



Secondary Science Curriculum Implementation

Findings from the First Year of a Four-Year Study of the District's 6-8 and 9-12 Science Curricula Adoption

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Abstract:

In spring 2019, the School Board approved the adoption of science instructional materials for grades K-5, 6-8, and 9-12. Approval was contingent upon rigorous review and evaluation of curriculum implementation and effectiveness. The 2019-20 school year marks the first of a four-year evaluation of the respective curriculum adoptions, with Years 1-3 focusing on implementation and alignment to the Next Generation Science Standards (NGSS), progress monitoring, and descriptive reporting of student

outcomes. In Year 4, pending the availability of sufficient student outcome data, we will conduct a quasi-experimental impact analysis of curriculum effectiveness.

Key Findings for Secondary Science (middle school and high school) in Year 1:

In fall 2019, the Research & Evaluation department partnered with the Curriculum, Assessment and Instruction department to craft a logic model to guide evaluation work pertaining to the secondary science curriculum study. Given school closures in Spring 2020, data collection for this year focused on survey data. In January 2020, we conducted a survey of school leaders on the implementation of secondary science curricula, including both the Amplify Science adoption in middle school and the various high school adoptions. In June 2020, we also conducted a survey of secondary science teachers.

- Response Rates: We received 32 responses to the school leader survey and 129 responses to the teacher survey (n=63 for middle school; n=66 for high school).
- General Impressions: School leaders and teachers alike generally support and value the adoption of common, NGSS-aligned instructional materials for secondary science. Based on their January 2020 responses, school leaders would like additional guidance and training about science curriculum implementation.
- Spring 2020 Supports: Teachers were generally satisfied with the science department's supports during the Spring 2020 school closures and named additional supports for the 2020-21 school year to help with remote learning implementation in science.
- Fidelity of Implementation: Implementation of instructional materials (prior to school closures) varied by course, but was generally high overall, ranging from 70% to 82% implementation "as intended" (i.e. following the unit storyline, following the unit pacing guide, giving the provided unit pre- and post- assessments, and integrating the NGSS Science Practices as indicated in the materials). Middle school rates of implementation were generally a bit higher than were rates in high school courses.
- Teacher Practices: Teachers generally report high levels of comfort with the NGSS domain areas, using technology to gather scientific evidence, and enabling student-to-student discourse.
- Assessments: Teachers report using many different types of assessments of student learning in science, but data reveal areas for improvement in assessment practices, for example assessing students' final explanations and using pre-test results to inform instruction.

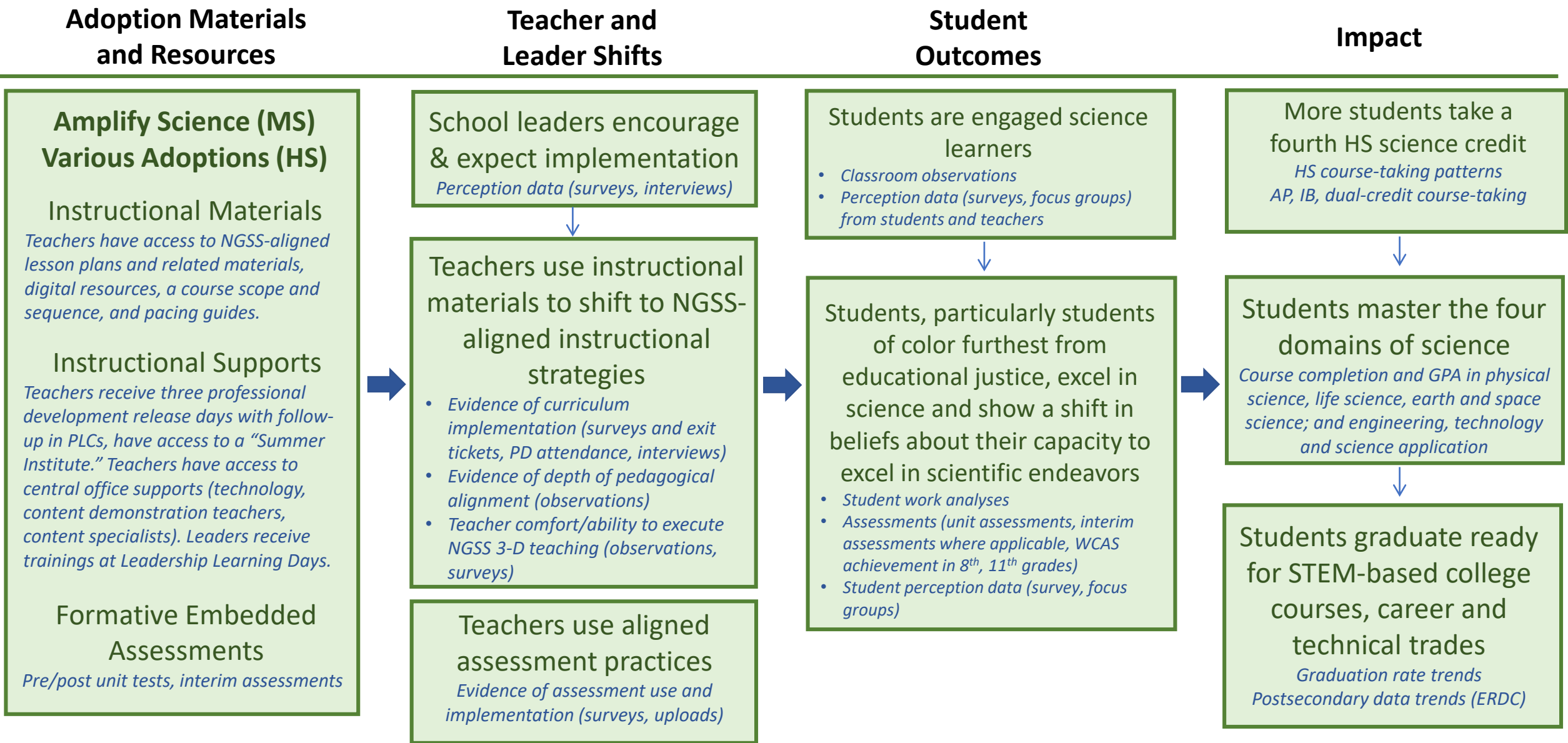
Student Outcomes: A majority of school leaders report confidence in the ability of instructional materials to improve students' technological literacy and preparedness for college and career, and support excellence in science.. Teachers' perceptions of student engagement vary greatly by course. Overall, a majority of secondary teachers (60%-79% across topic areas) express optimism in the ability of the materials increase science achievement for all students but indicated some apprehension in regard to specific populations of students. Recognizing that this data was collected within the first year of implementation and during an unprecedented disruption to teaching and learning due to school closures, further exploration of trends around teacher attitudes will continue to be a priority of the curriculum implementation study in future years.

The Curriculum Assessment and Instruction (CAI) department reports that it used the data from the curriculum study to inform the plan for remote learning in 2020-21 and to identify supports for robust science teaching using the adopted instructional materials. Using the data gathered, teacher leaders created digital tools using the adopted materials that were readily accessible to all teachers of science as

the doors opened for the 2020-21 school year. The common instructional materials made it possible to prepare the tools necessary for digital learning and to offer a robust professional development schedule for all secondary science teachers. The PD offerings are informed by the survey data that include opportunities to deepen our teaching practices using culturally responsive pedagogy. In addition, teacher leaders continue to share strategies on digital tools and methodologies to help maintain these important culturally responsive teaching (CRT) practices in the digital environment. Just-in-time support is offered to all teachers on MS Teams.

Research for the 2020-21 school year will focus on continued implementation study of the Amplify Science and various high school curricula, with specific emphasis on implementation in remote learning environments. Data collection strategies may include surveys, focus groups, and classroom observations, and analysis strategies may also include analysis of student engagement and other student-level data.

SECONDARY SCIENCE CURRICULUM ADOPTION LOGIC MODEL (Jan 7, 2020)



Secondary Science Curriculum Implementation Study: Year 1

Summary Findings from the School Leader Survey
(January 2020) and Teacher Survey (June 2020)

Research & Evaluation Department
Seattle Public Schools
Fall 2020



Jessica K. Beaver, PhD
Jane Barker, PhD

Response Rates: School Leader Survey

Overall Responses

32

school leaders
responded to the
survey

Responses by School Type

Alternative School	4
Comprehensive High School	11
Comprehensive Middle School	12
K-8	5

Responses by Role

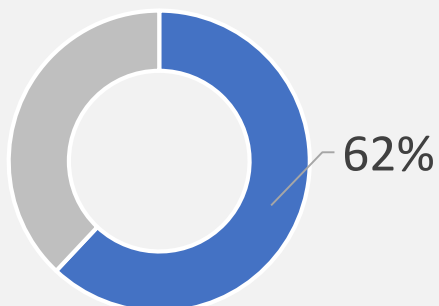
of respondents,
9 are Assistant
Principals and
23 are Principals

Response Rates: School Leader Survey

Overall Response Rates

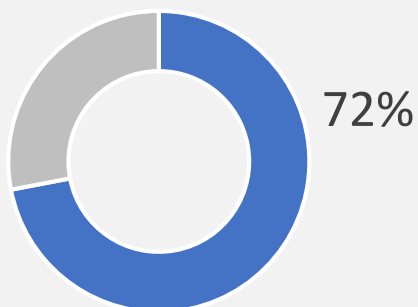
Middle School Classroom Teachers

N=61



High School Classroom Teachers

N=63

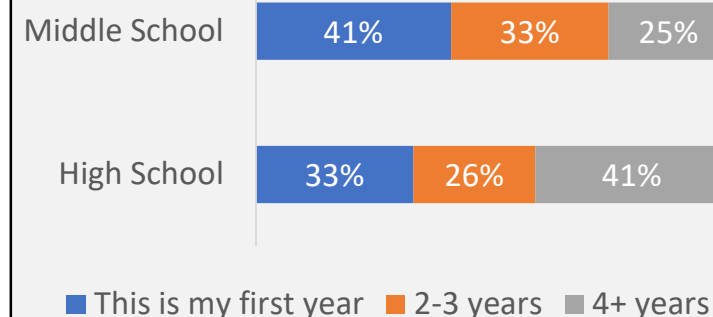


Responses by Course

Course	n
Amplify Science 6HCC	4
Amplify Science 6th	26
Amplify Science 7th	25
Amplify Science 8th	30
Biology A	27
Biology B	30
Chemistry A	43
Chemistry B	19
Other	12
Physics A	41
Physics B (HS only)	18

Responses by Characteristic

Years experience with the materials



Educator role

Role	n
MS Classroom Teacher	61
MS Support Teacher	2
HS Classroom Teacher	63
HS Support Teacher	3

General Impressions and Feedback

Questions about....

- Perceived importance of having common instructional materials
- Leaders' expectations for implementation
- Teaching phenomenon-based instruction

“Having common science instructional materials across the district is critically important”

ALL



85%

MS



83%

HS



87%

Strongly disagree
Somewhat disagree
Neither Agree nor Disagree
Somewhat agree
Strongly agree

“I expect and encourage science teachers in my school to implement the district adopted curricula for science”

ALL



MS



HS



Strongly disagree Somewhat agree Strongly agree

“Teachers in my school use phenomenon-based (“story-based”) instruction to teach science”

ALL



MS



HS

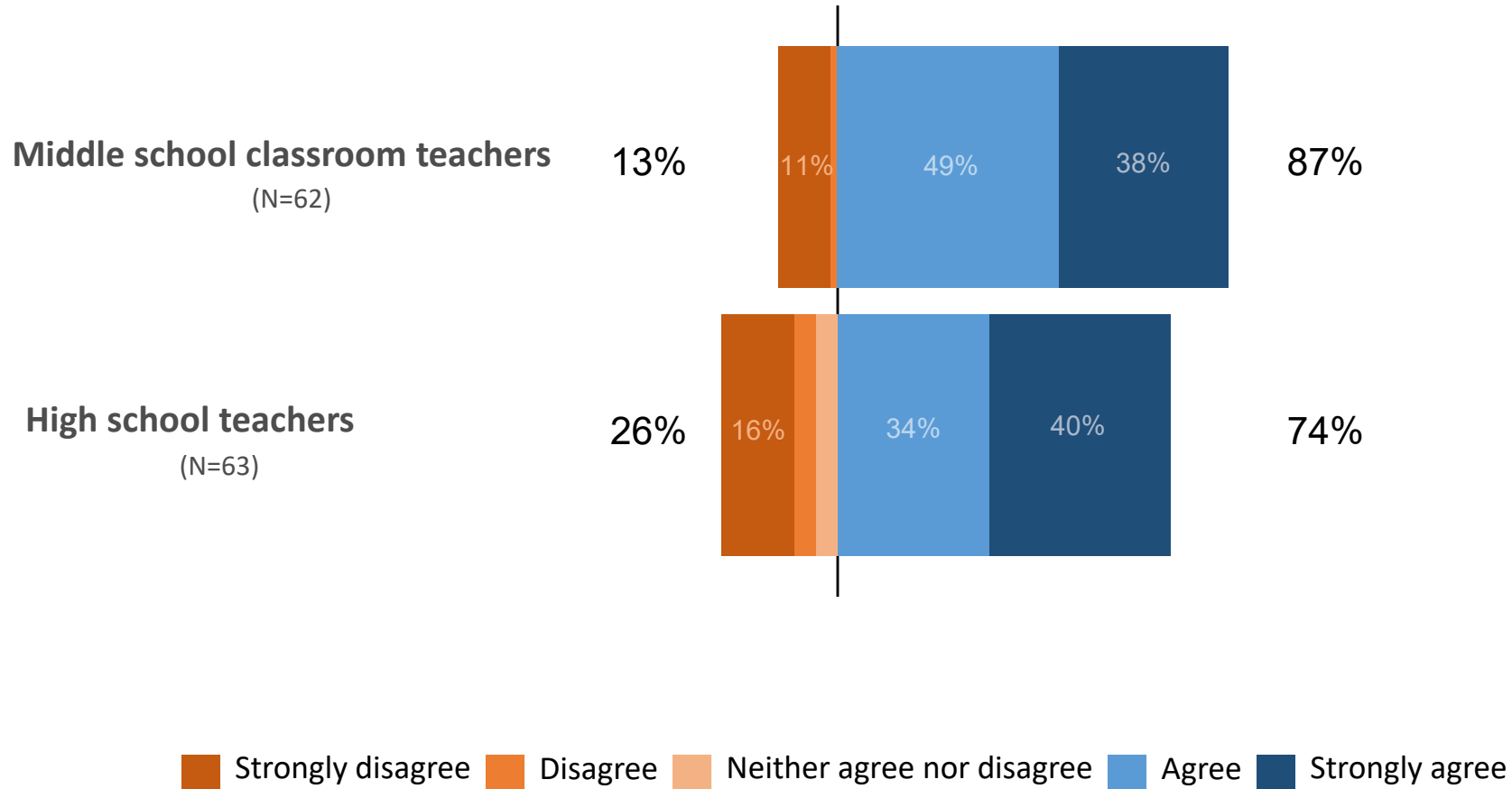


■ Don't Know/Unsure ■ Somewhat disagree ■ Somewhat agree ■ Strongly agree

Definition:
“Phenomenon-based instruction” uses units based on a storyline that begins with a puzzle and offers several opportunities to collect evidence to explain that puzzle by the end of the unit instruction to teach science

