arguing (Weekly)



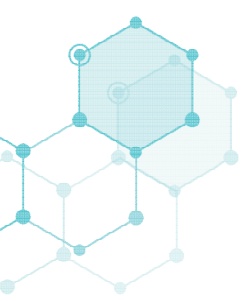


Instruction Takeaways

Instructional time for science at the elementary is still relatively low

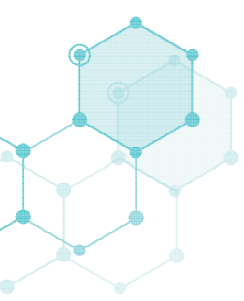
Heavy emphasis on developing conceptual understanding, but not on how science is done or how knowledge is generated and revised

Students conduct investigations and analyze data fairly often, but they are not asked to think critically nearly as often

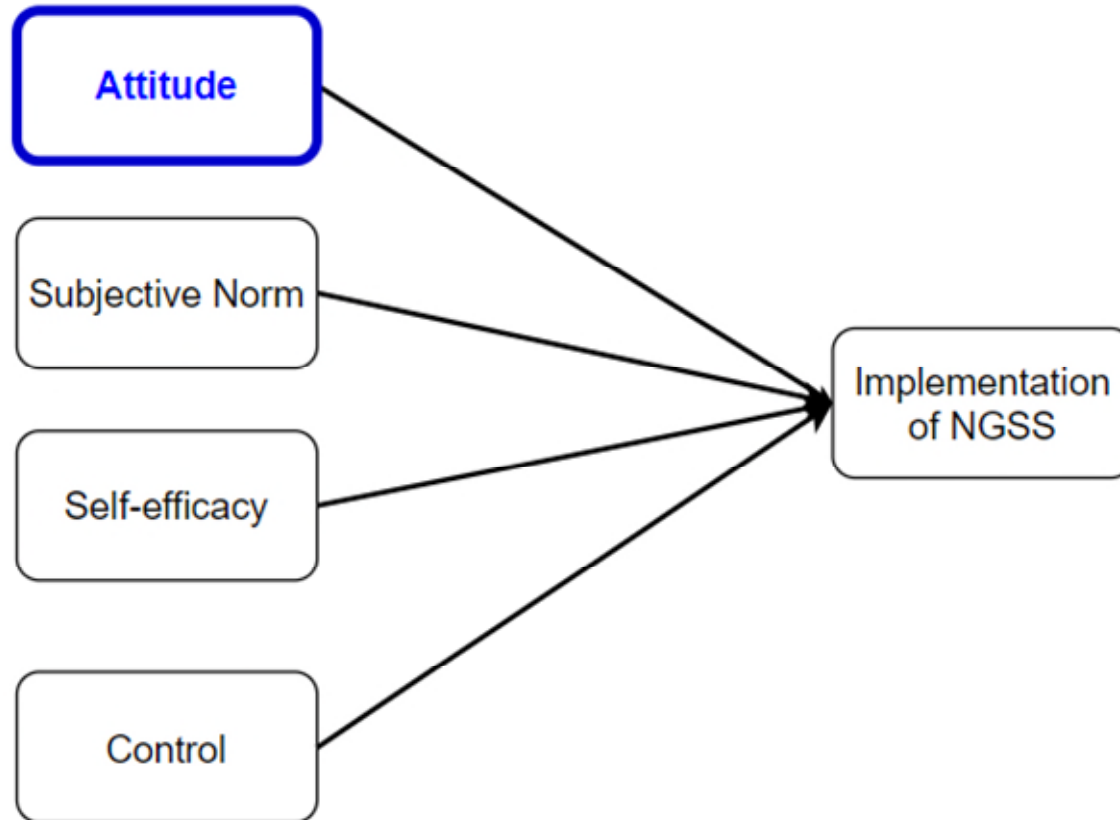


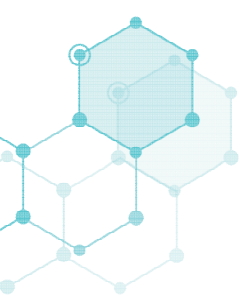
Breakout Room Discussion Question

What do the data suggest about national implementation of standards, and how does that compare with your own context?

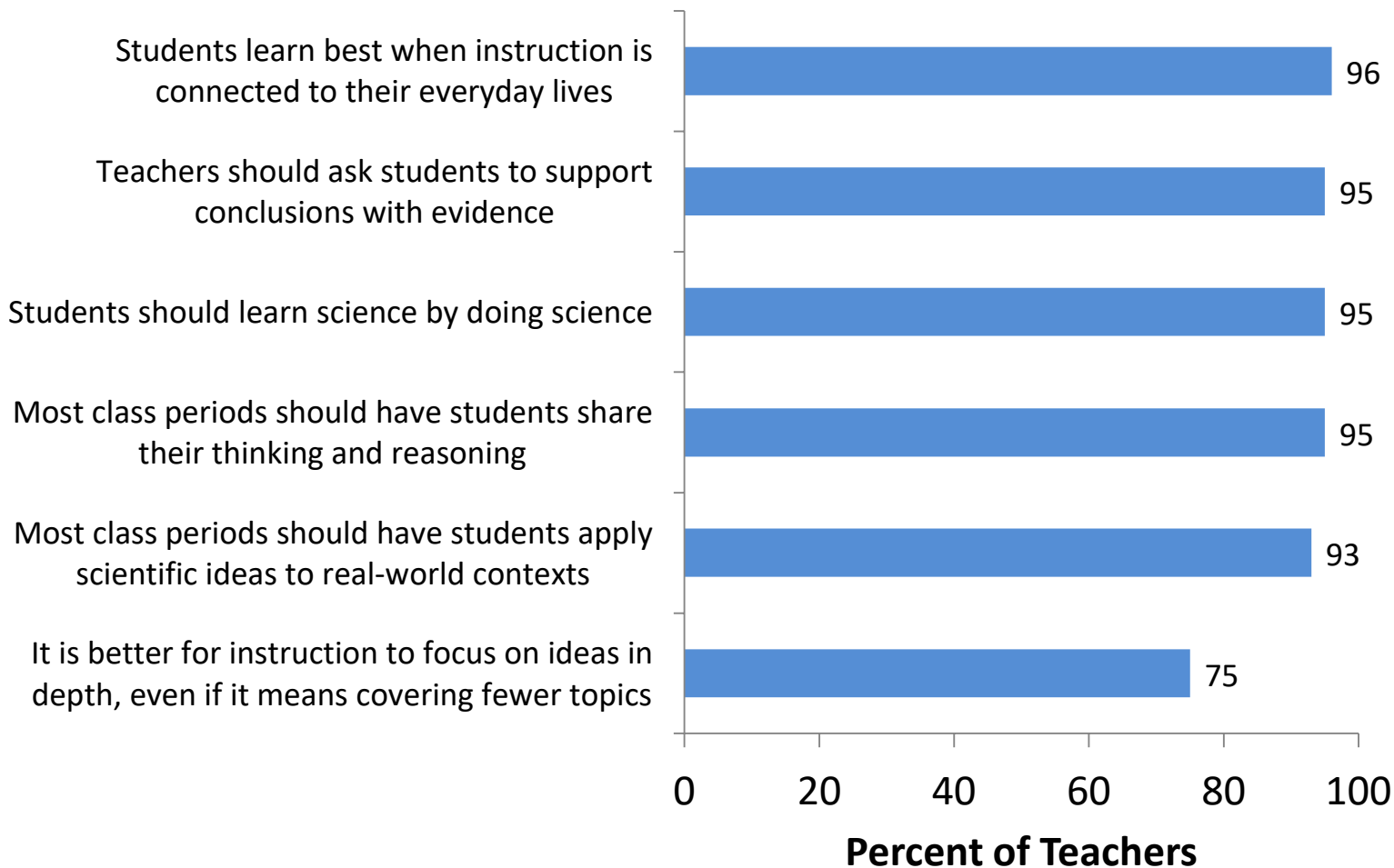


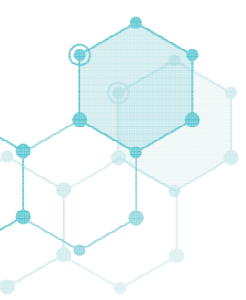
Factors Affecting Standards Implementation: Attitudes





Teachers Agreeing With Reform-Oriented Beliefs About Instruction





Elementary Science Teachers Agreeing With Various Statements About Teaching and Learning

Students should be provided definitions for new vocabulary at beginning of instruction on an idea

77

Hands-on/laboratory activities should be used primarily to reinforce a science idea that the students have already learned

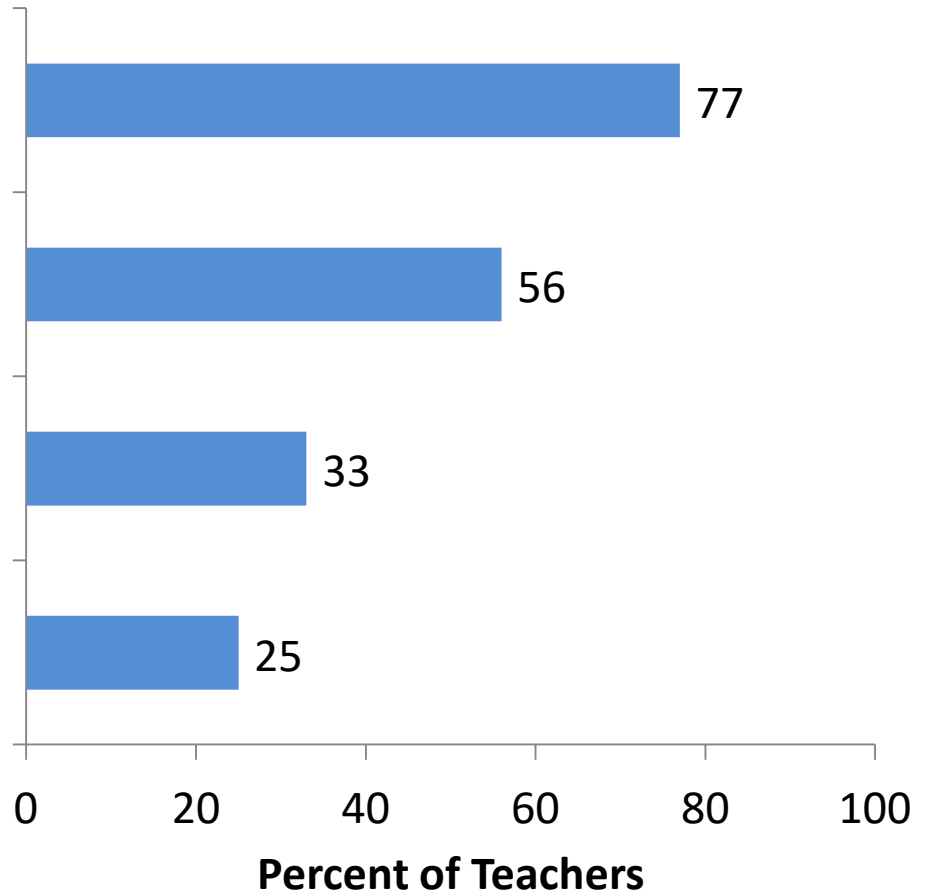
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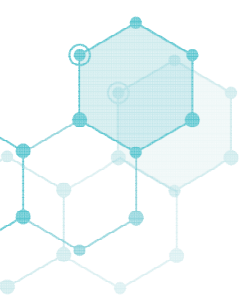
Teachers should explain an idea to students before having them consider evidence that relates to the idea