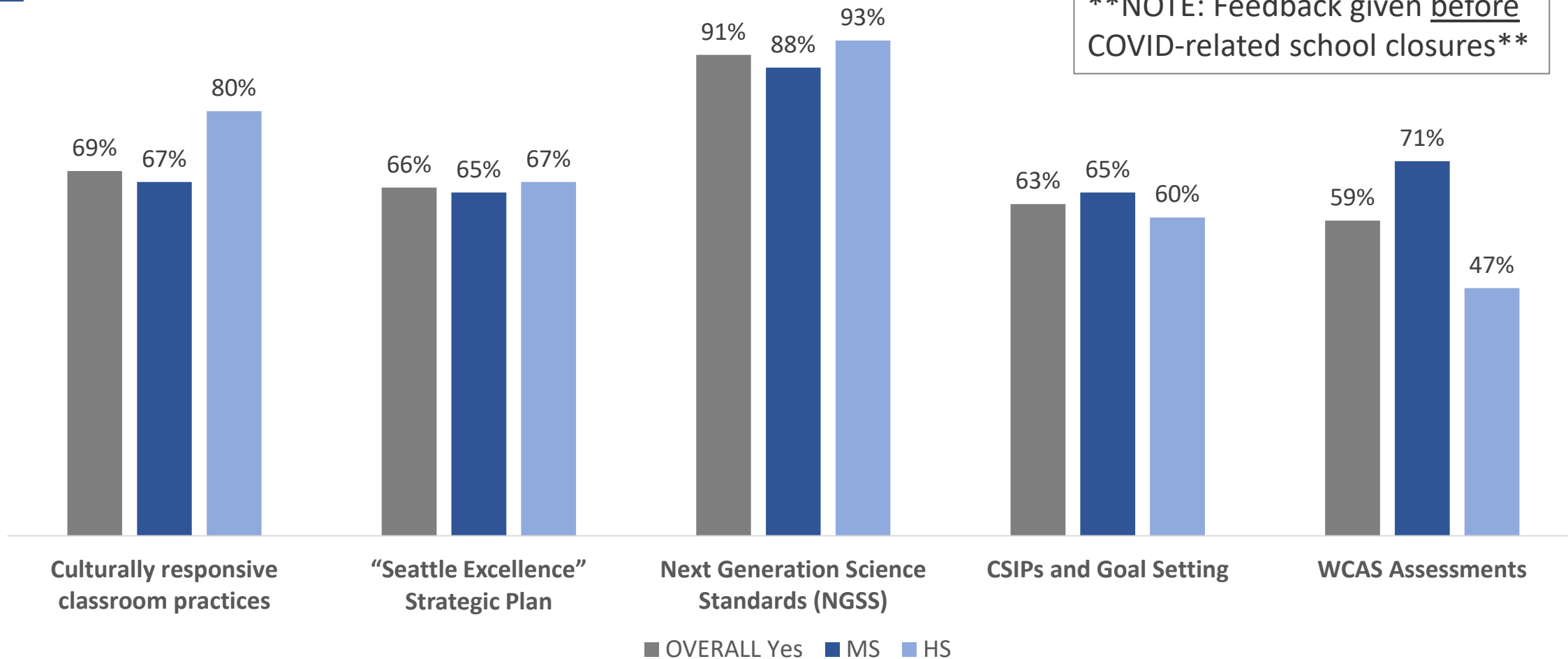
General Feelings about Common Instructional Materials

“Common instructional materials have given us a common platform on which we can build and share online resources across the district.”



“I understand how the adopted science curricula align to...”

****NOTE:** Feedback given before
COVID-related school closures**



Note: Percentages indicate the percent of respondents who indicated “Yes” to the question

What central office guidance and communication has been helpful for you? (20 responses)

- **Principal trainings** (6 respondents – 3 MS, 3 HS)
- **Trainings for school leaders** (6 respondents – 2 MS, 4 HS)
- **Meetings with the central office science team** (4 respondents – 1 MS, 4 HS)
- **Communicating the purpose of the adoption** (3 respondents – 1 MS, 2 HS)
- **Visits to my school** (3 respondents – 2 MS, 1 HS)
- **Information on the district website** (1 respondent – MS)
- **NGSS crosswalk document** (1 respondent – MS)

How can the central office improve its communication about alignment?

- **Explain WCAS and other science assessments** (4 respondents – 2 MS, 2 HS)
- **More PD** (3 respondents – 2 MS, 1 HS)
- **Clarify the district's prioritization of science** (2 respondents – MS)
- **Provide alignment information to culturally responsive pedagogy** (2 respondents – MS)
- **More guidance on implementation in alternative schools** (2 respondents – HS)
- **Provide more info for families** (1 respondent – HS)

Suggestions for smooth science curriculum implementation in 2020-21

****NOTE:** Feedback given before
COVID-related school closures**

Responses from K-8 and comprehensive middle school leaders (8 responses)

- “Focus on core science teachers supporting ELL and Special Ed students”
- “Technology supports - Internet down, not enough computers - teachers recently expressing concern”
- “Please provide great PD without subs being needed as much as possible”
- “Whatever [my science teacher leader] and the team needs”
- “The number one concern I hear is that the curriculum isn't very hands-on. Any messaging that can be done to counter that narrative would be helpful.”
- “Support with grading assessments and organizing retakes”
- “Adapt the curriculum for students with special needs.
- “Allowing for more time for teachers to work together to collaborate (across buildings) on different curricular units...”

Suggestions for smooth science curriculum implementation in 2020-21

****NOTE: Feedback given before
COVID-related school closures****

Responses from alternative high school and comprehensive high school leaders (8 responses)

- “Continue to share who attends the PD sessions”
- “Continued support in moving reluctant staff along to implementing new curriculum”
- “With such a large contingent of ELL students, we would love support on how to best align the learning to address language learning”
- “Insisting that all students stay on the pacing guide is not educational equity”
- “Collaborative alignment”
- “Correct the content errors that have been found and help admin know what do we do when the teachers are not implementing curricula as intended”
- “Create more visibility around expectations and accountability for teachers and Administrators.”
- “Our teachers are more concerned about how the curriculum was implemented; not the curriculum itself. Issues include lack of time to fully develop the curriculum before launching it; unclear expectations; lack of student preparation for the curriculum scope and sequence; lack of opportunities to fully voice concerns”

Response to Spring 2020 School Closures

Questions to teachers about....

- Feedback on Spring 2020 remote learning supports
- Desire for additional supports

**** Note: Feedback given in June 2020****

Feedback on Spring 2020 Remote Learning Supports

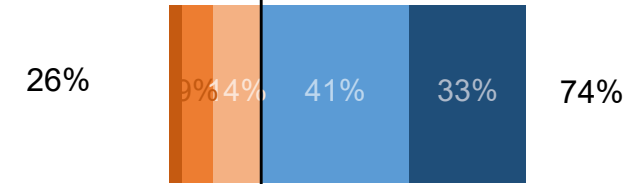
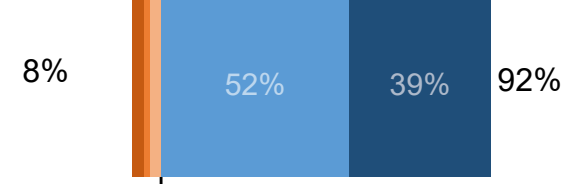
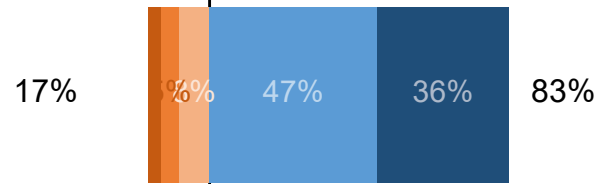
“Please indicate how satisfied you are with the following:”

All Respondents (N=129)

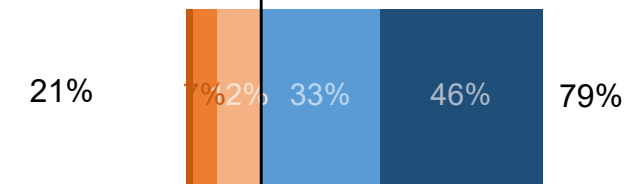
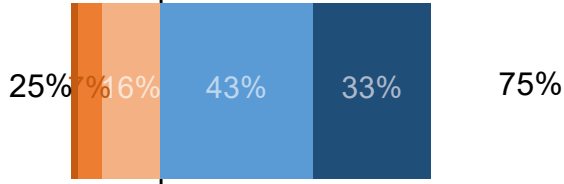
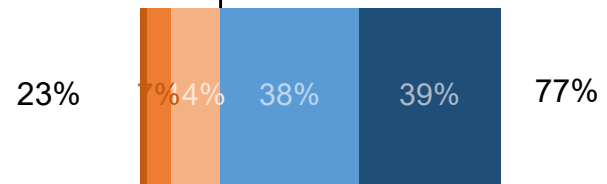
Middle School (N=62)

High School (N=63)

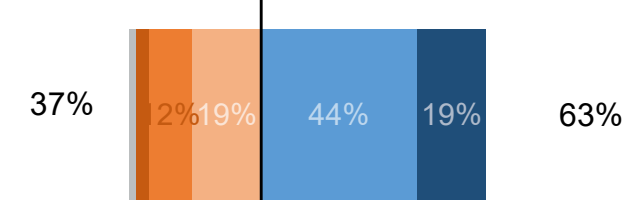
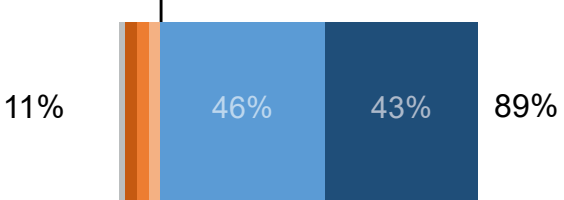
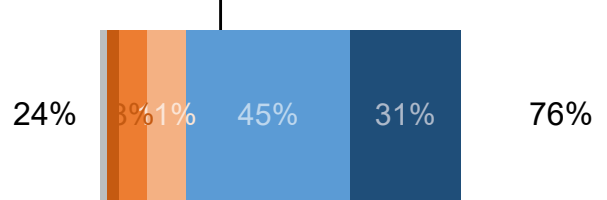
The science department’s
response to the shift to
remote/distance learning



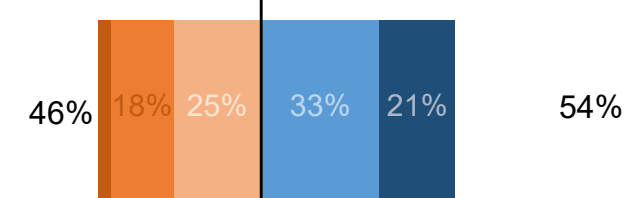
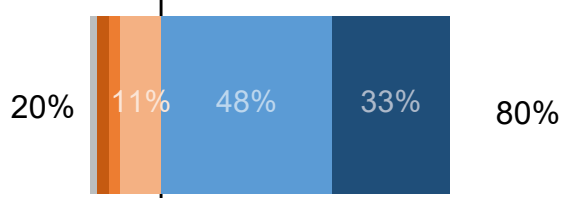
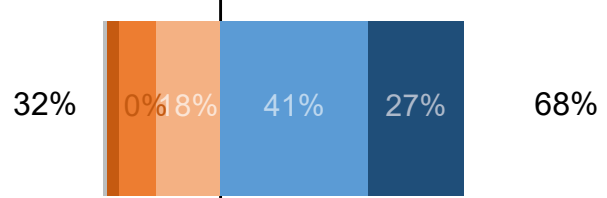
Opportunity to seek support and
collaboration from peers, lead
teachers and science specialists



The remote learning instructional
materials (and associated teacher
supports) provided by the science
department



The format of the remote learning
instructional materials provided
by the science department



Don't Know/Unsure
Extremely dissatisfied



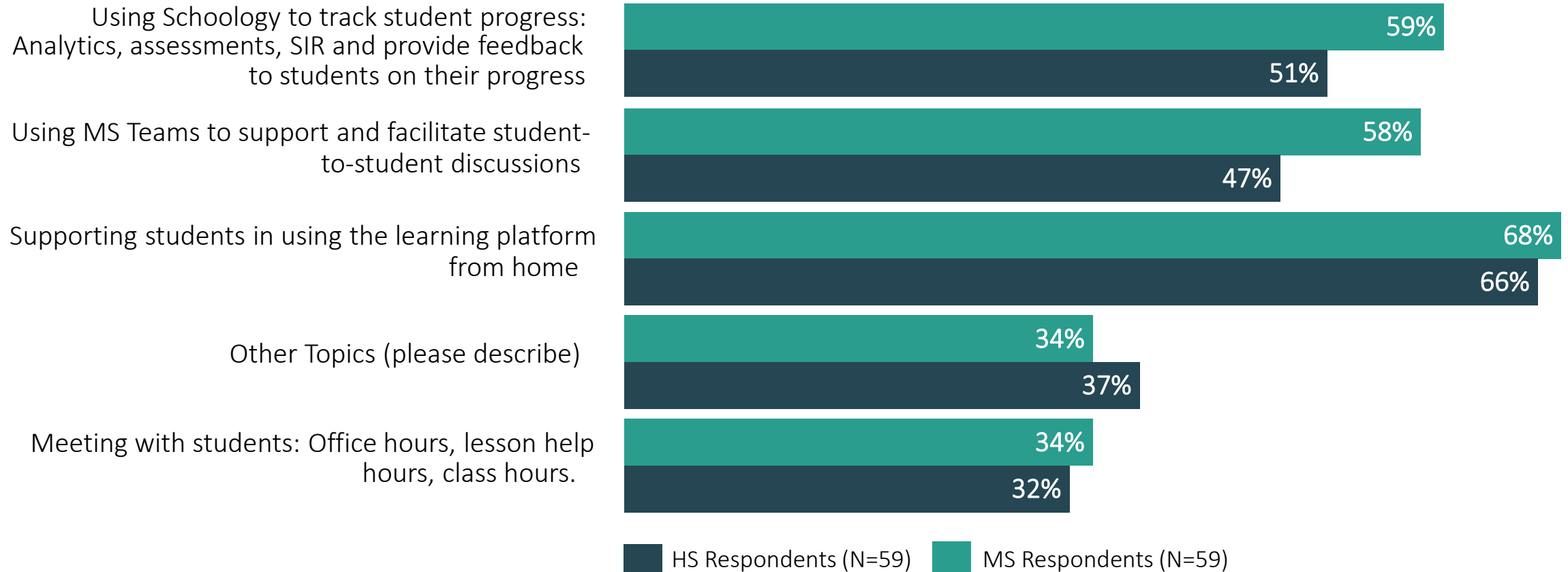
Dissatisfied
Neutral



Satisfied
Extremely satisfied

Additional Desired Remote Learning Supports

“If it becomes necessary to continue remote teaching and learning to some degree during the 2020-21 school year, which of the following supports would like you to learn more about?”