33

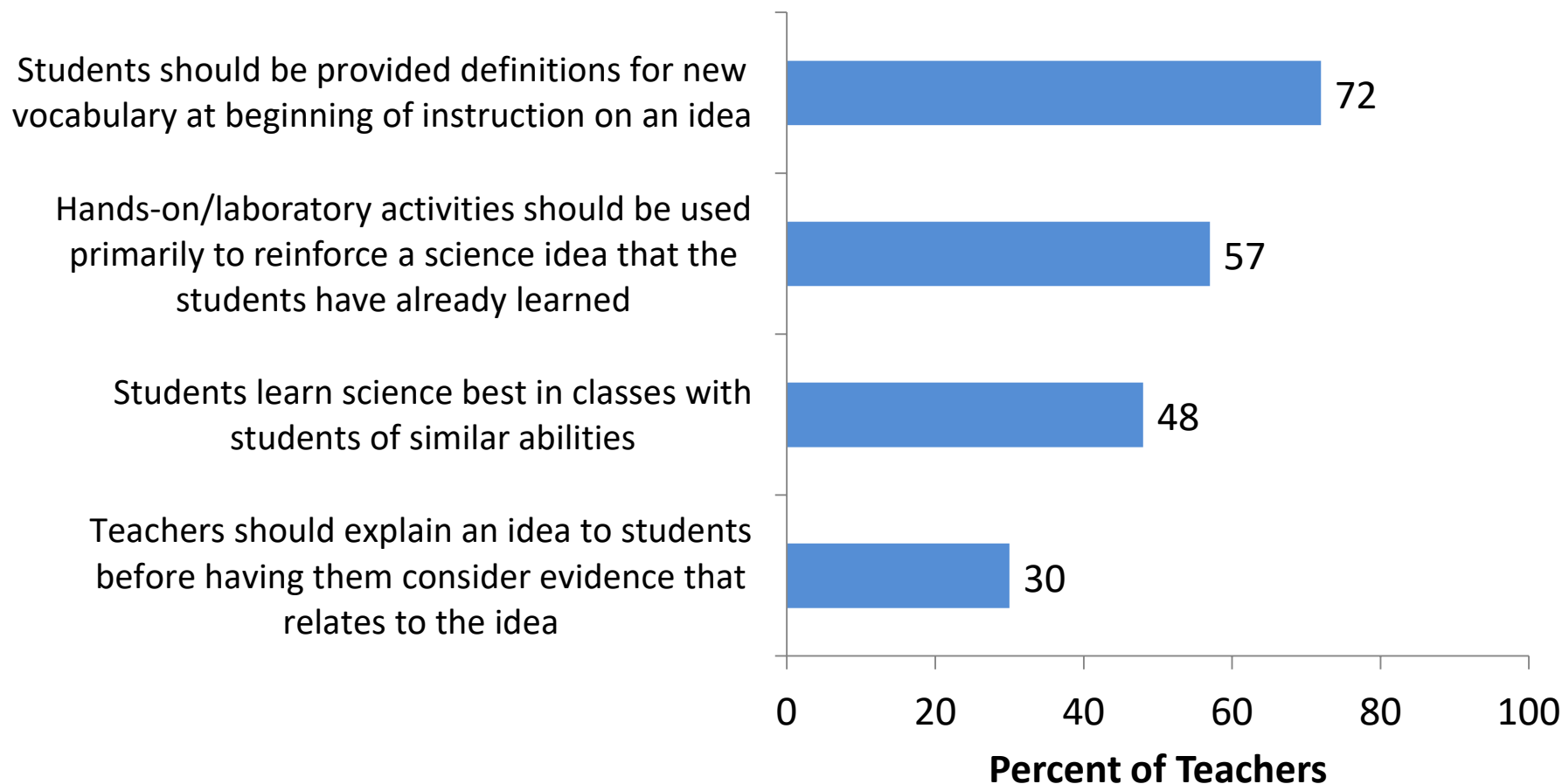
Students learn science best in classes with students of similar abilities

25





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





High School Science Teachers Agreeing With Various Statements About Teaching and Learning

Students should be provided definitions for new vocabulary at beginning of instruction on an idea

66

Students learn science best in classes with students of similar abilities

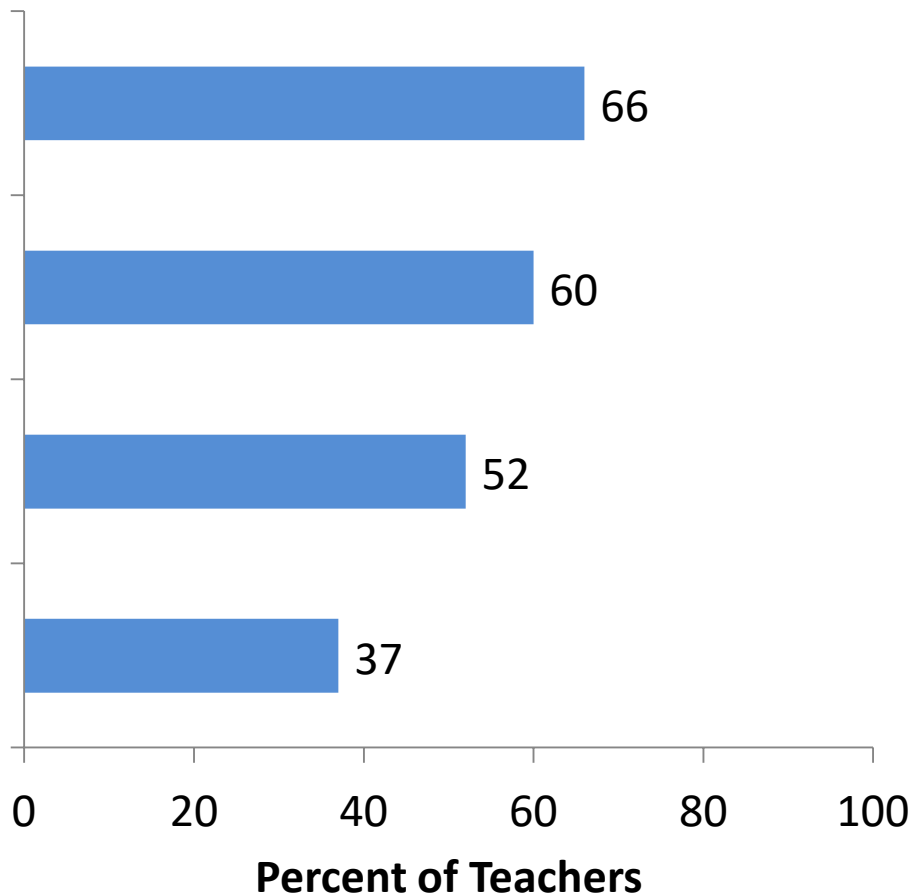
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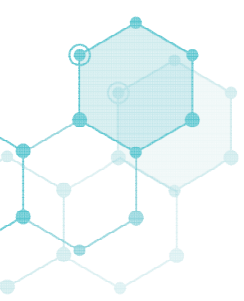
Hands-on/laboratory activities should be used primarily to reinforce a science idea that the students have already learned

52

Teachers should explain an idea to students before having them consider evidence that relates to the idea

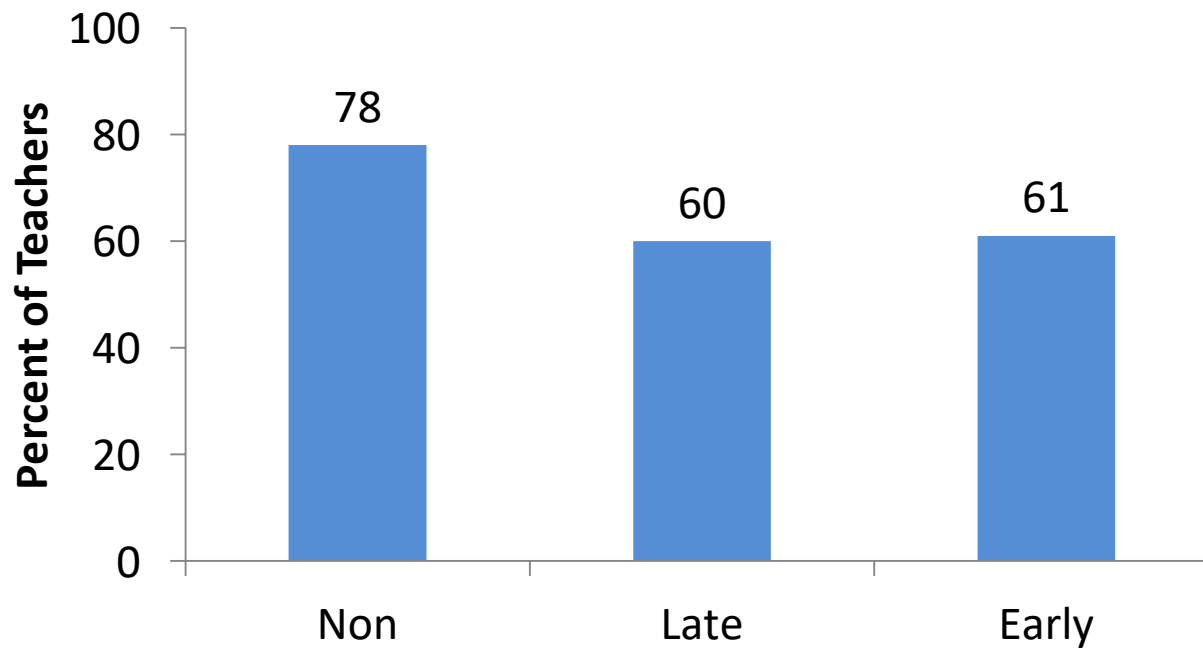
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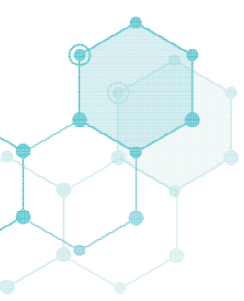




High School Teachers

At the beginning of instruction on a science idea, students should be provided with definitions for new scientific vocabulary that will be used.

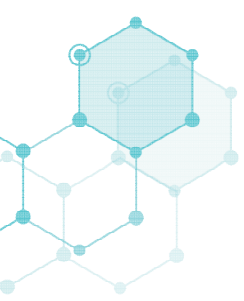




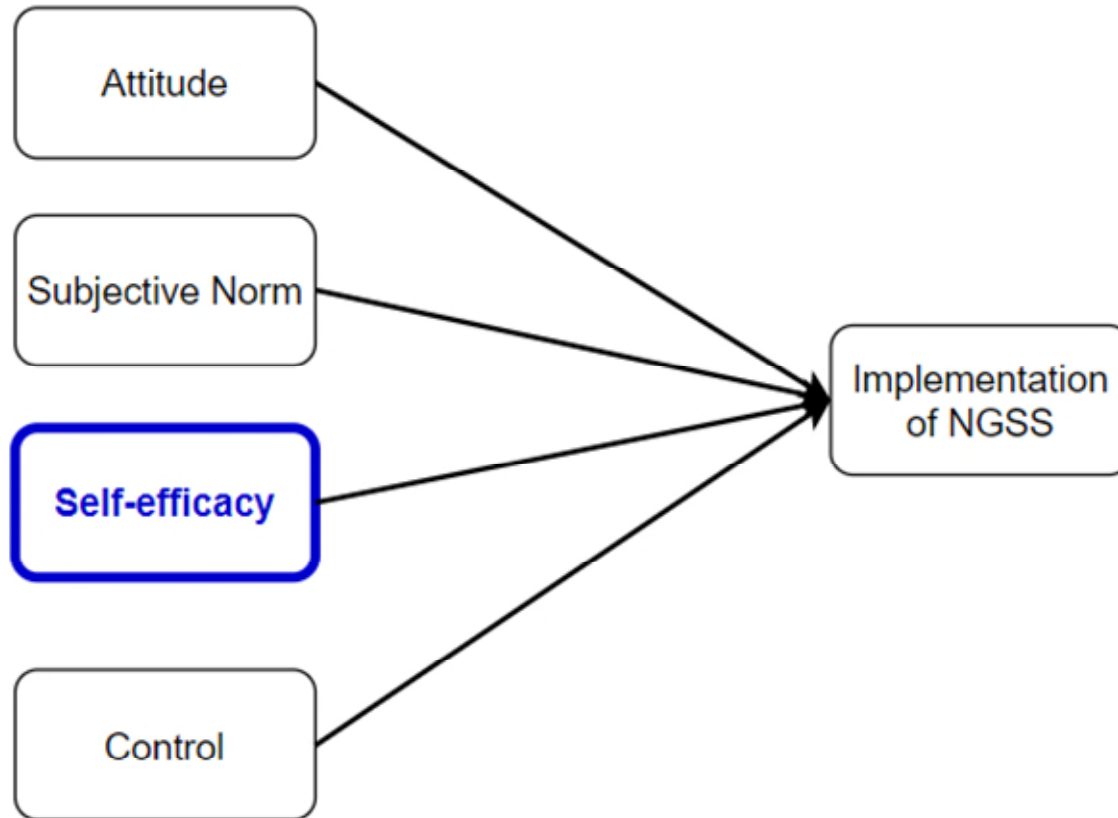
Breakout Room Discussion Question

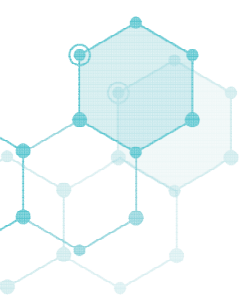
Based on these data, how well do teachers' beliefs about science instruction nationally align with science standards?

Where beliefs are not well aligned, what might cause them to be more aligned?

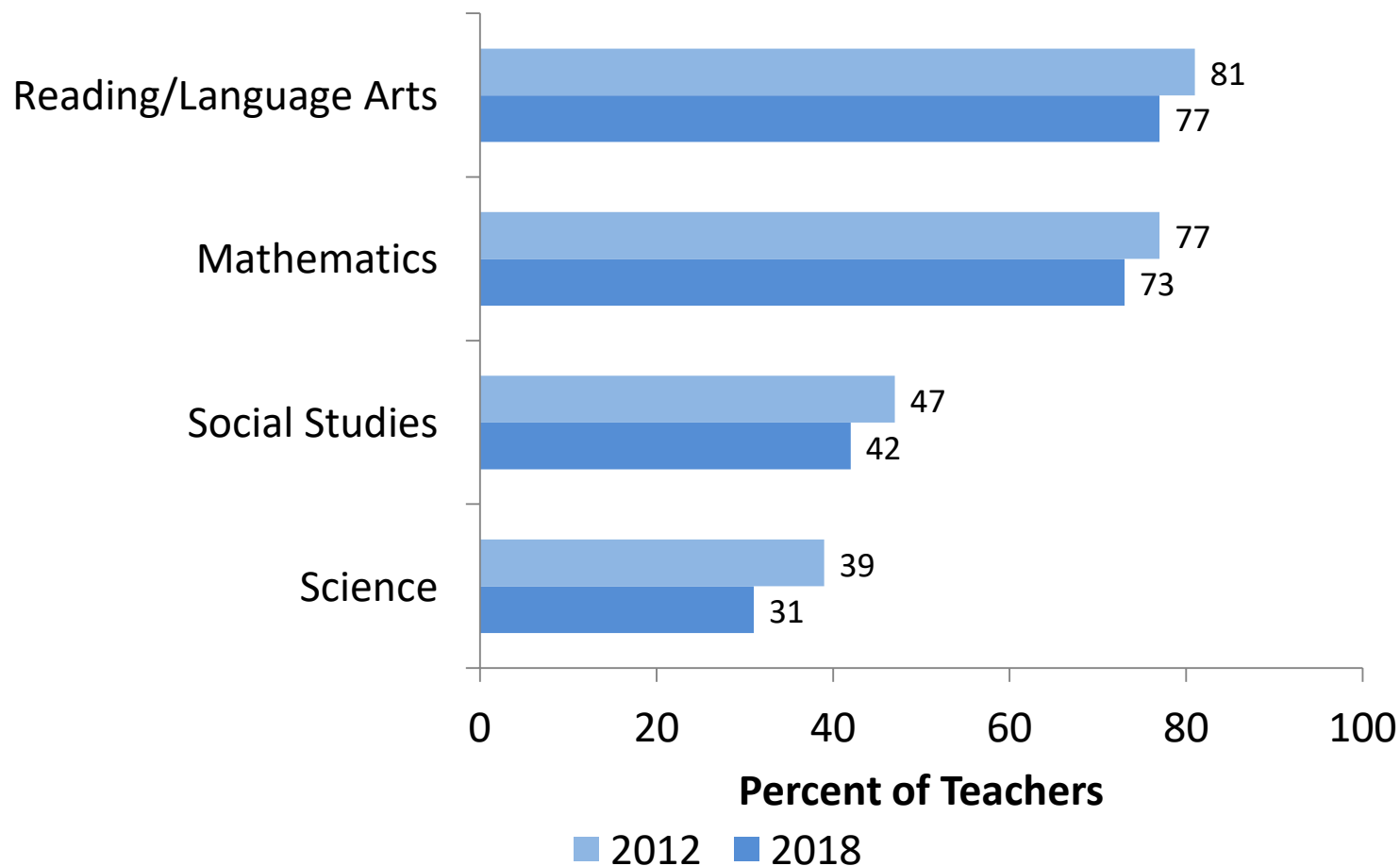


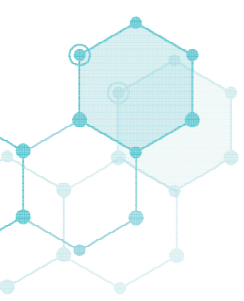
Factors Affecting Standards Implementation: Self-Efficacy





Elementary Teachers' Considering Themselves Very Well Prepared to Teach Each Subject