More detail on “other topics” for support

MIDDLE SCHOOL

1. **Modifying units** - 14 teachers want help making instruction work in remote formats (e.g., using Zoom, small groups instruction, running labs, creating videos for flipped classrooms, engaging students in content)
2. **Differentiation** – 4 teachers want help to ensure instruction effectively engages all students (e.g. for students with IEPs, reluctant learners)
3. **LMS Help** – 2 teachers want help with Schoology (or switching to another platform)
4. **Assessments** – 2 teachers talk about providing guidance/expectations for assessments and grading

HIGH SCHOOL

1. **Modifying Units** – 10 teachers want help providing hands-on lab experiences, incorporating discourse strategies, using Zoom, and engaging students who don't have learning supports in the home
2. **OneNote** – 8 teachers ask for help implementing OneNote in their classrooms
3. **Differentiation** – 3 teachers want help to ensure instruction effectively engages all students (e.g. for students receiving EL services or who have IEPs, students of color furthest from educational justice)
4. **LMS Help** – 1 teacher asked for help syncing the Schoology gradebook with PowerTeacherPro.

Teaching Adopted Materials as Intended

Questions about....

- Frequency of curriculum use
- Supplemental materials
- Leadership expectations
- Pacing

“Taught as Intended” Definition

CORE MEASURES

These survey items are used to create our “taught as intended” index (slide 26)

1. Frequency of Curriculum Use
(at least 4 days/ week)

2. Leadership Expectations
(“Agree” or “Strongly agree”)

3. Curriculum Pacing
(“Yes”)

4. Instructional Practice
*Six sub questions (“Frequently”,
“Always”)*

ADDITIONAL MEASURES

These measures were examined but are not included in our index

1. Supplementation

2. Units Completed in Fall 2019

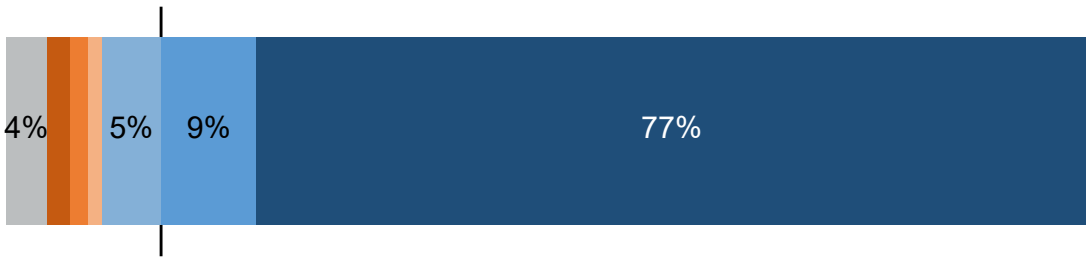


Core Measure 1: Frequency of Curriculum Use OVERALL

“Prior to school closure, how often did you typically use the adopted science instructional materials in your classroom?”

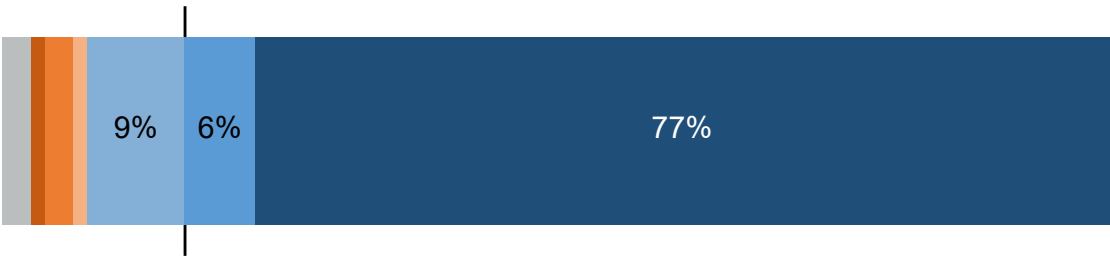
4 or More Days
Per Week

All Teachers



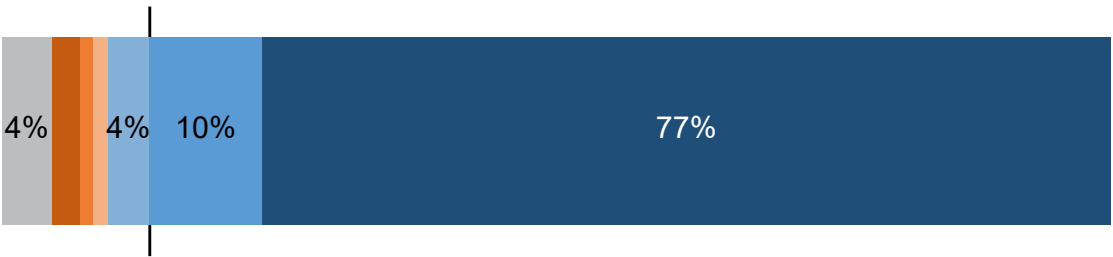
86%

Middle School
Teachers
(Combined Curricula)

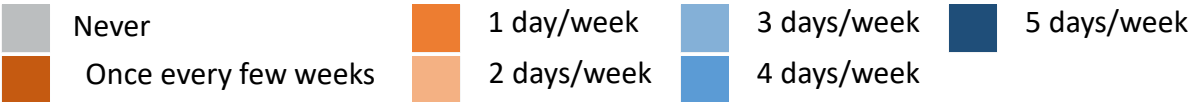


84%

High School
Teachers
(Combined Curricula)



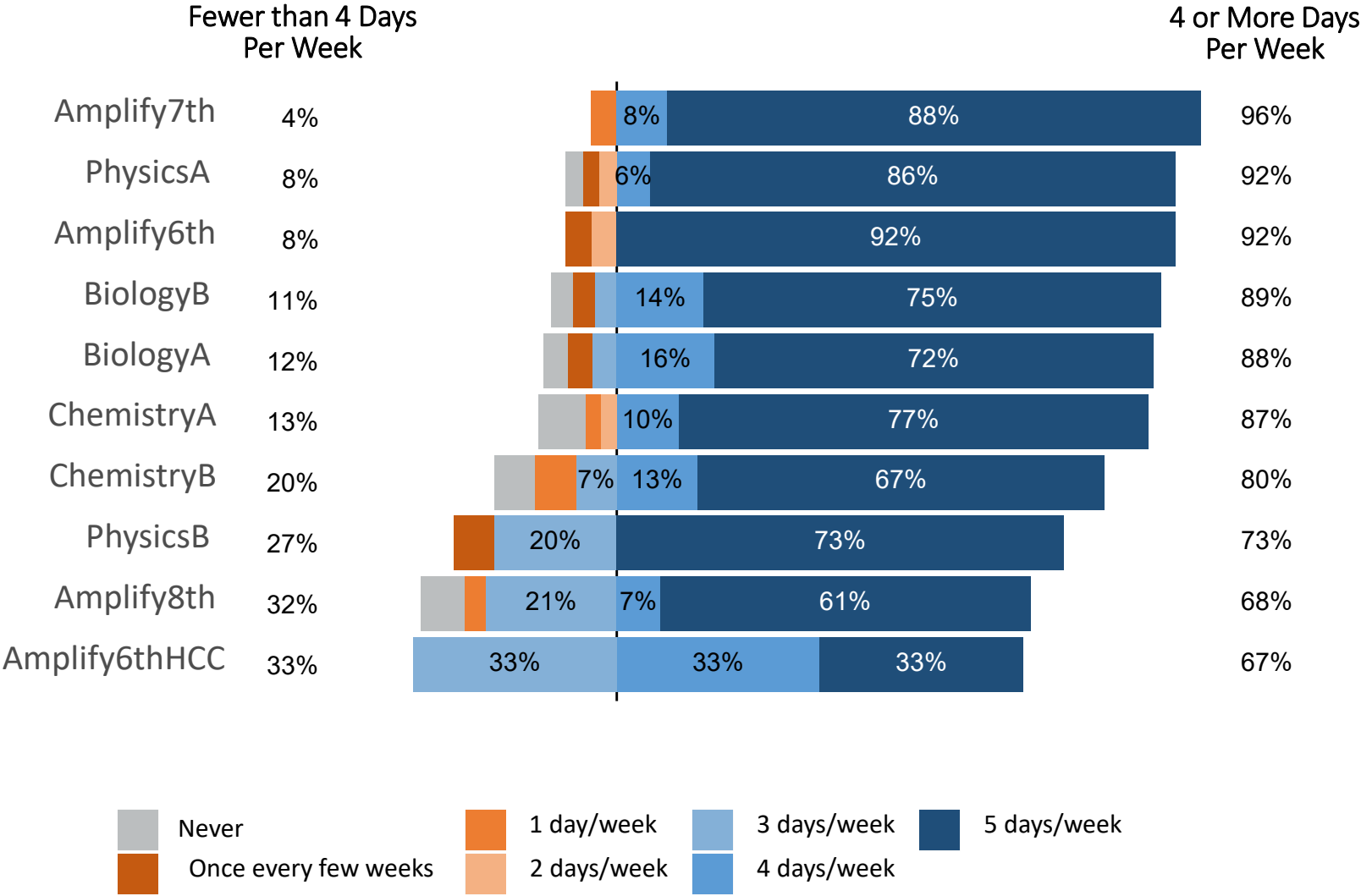
87%





Core Measure 1: Frequency of Curriculum Use BY COURSE

“Prior to school closure, how often did you typically use the adopted science instructional materials in your classroom?”

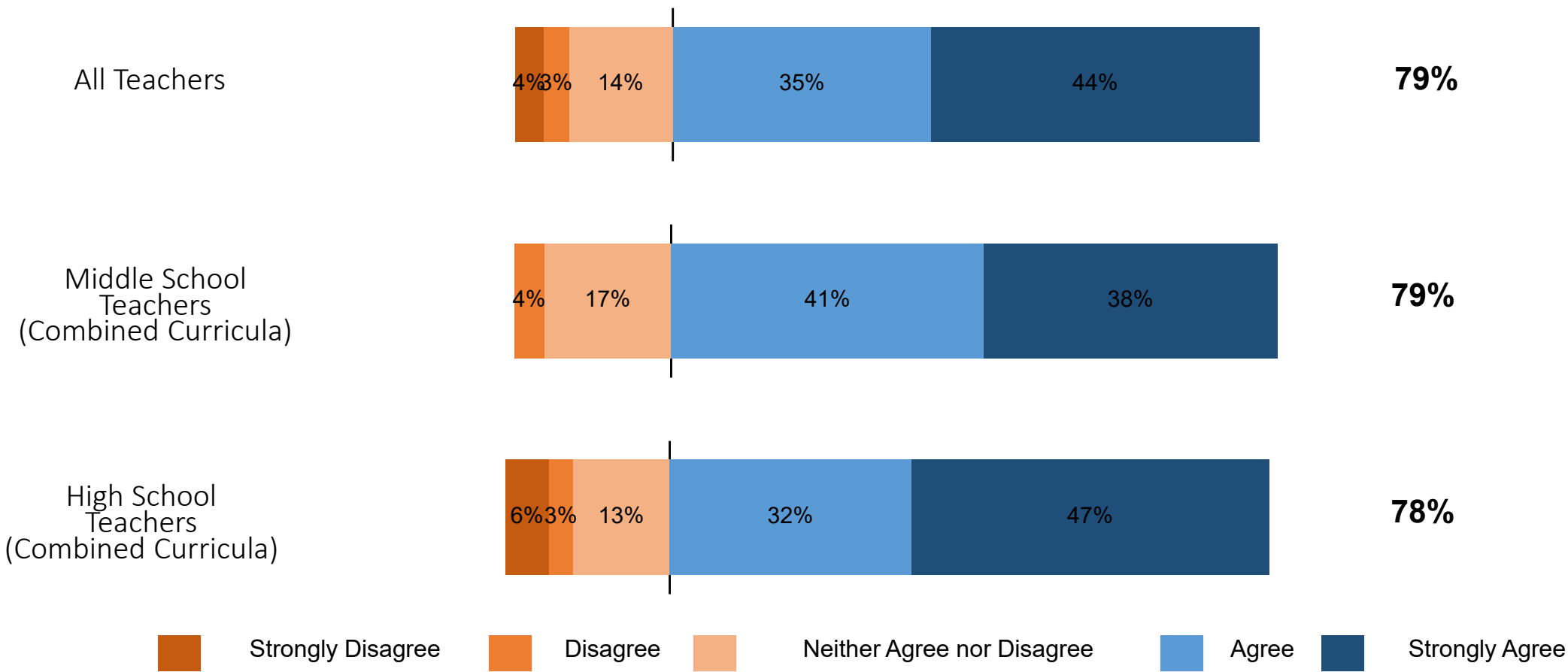




Core Measure 2: Leadership Expectations OVERALL

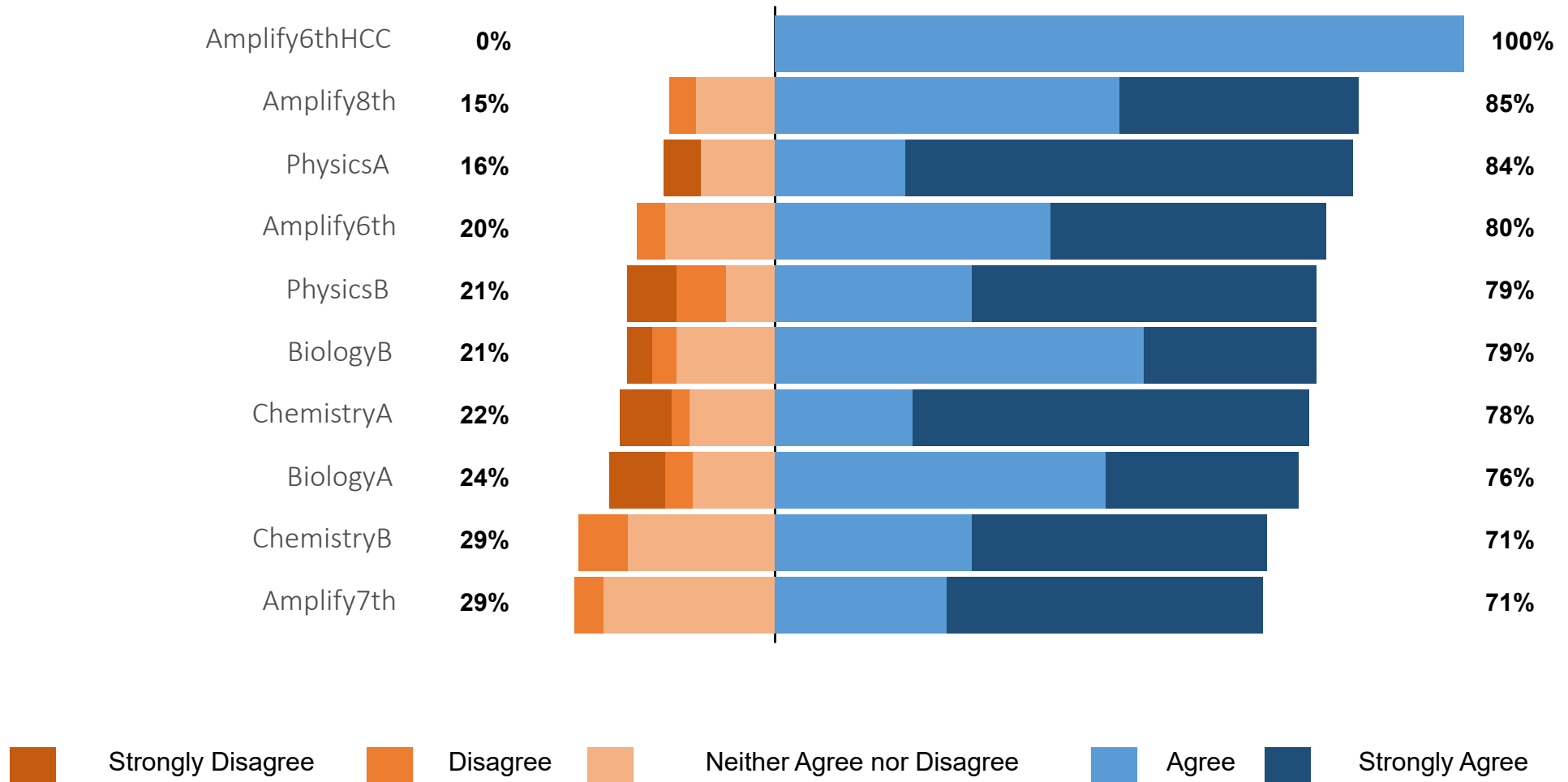
“At my school (prior to the closures), I was expected to teach the adopted science instructional materials ‘as intended.’”