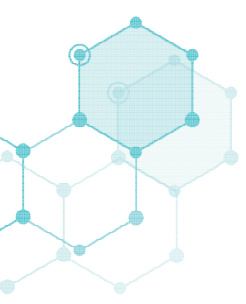


Professional Development

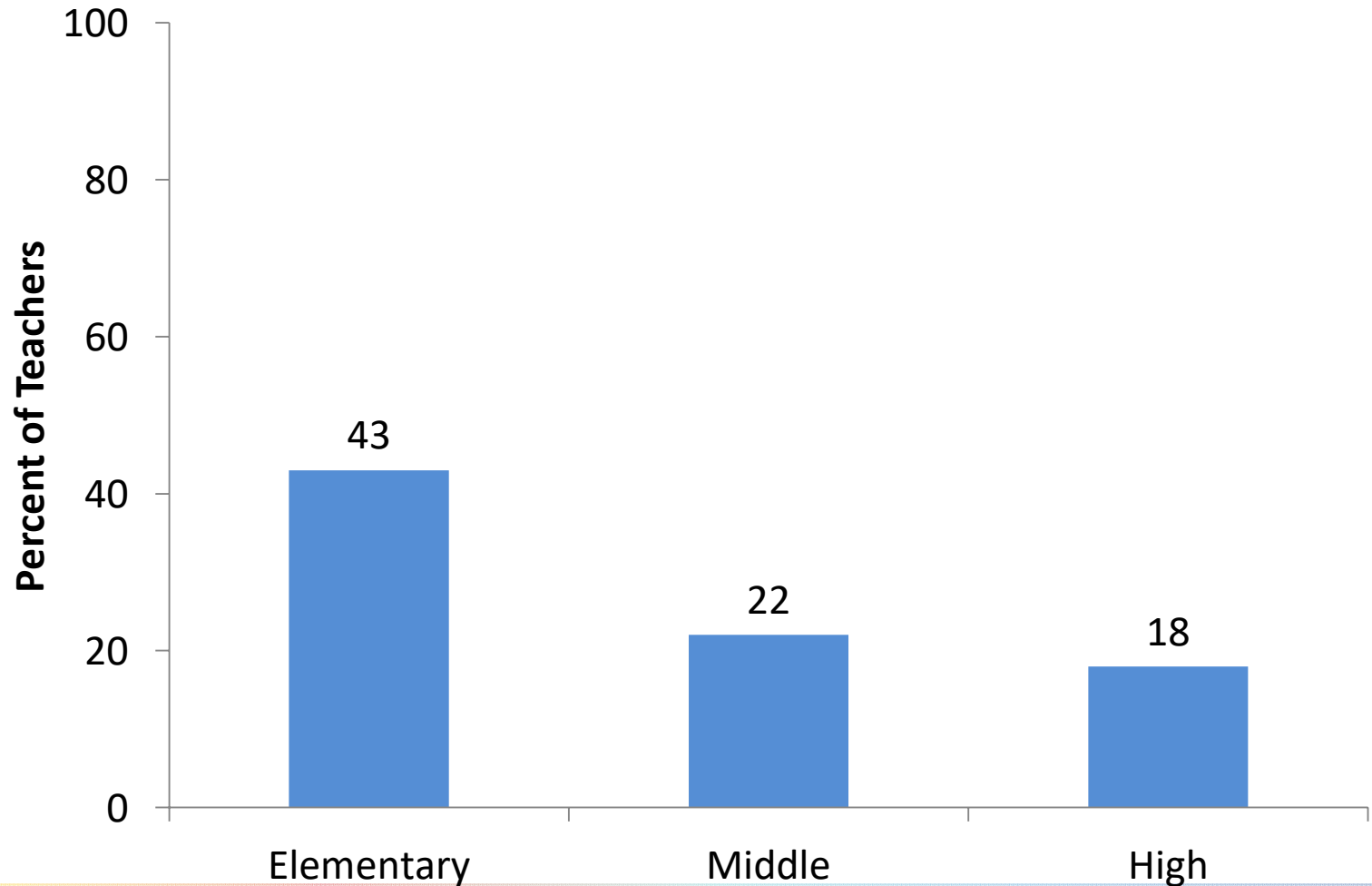
NSSME

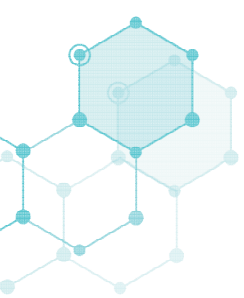
THE NATIONAL SURVEY OF
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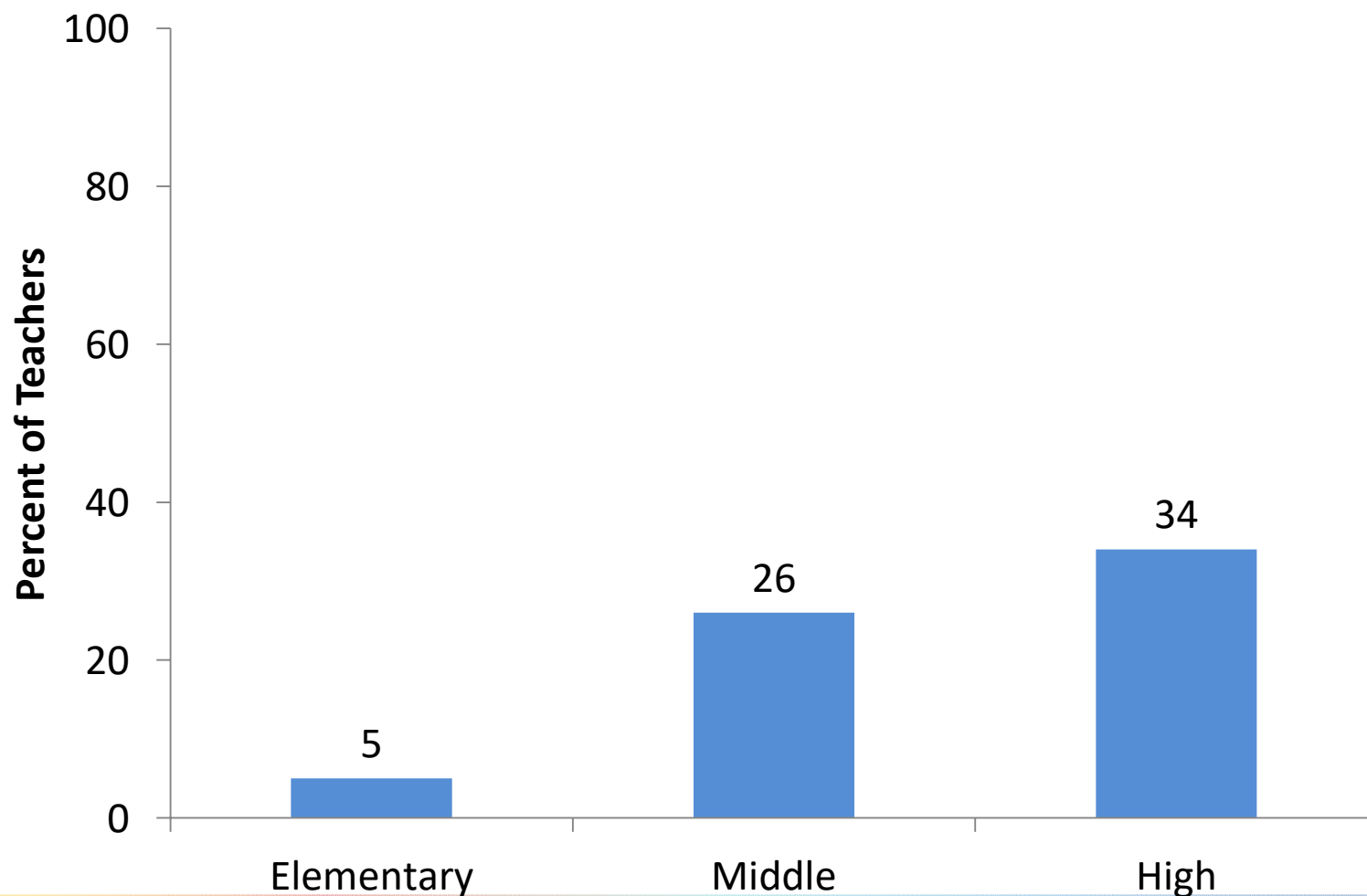


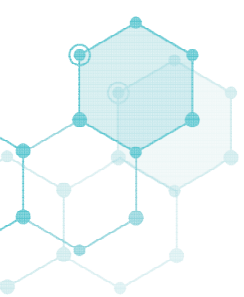
No Science PD in Last Three Years



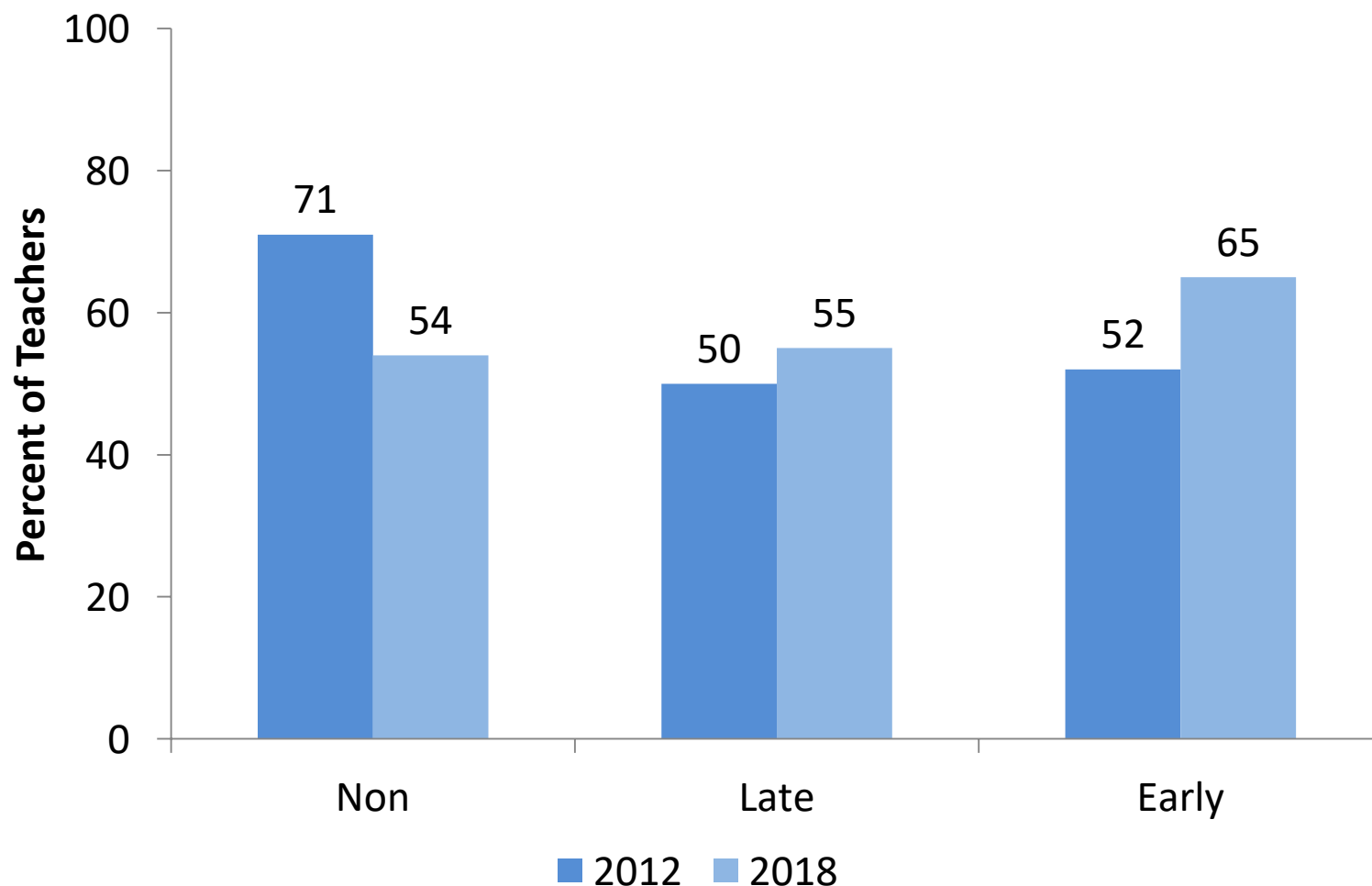


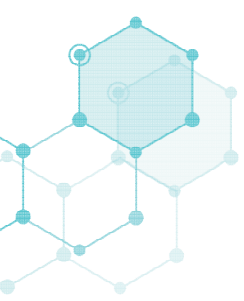
More Than 35 Hours of Science PD in Last Three Years



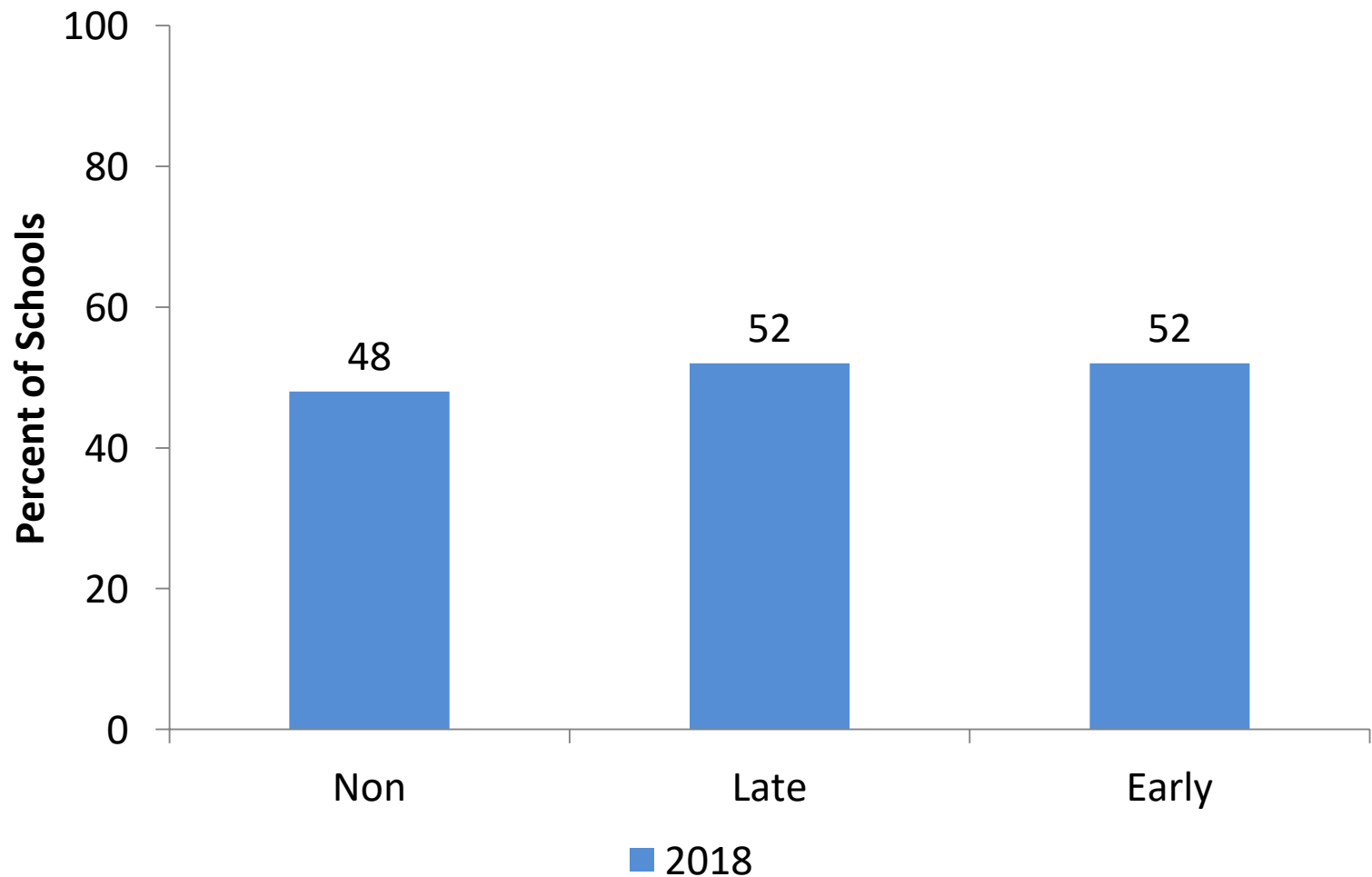


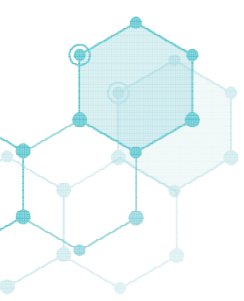
Participation in Science PD in Last Three Years - Elementary





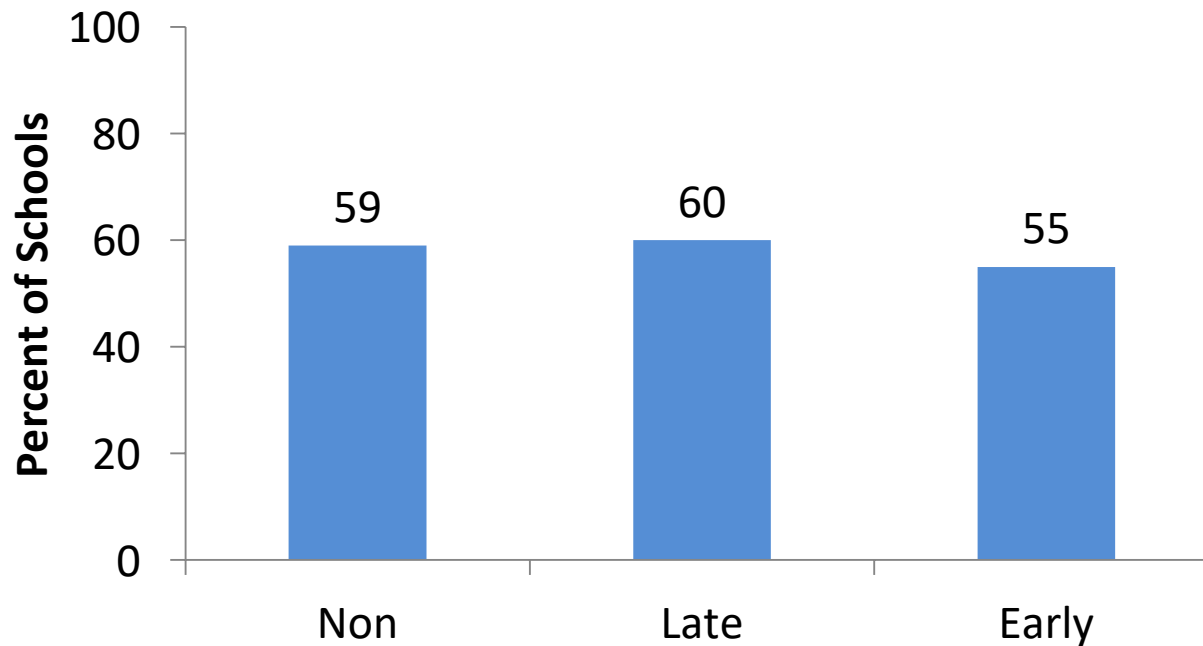
Science Workshops Offered Locally in Last Three Years

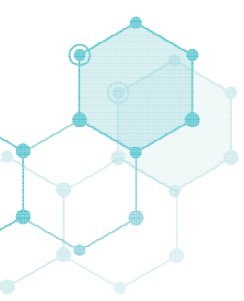




Influence of State Science Standards

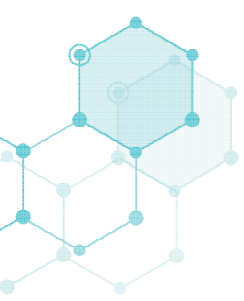
The school/district organizes science professional development based on state standards.