Agree or Strongly Agree



Core Measure 2: Leadership Expectations BY COURSE

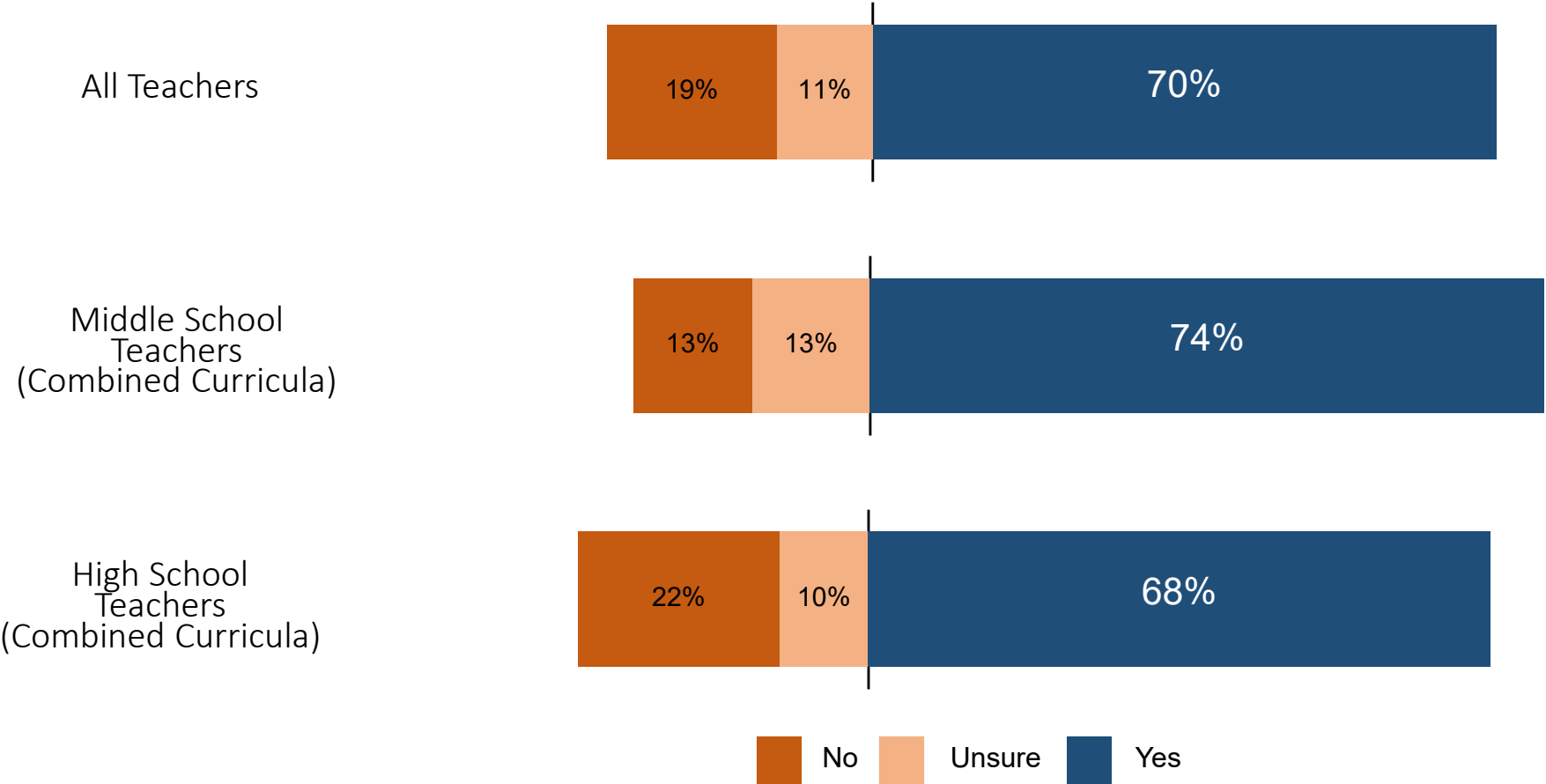
“At my school (prior to the closures), I was expected to teach the adopted science instructional materials “as intended.”





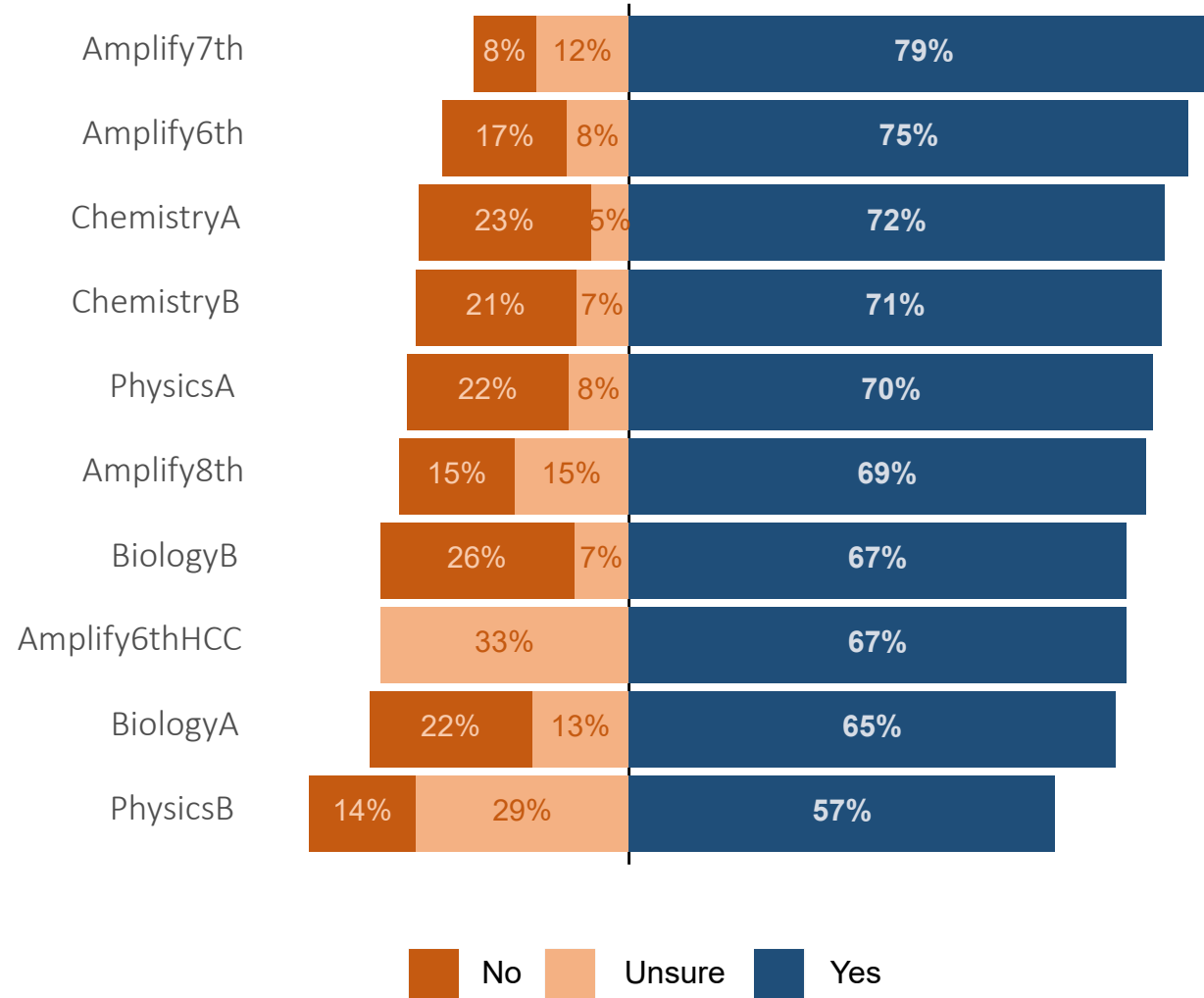
Core Measure 3: Curriculum Pacing OVERALL

“Did you follow the district-provided scope and sequence pacing guide for your grade level?”



Core Measure 3: Curriculum Pacing BY COURSE

“Did you follow the district-provided scope and sequence pacing guide for your grade level?”



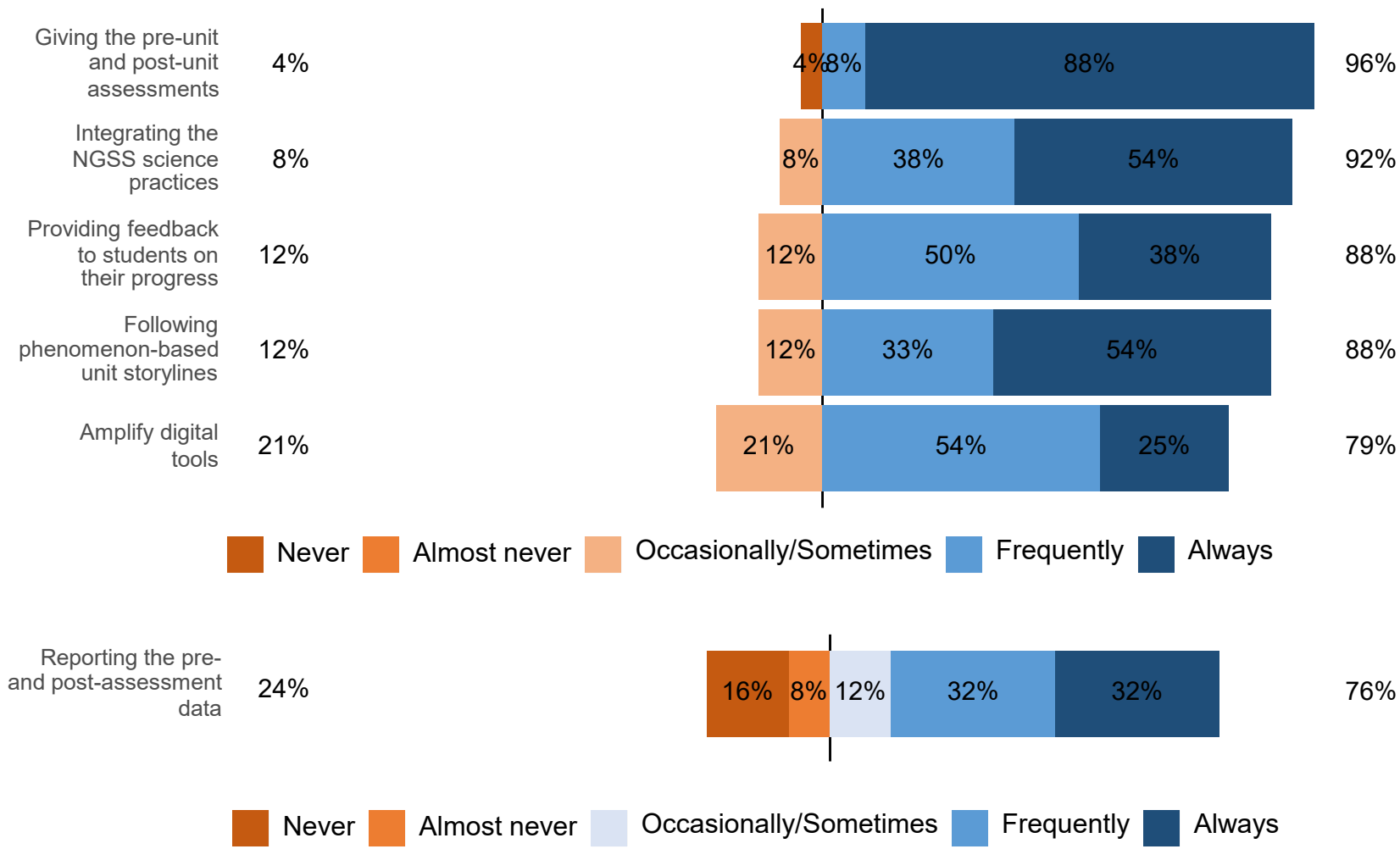


Core Measure 4: Instructional Practices

Amplify 6

(n=26)