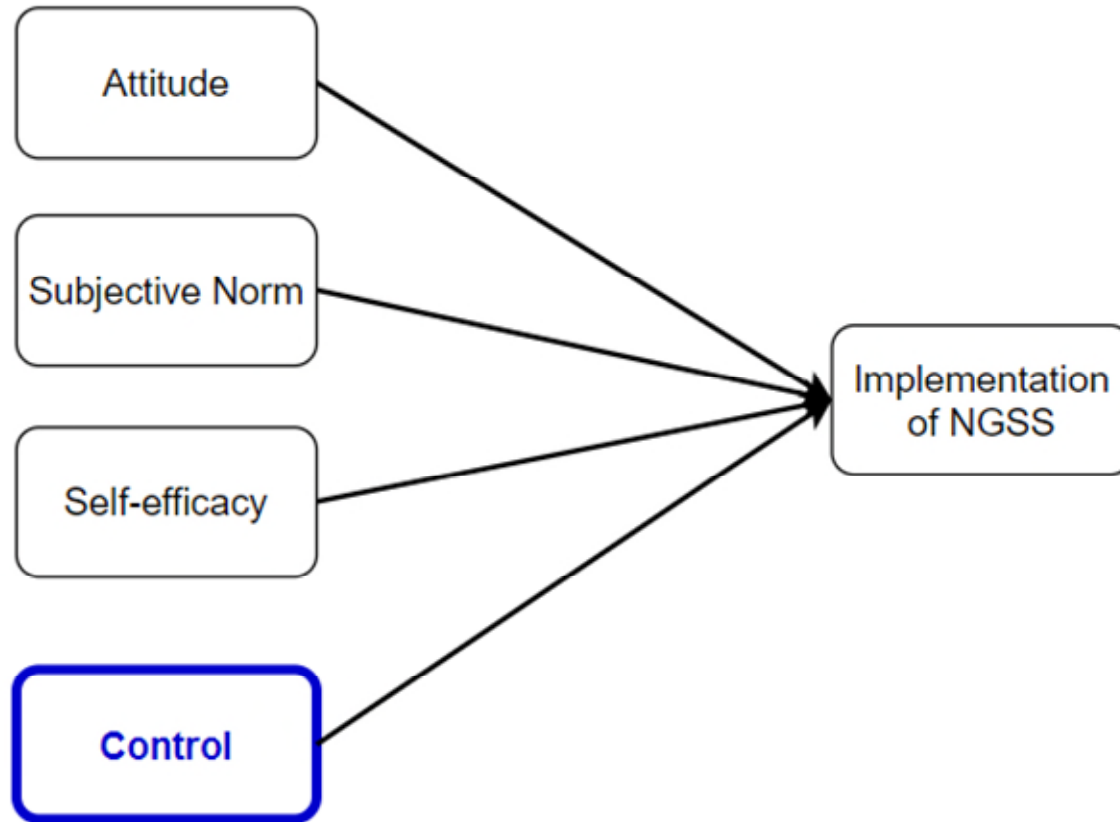


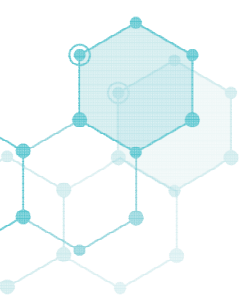
Breakout Room Discussion Question

Do the data on PD participation ring true? If so, how are teachers being supported to implement science standards if not through PD?



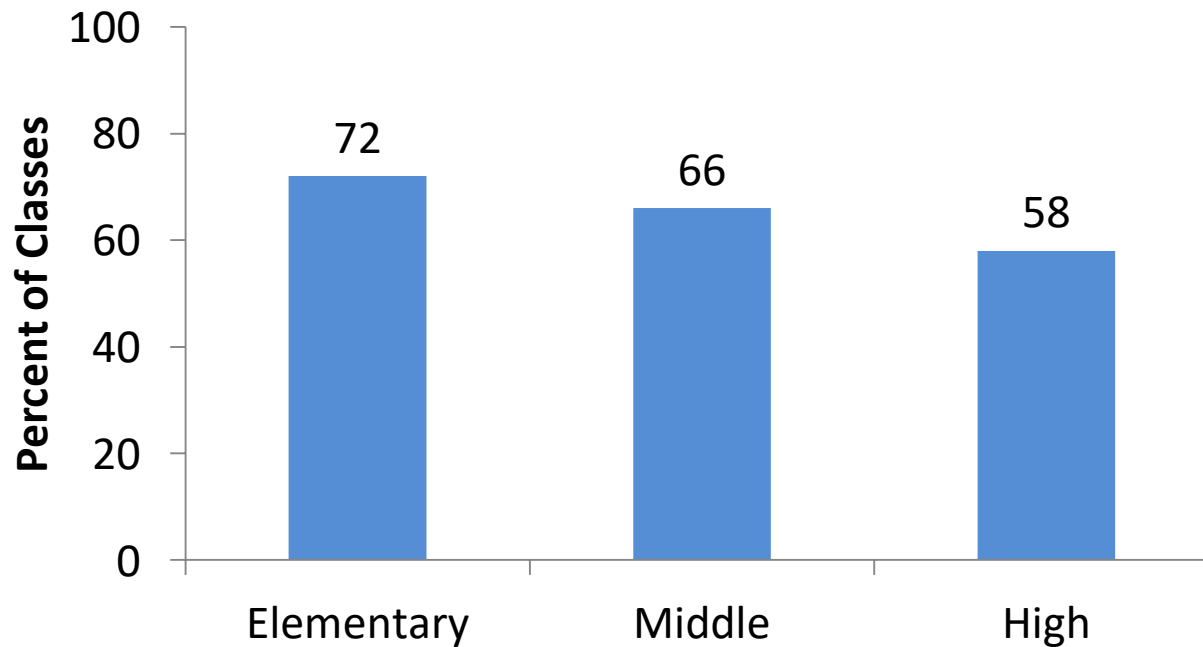
Factors Affecting Standards Implementation: Control

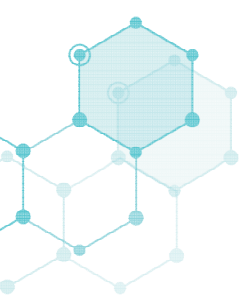




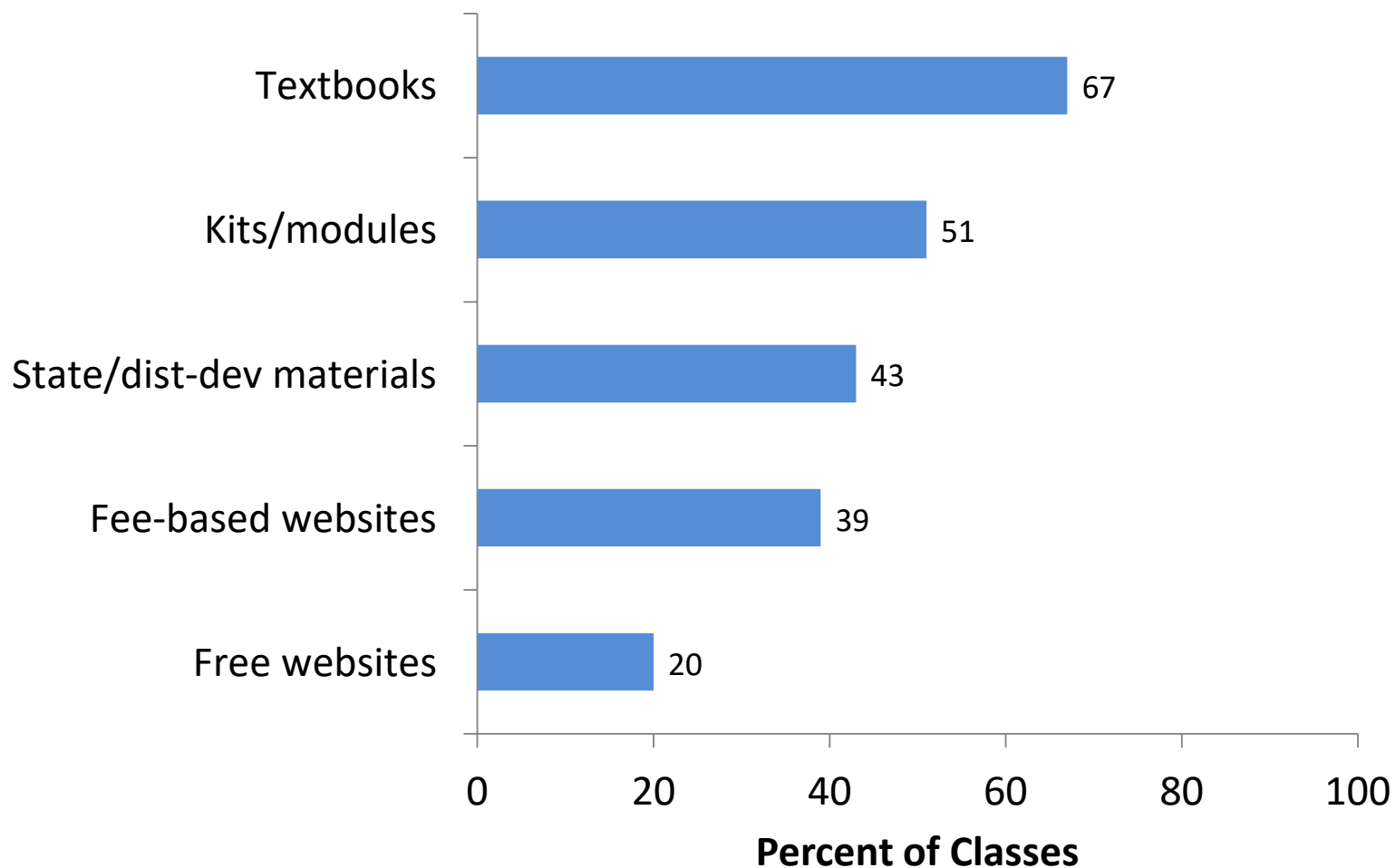
Instructional Materials

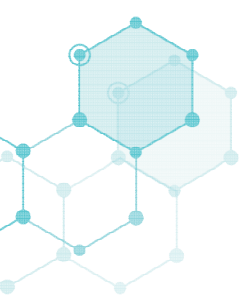
For most science classes, districts designate instructional materials to be used:



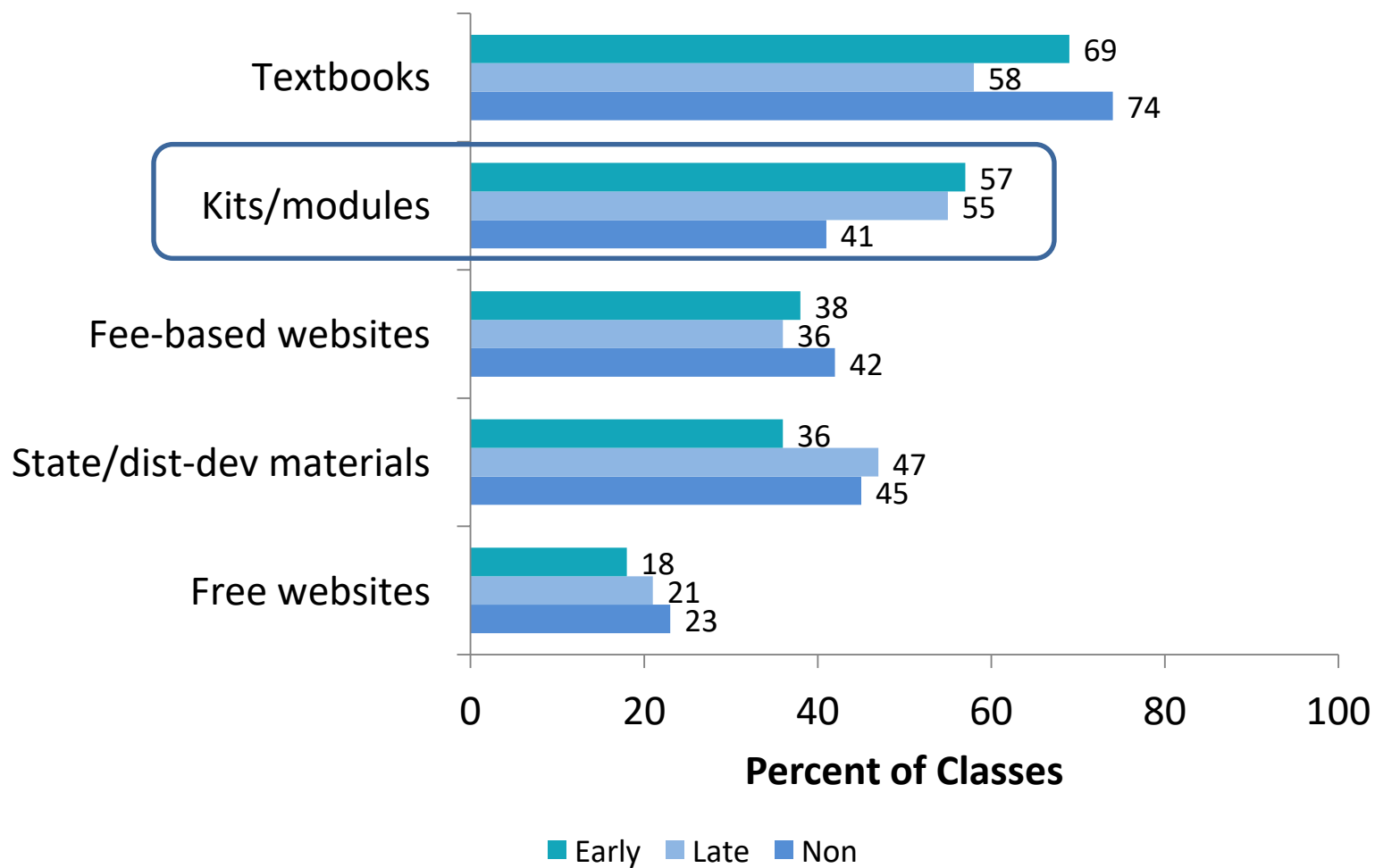


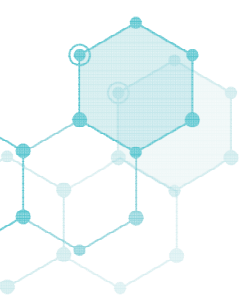
Designated Instructional Materials—All Grades



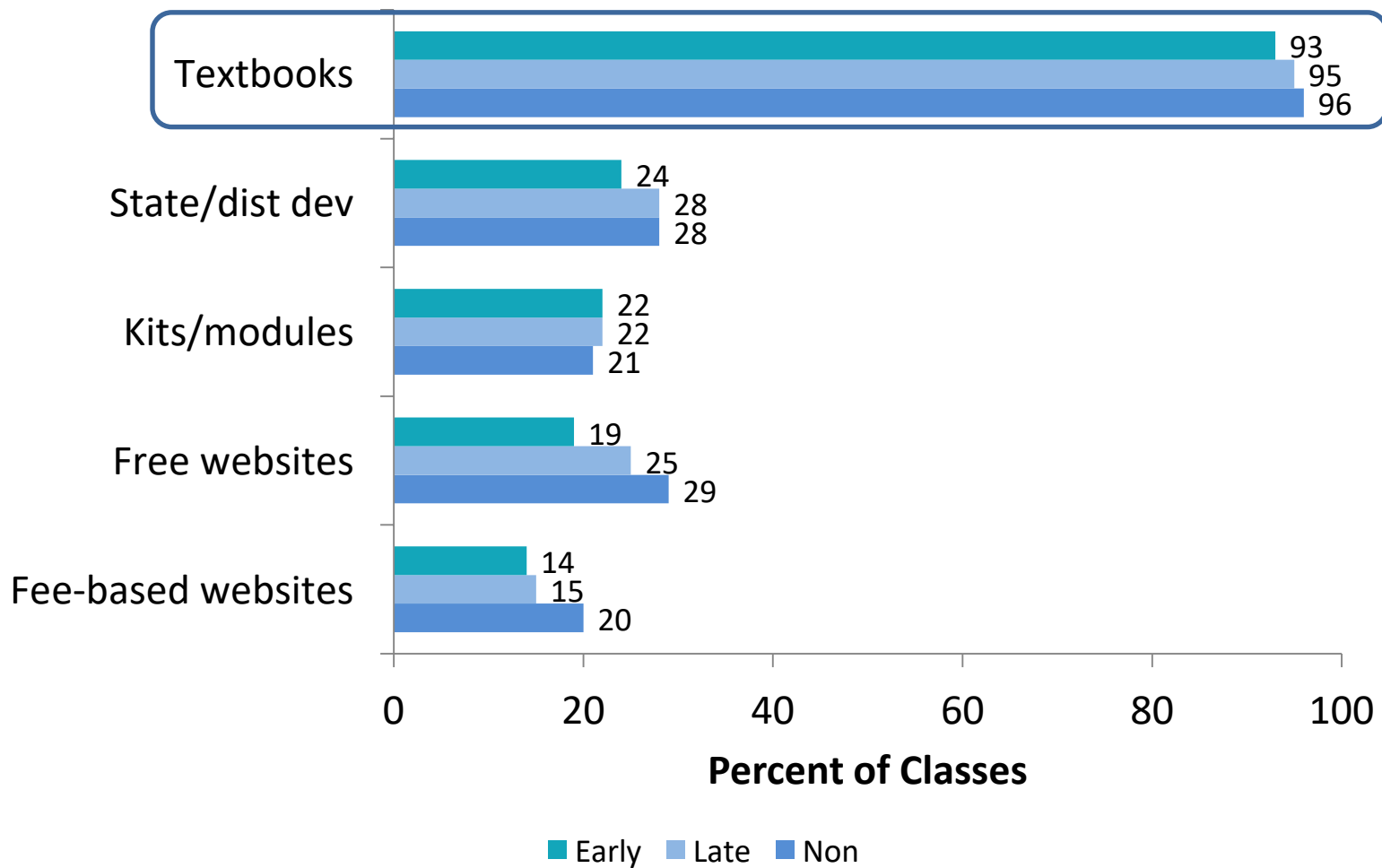


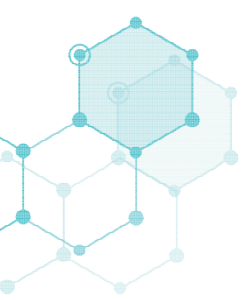
Designated Instructional Materials—Elementary