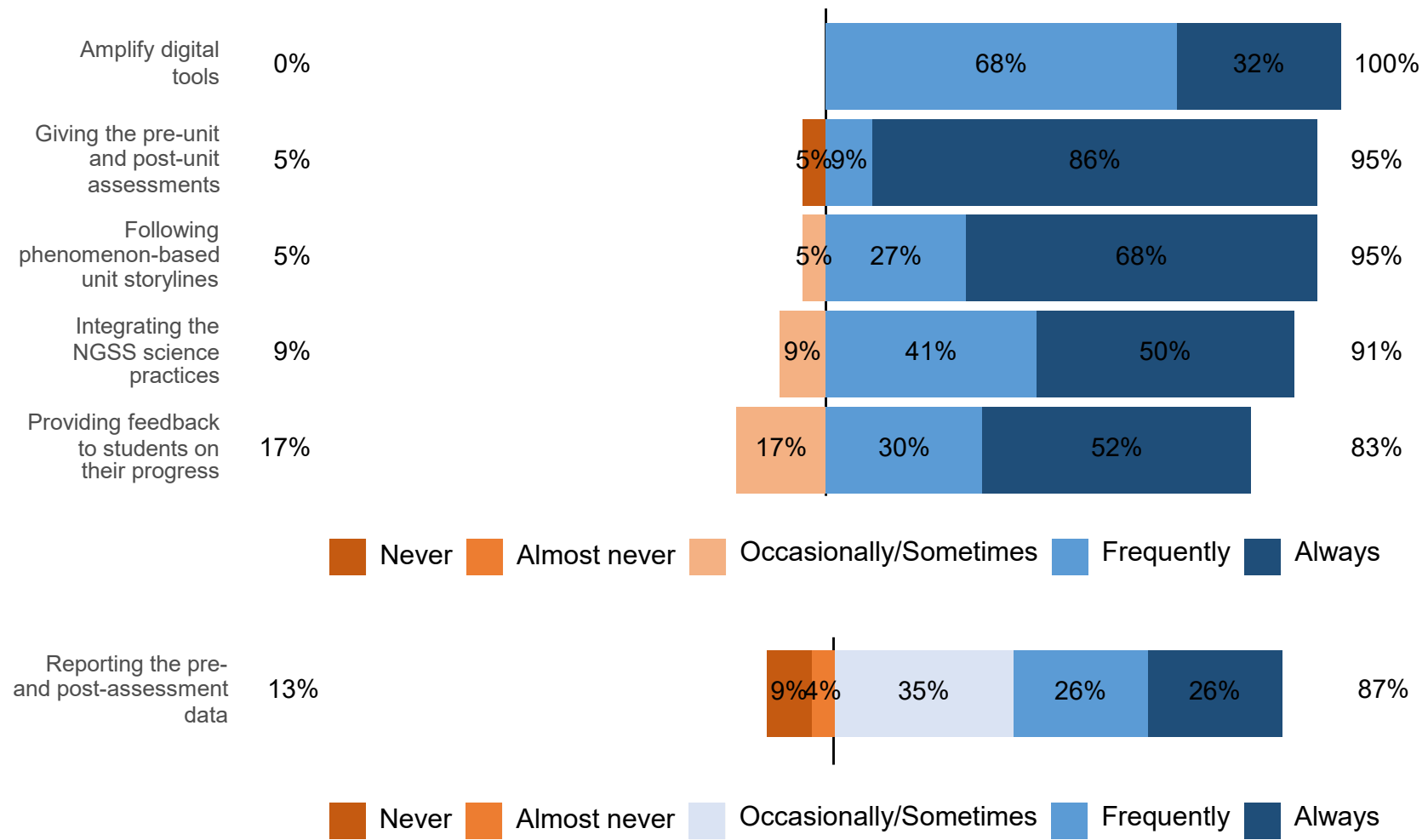
How often were you incorporating the following into your instructional practice?





Core Measure 4: Instructional Practices Amplify 7 (n=25)

How often were you incorporating the following into your instructional practice?



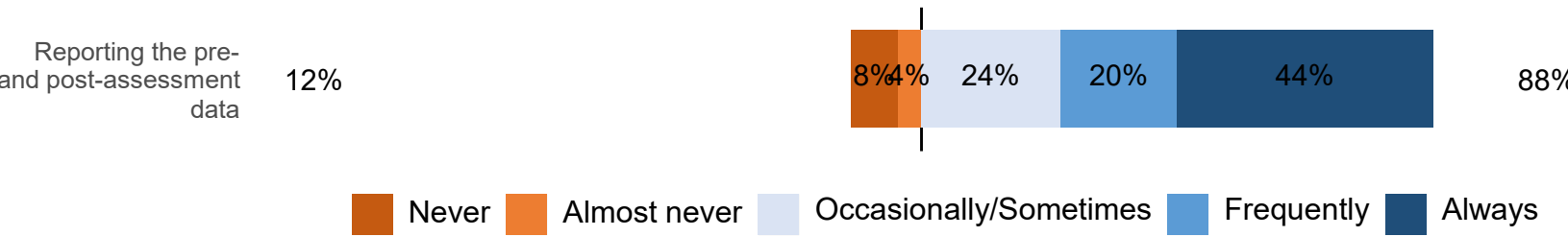
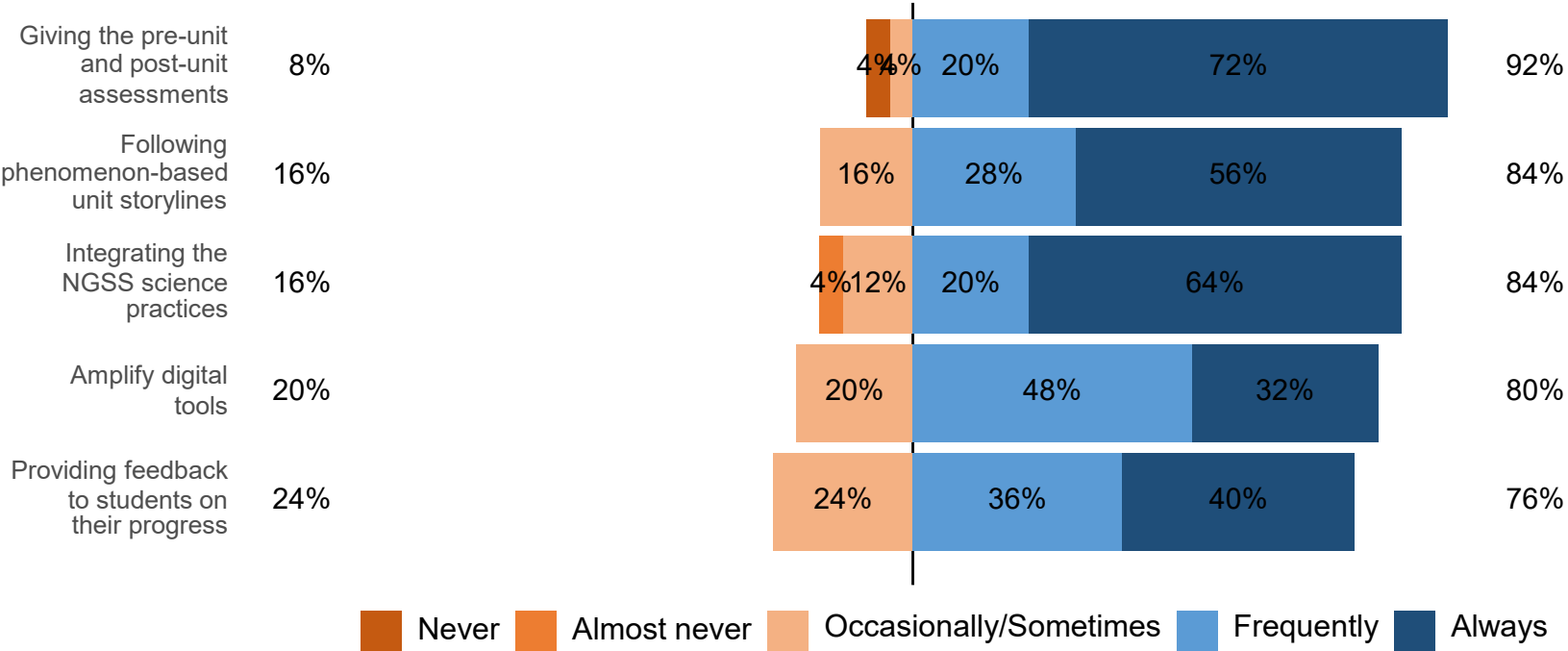


Core Measure 4: Instructional Practices

Amplify 8

(n=30)

How often were you incorporating the following into your instructional practice?



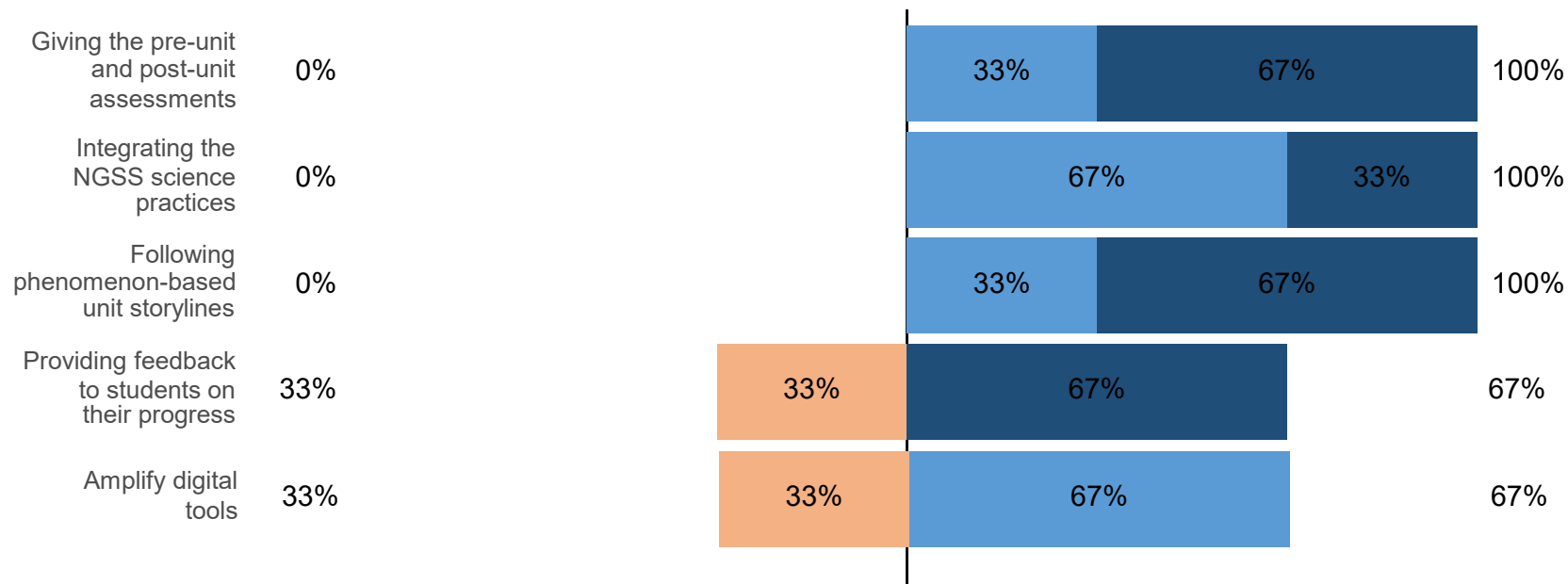


Core Measure 4: Instructional Practices

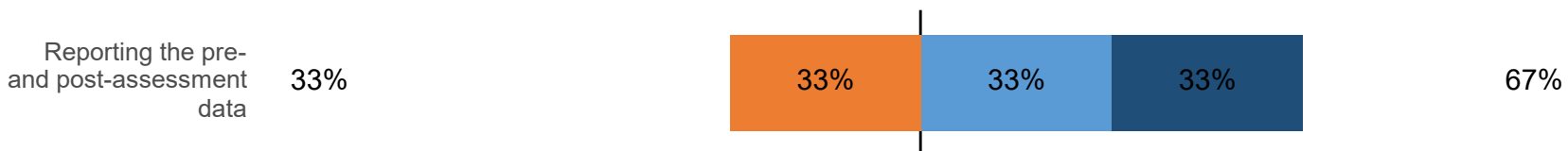
Amplify 6 HCC

(n=4)

How often were you incorporating the following into your instructional practice?



Never Almost never Occasionally/Sometimes Frequently Always



Never Almost never Occasionally/Sometimes Frequently Always

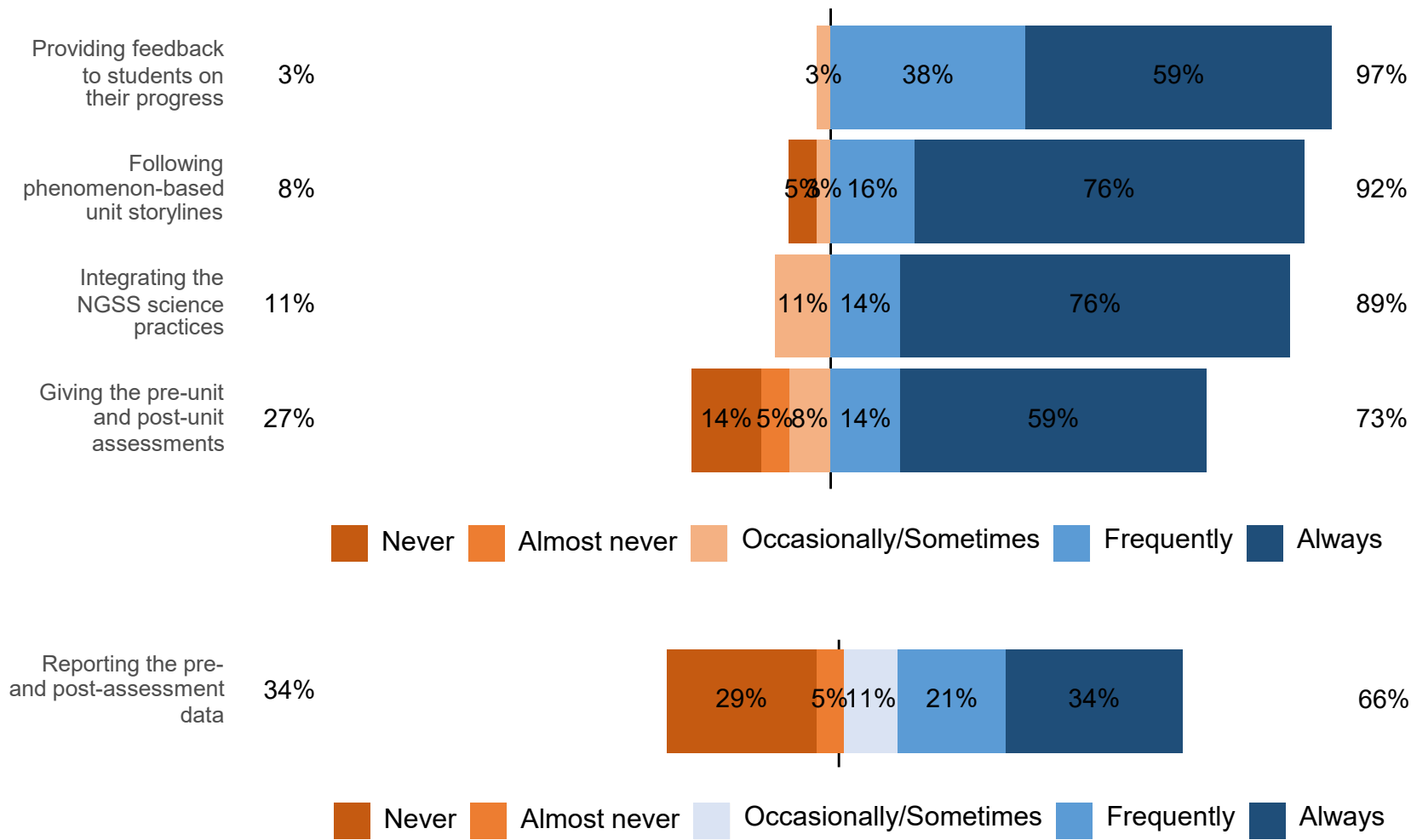


Core Measure 4: Instructional Practices

Chemistry A

(n=43)

How often were you incorporating the following into your instructional practice?