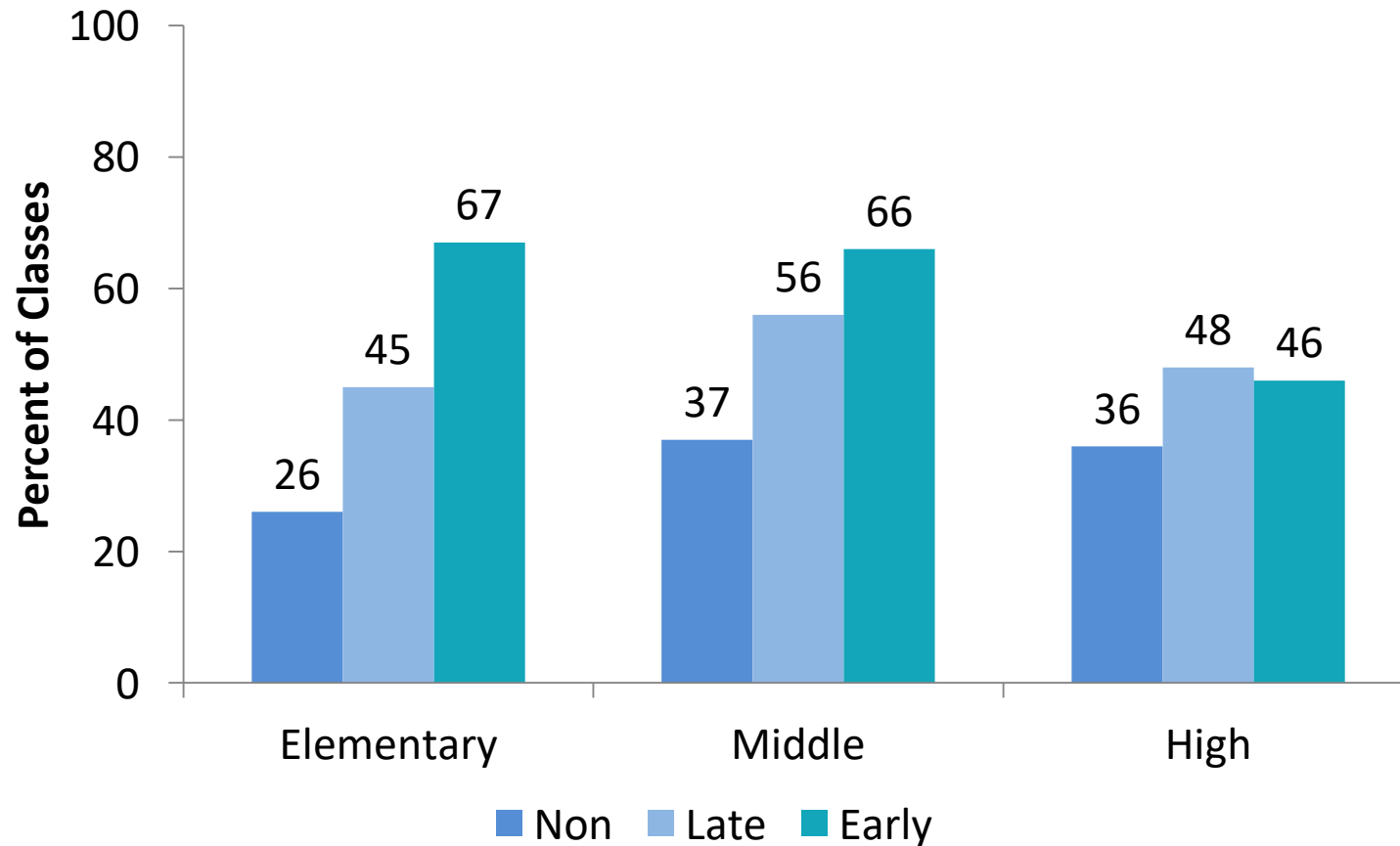


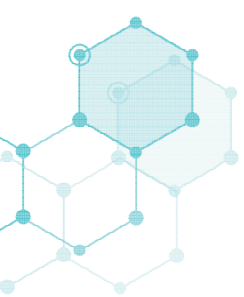
Designated Instructional Materials—High





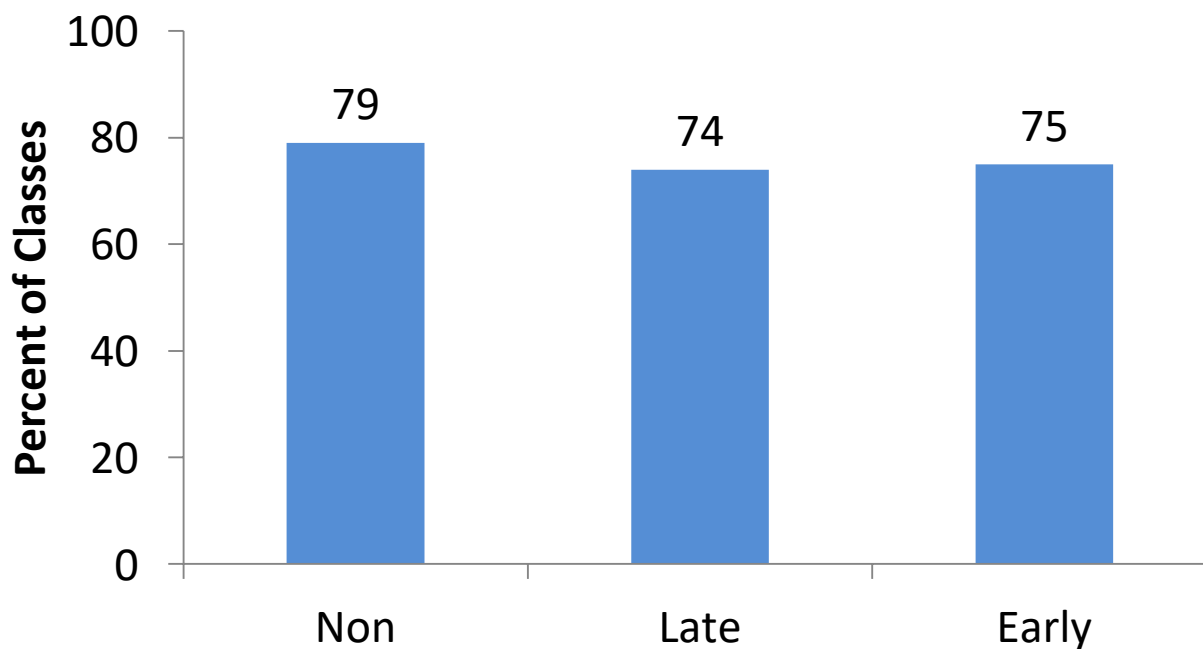
Science Classes Using Textbooks Published in 2009 or Earlier

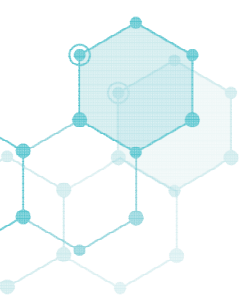




Ways Teachers Used Their Textbook in Most Recent Unit

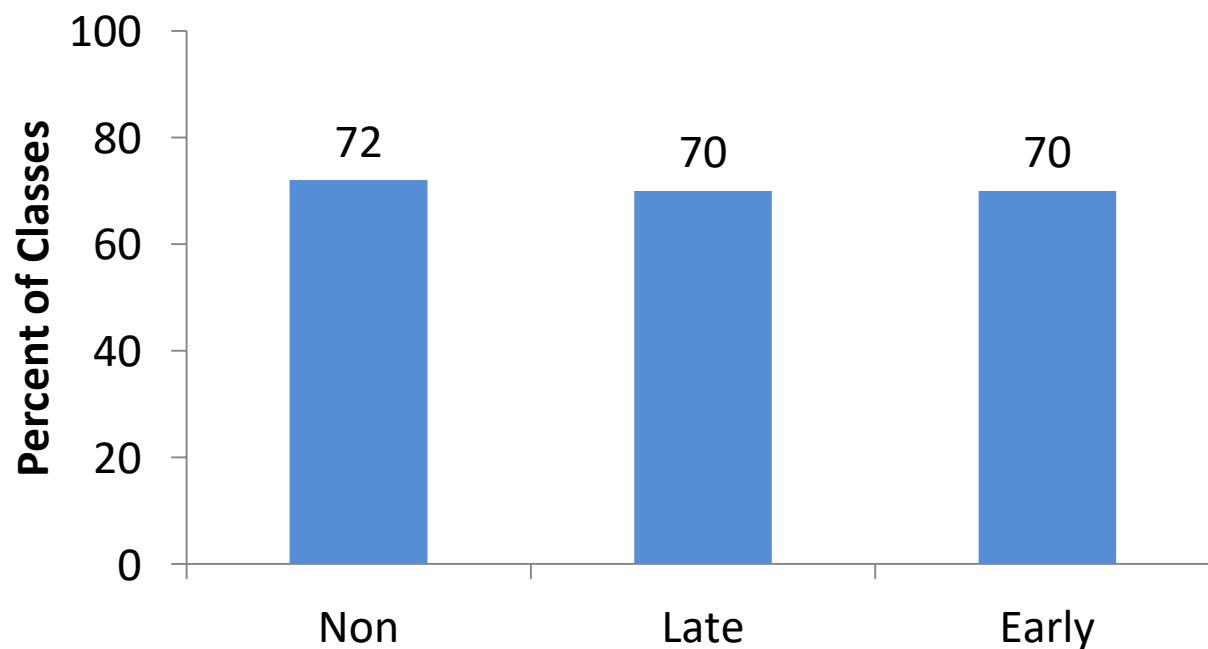
I used these materials to guide the structure and content emphasis of the unit.

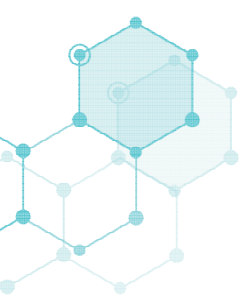




Ways Teachers Used Their Textbook in Most Recent Unit

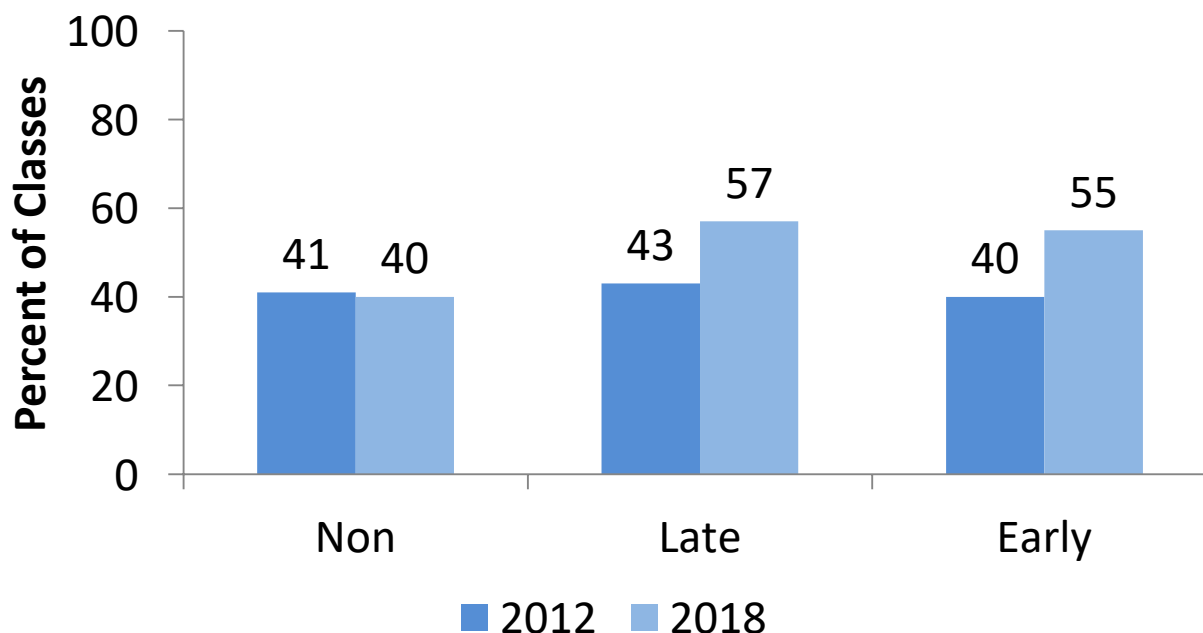
I incorporated activities (e.g., problems, investigations, readings) from other sources to supplement what these materials were lacking.

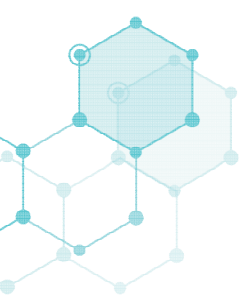




Ways Elementary Teachers Used Their Textbook in Most Recent Unit

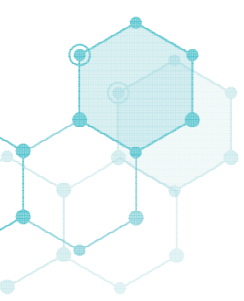
I picked what was important and skipped the rest.





Breakout Room Discussion Question

How have you seen (1) district policies about instructional materials and (2) the availability of Framework-aligned materials affect implementation of the standards?



Concluding Thoughts

- Teacher beliefs seem mostly aligned with science standards, although some contradictions are apparent.
- Elementary teachers in particular do not feel well prepared to teach science.
- The lack of availability of and participation in Framework-aligned PD seems like a major obstacle.
- The number of Framework-aligned materials is increasing, but it's not clear how widely they are being used.