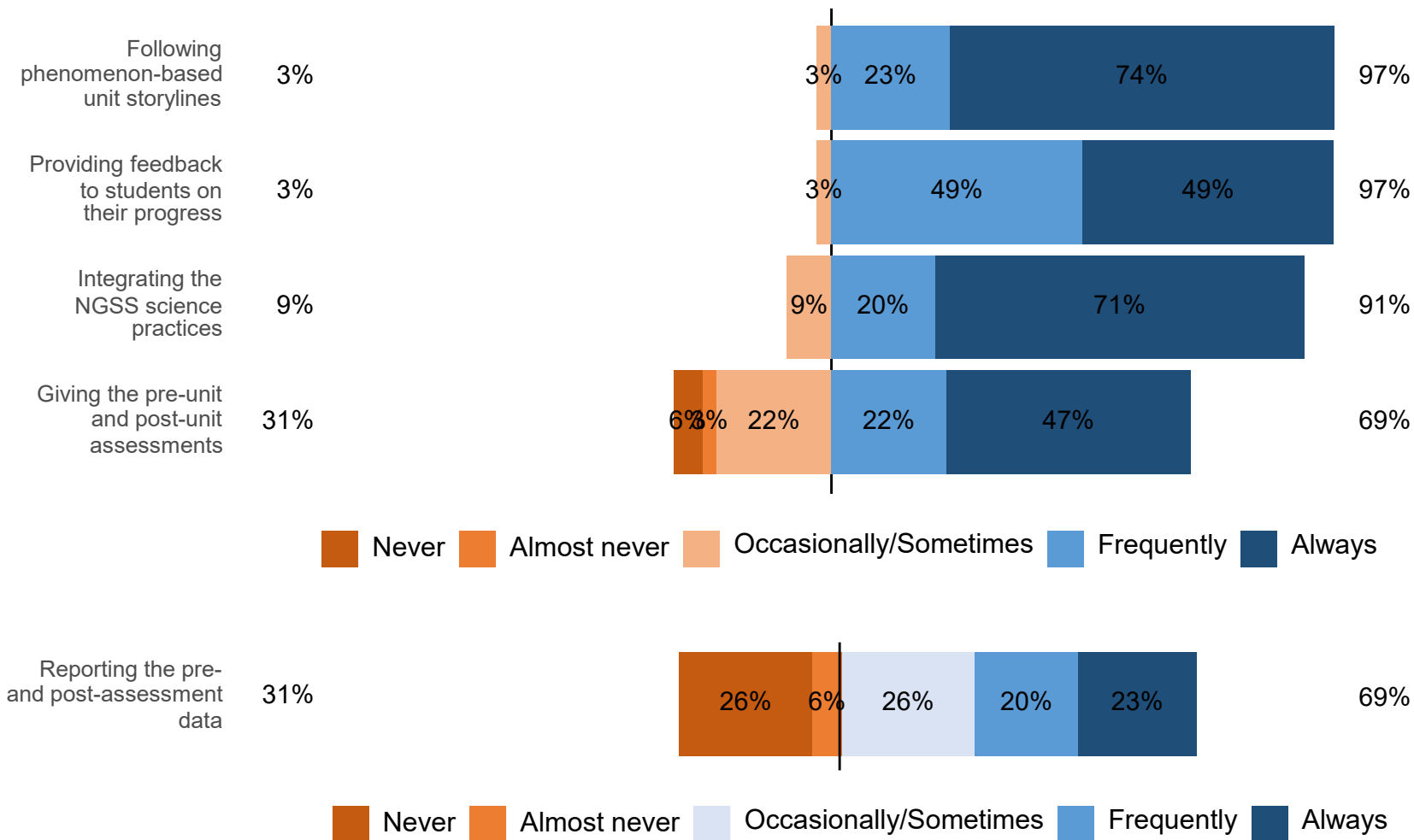


Core Measure 4: Instructional Practices

Physics A

(n=41)

How often were you incorporating the following into your instructional practice?

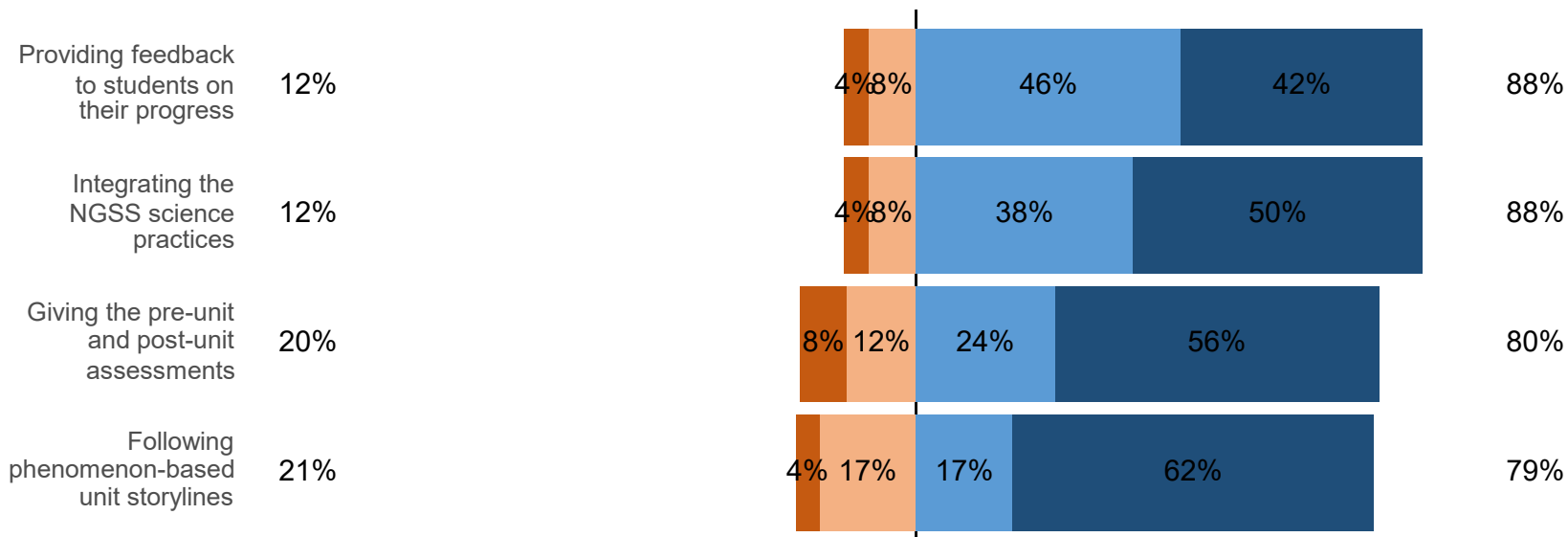


Core Measure 4: Instructional Practices

Biology A

(n=27)

How often were you incorporating the following into your instructional practice?



Never Almost never Occasionally/Sometimes Frequently Always



Never Almost never Occasionally/Sometimes Frequently Always

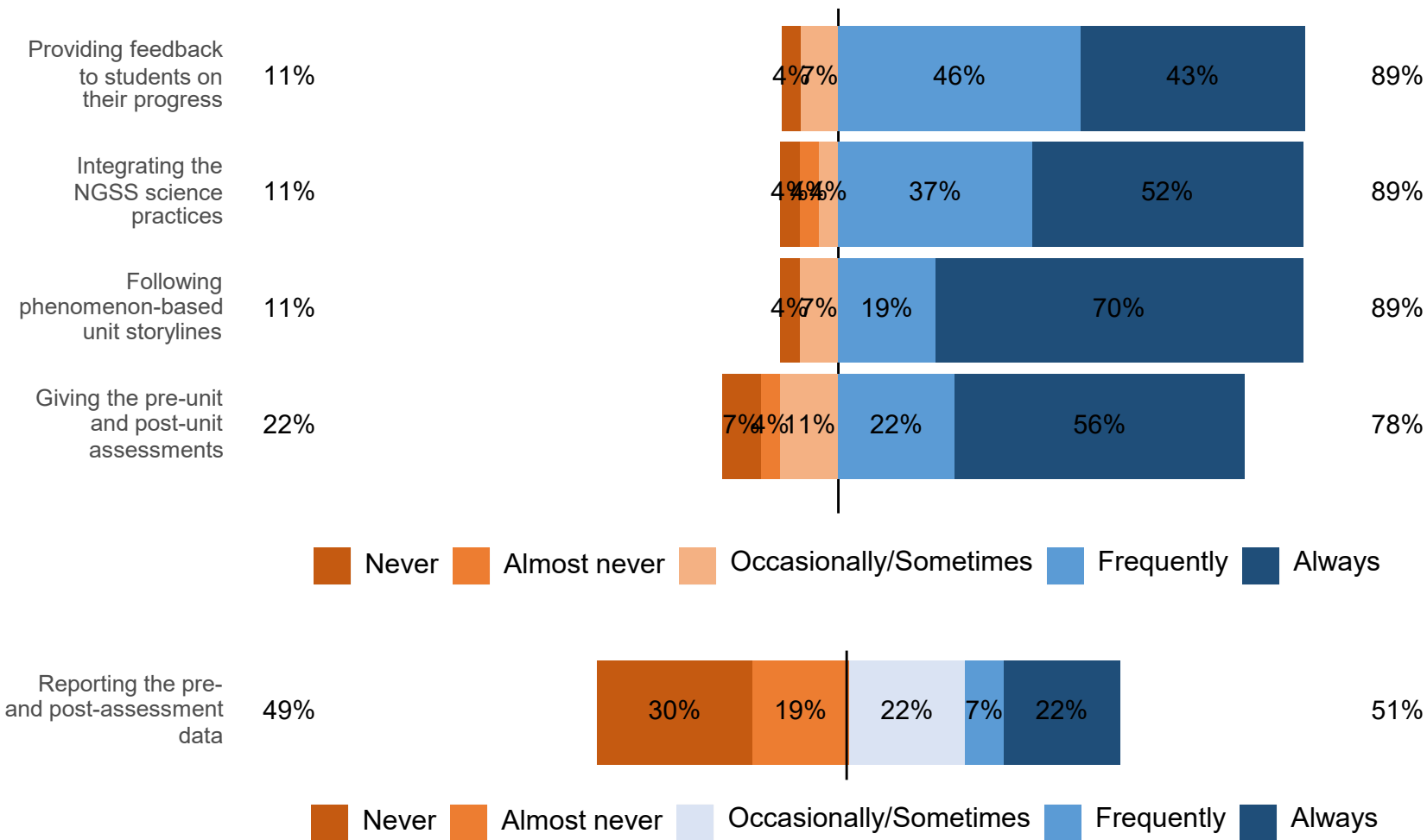


Core Measure 4: Instructional Practices

Biology B

(n=30)

How often were you incorporating the following into your instructional practice?



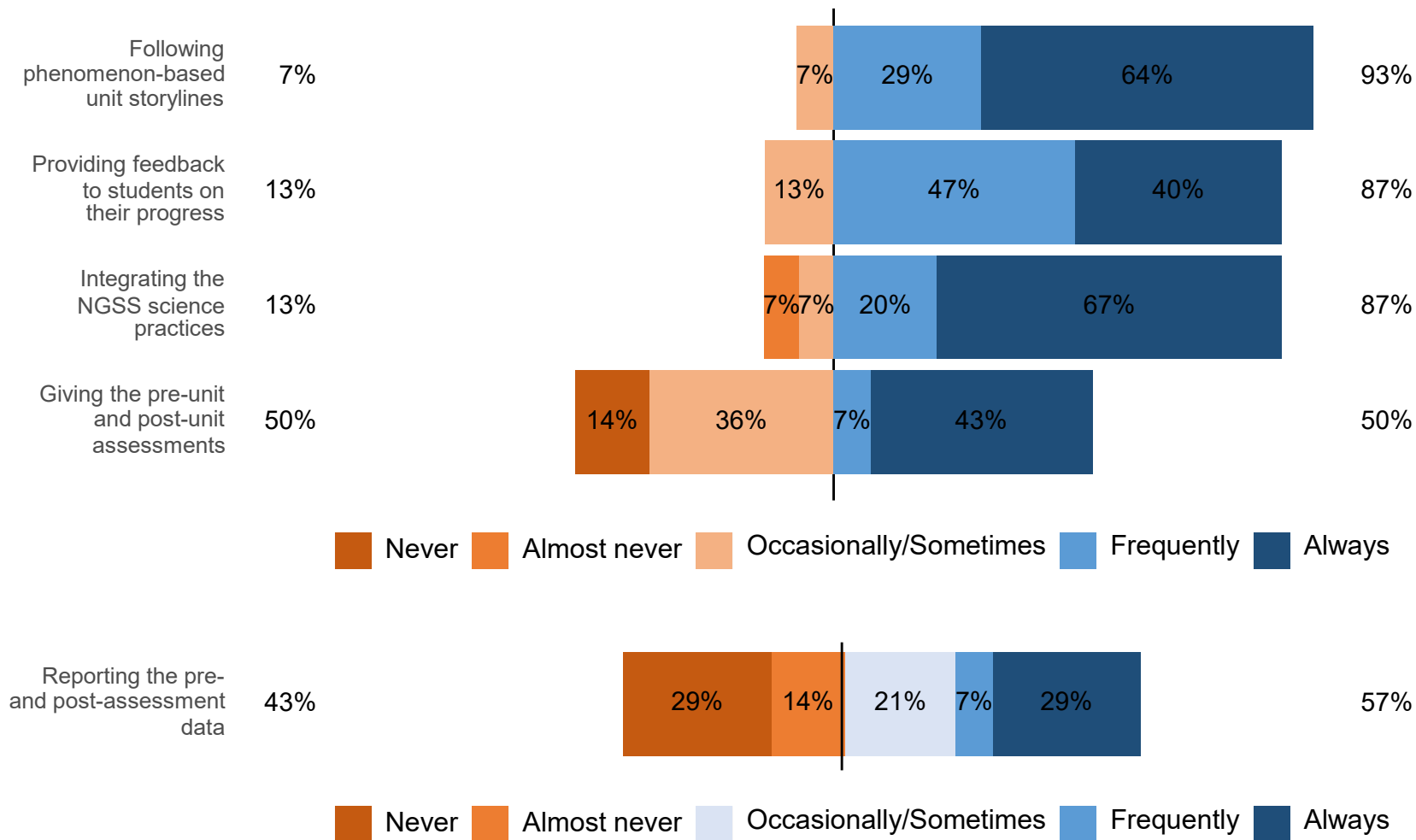


Core Measure 4: Instructional Practices

Chemistry B

(n=19)

How often were you incorporating the following into your instructional practice?



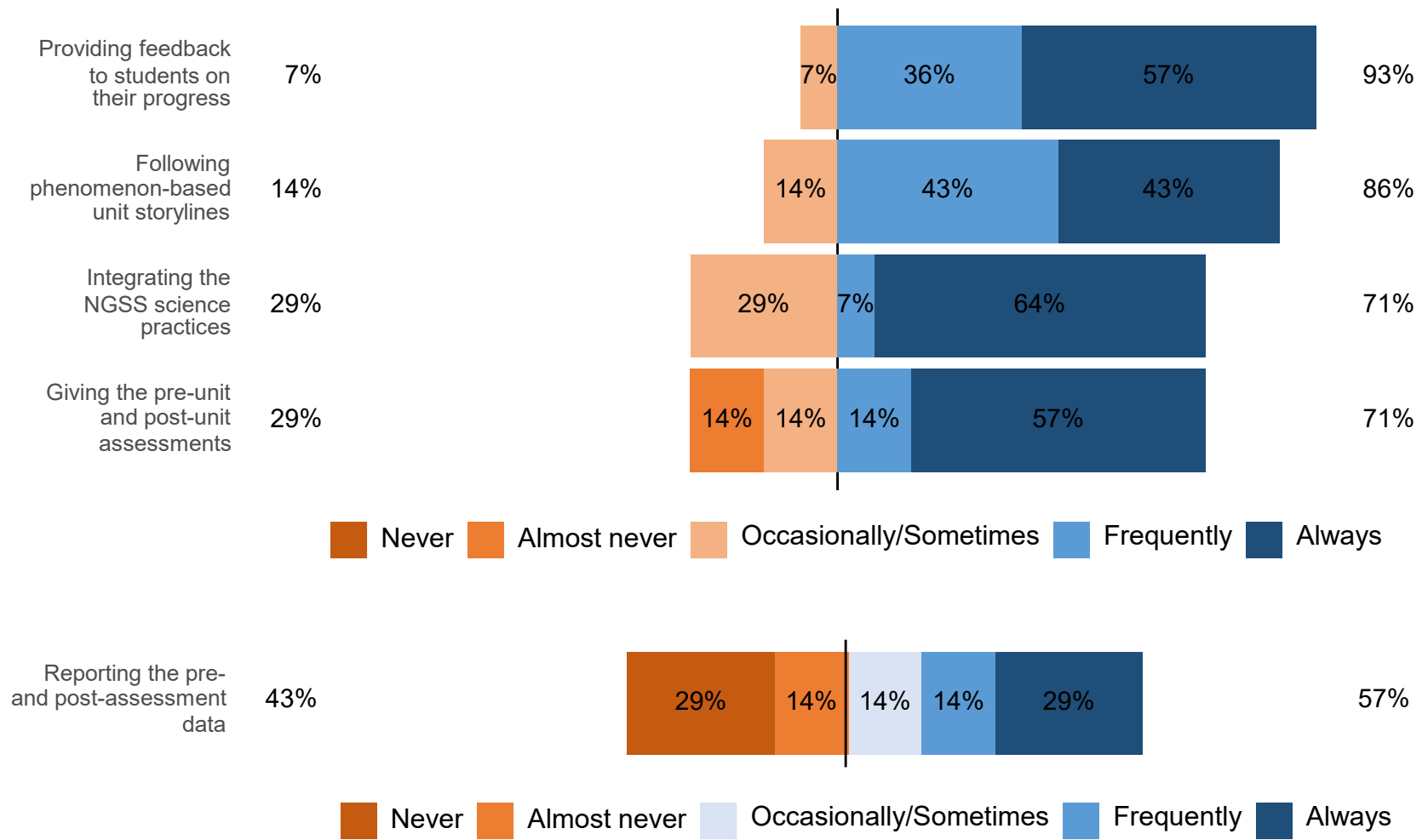


Core Measure 4: Instructional Practices

Physics B

(n=18)

How often were you incorporating the following into your instructional practice?



“Taught as Intended” Index (by course)

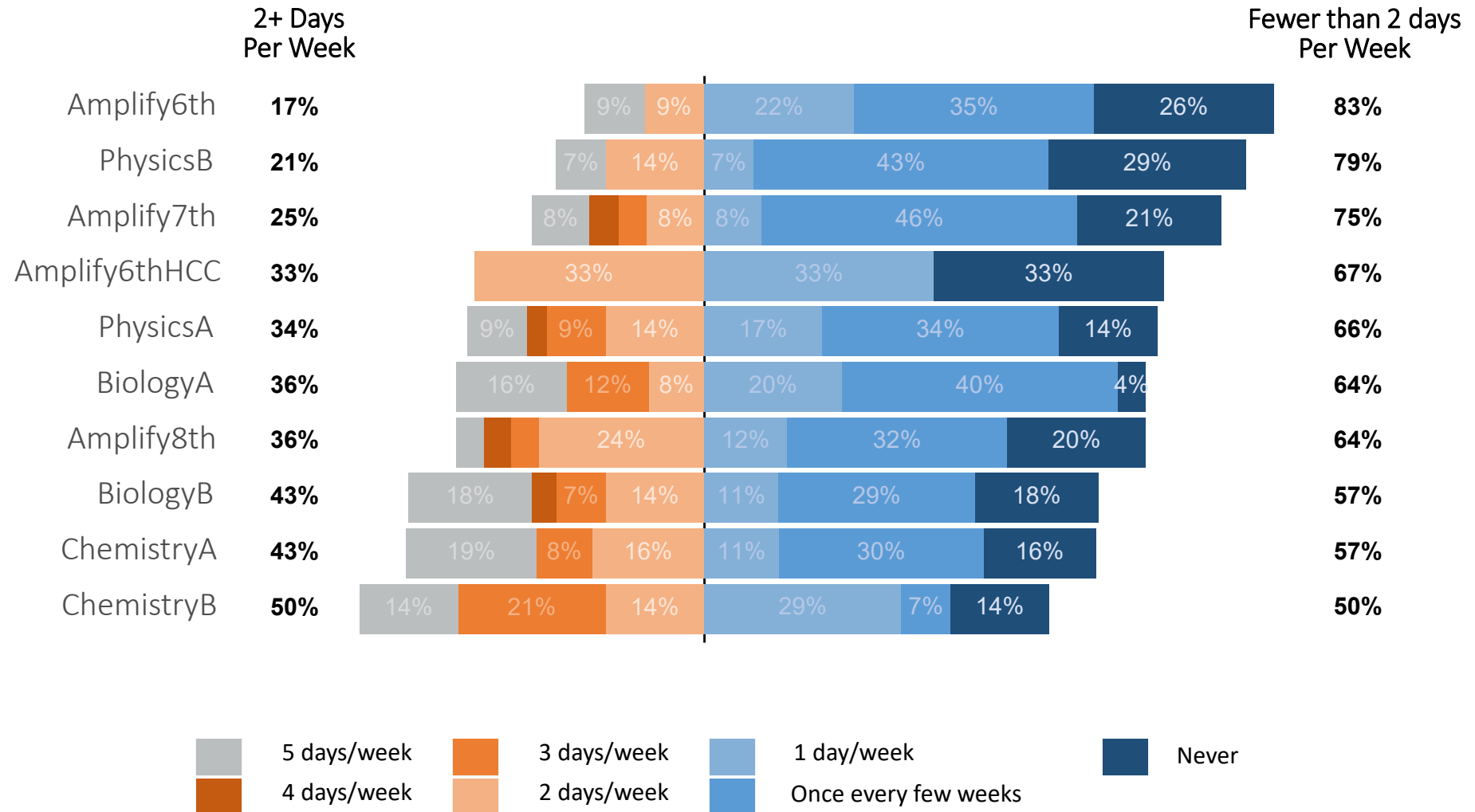
Combining Core Measures 1-4, we created an index that measures the degree to which teachers in each science course are teaching the materials “as intended”

Note: Read as “Teachers of X course are teaching the materials X% as intended”



Additional Measure: Supplemental Materials BY COURSE

“Prior to school closure, how often did you supplement the adopted instructional materials with non-adopted materials?”



Instructional Practices

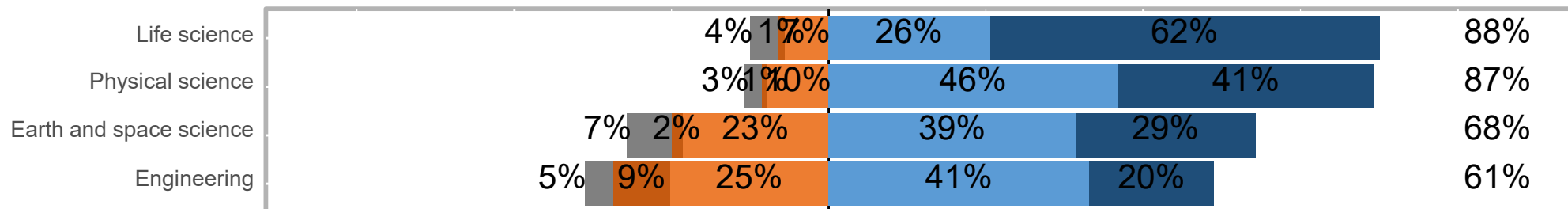
Questions about....

- Comfort level with NGSS domains
- Perceptions on the role of technology in gathering scientific evidence
- Strategies for encouraging student discourse
- Professional development

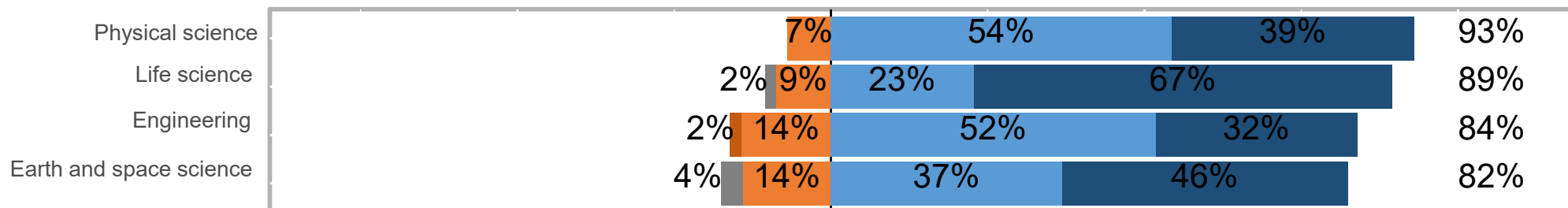
Comfort Level with NGSS Domains

"I feel confident in my content knowledge in the following areas:"

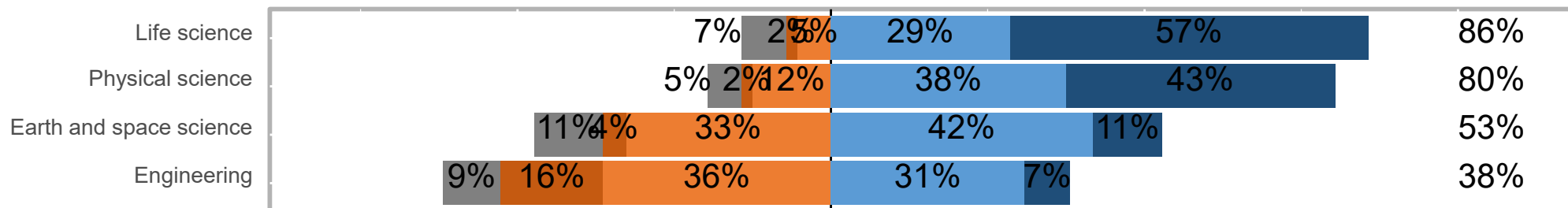
All Teachers



Middle Schools



High Schools

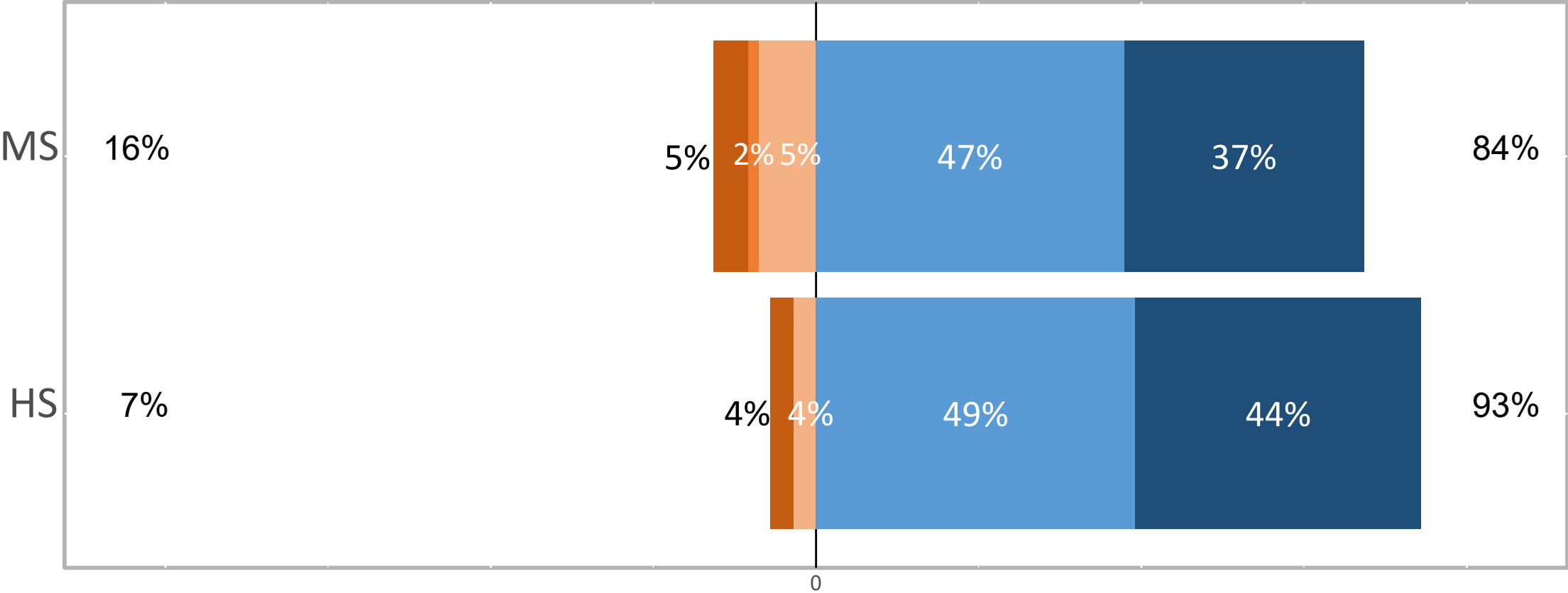


Not applicable/I do not teach this area
 Not confident at all
 Limited confidence
 Moderately confident
 Extremely confident



Perceptions on the Role of Technology

"I see value in having my students use technology to gather scientific evidence"

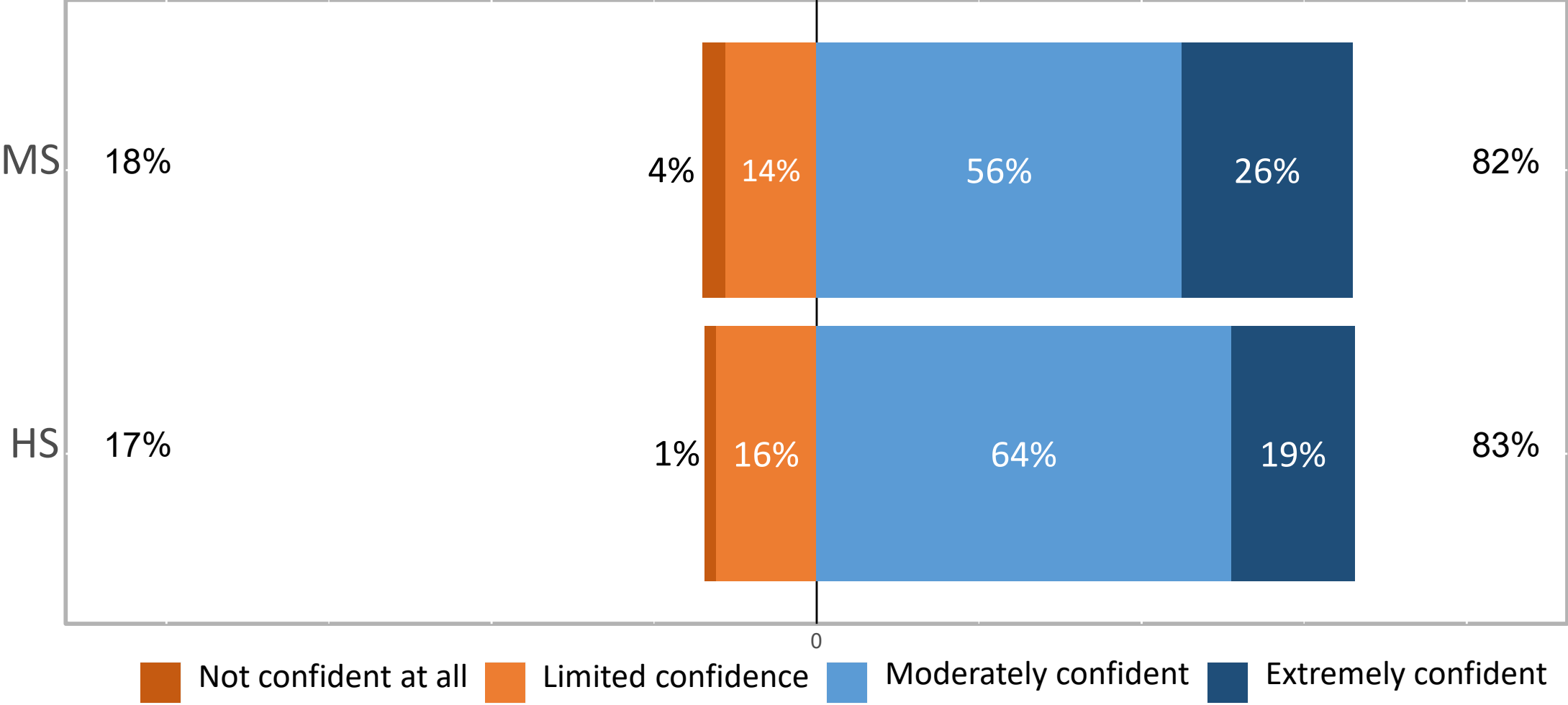


Strongly disagree Disagree Neither agree nor disagree Agree Strongly agree



Student Discourse

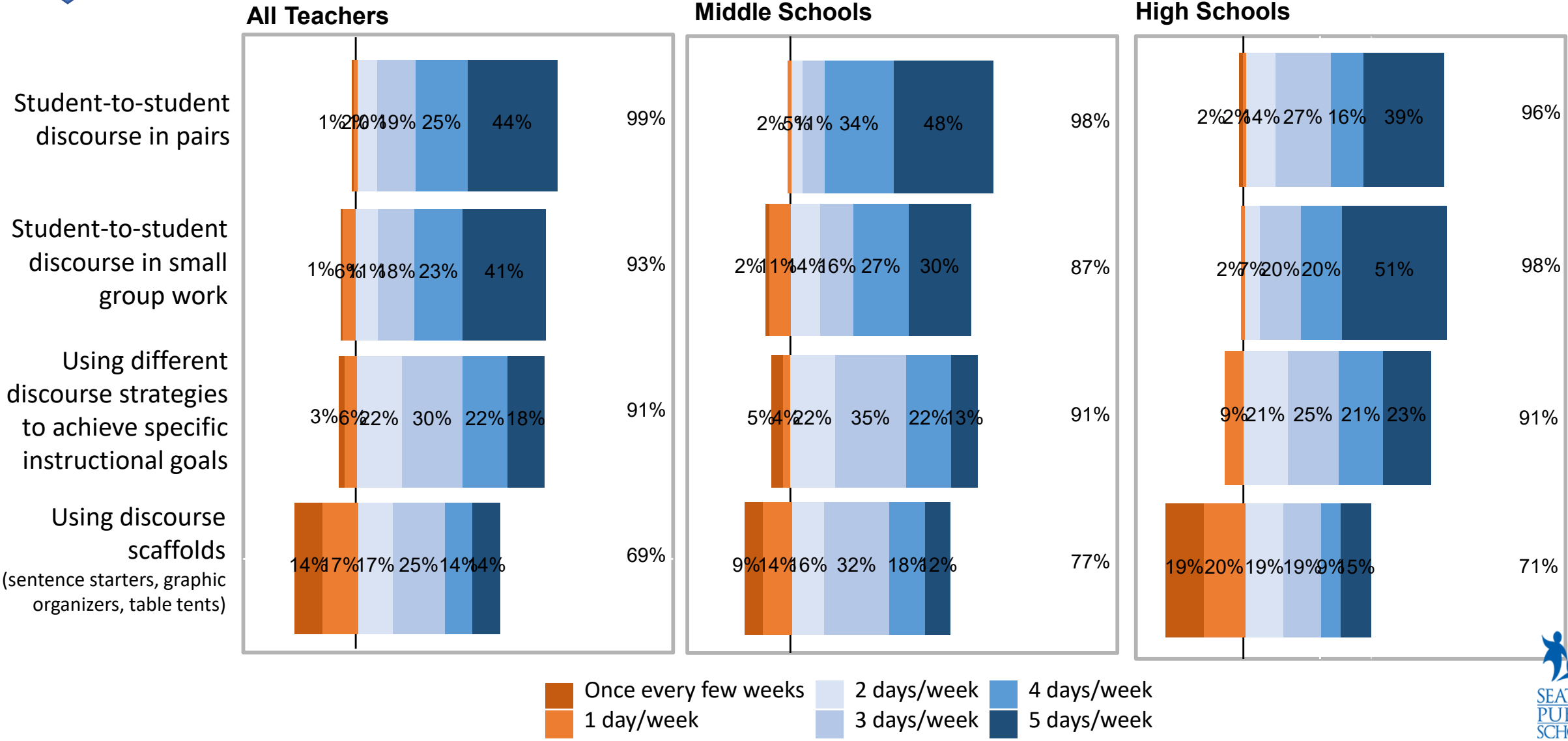
"I feel confident that my students can engage in scientific discourse with their peers to make sense of complex scientific ideas"





Student Discourse

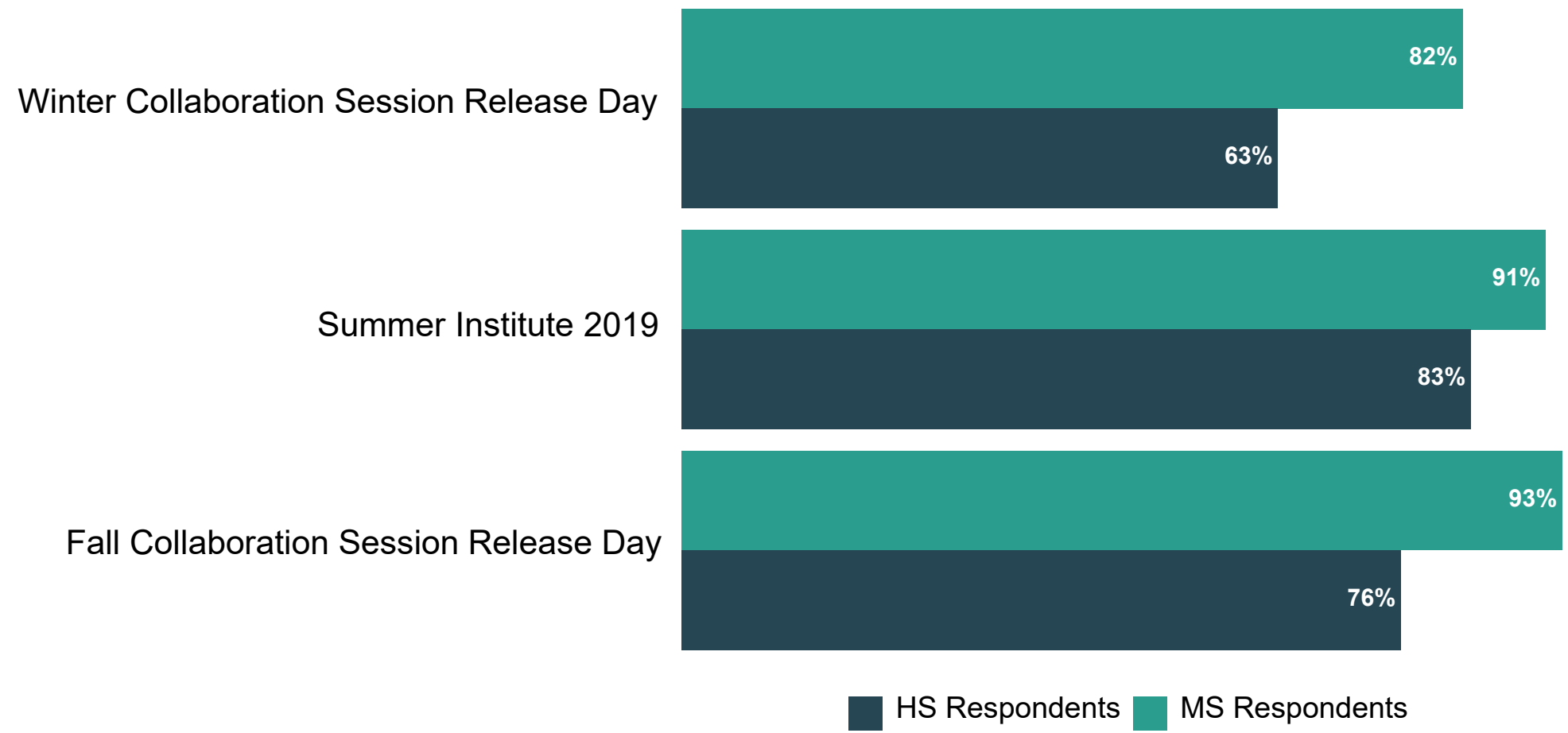
"I used the following practices to encourage student-to-student discourse during science lessons"





Professional Development

“I have attended the following professional development sessions...”



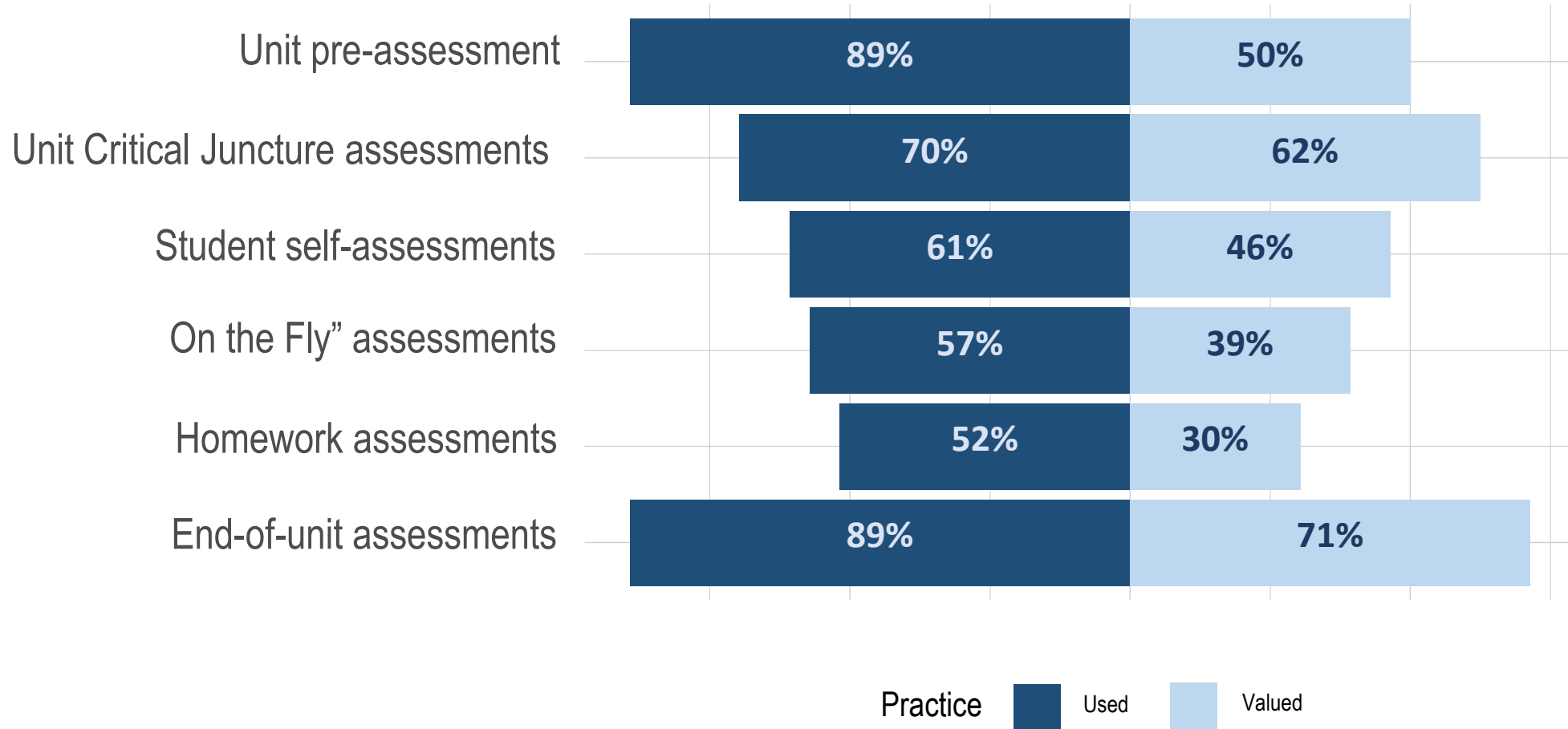
Assessments

Questions about....

- Embedded assessments (in both middle and high school)
- Assessment roles and purposes
- Formative feedback mechanisms
- Educators' assessment skills

Embedded Assessments in Middle School

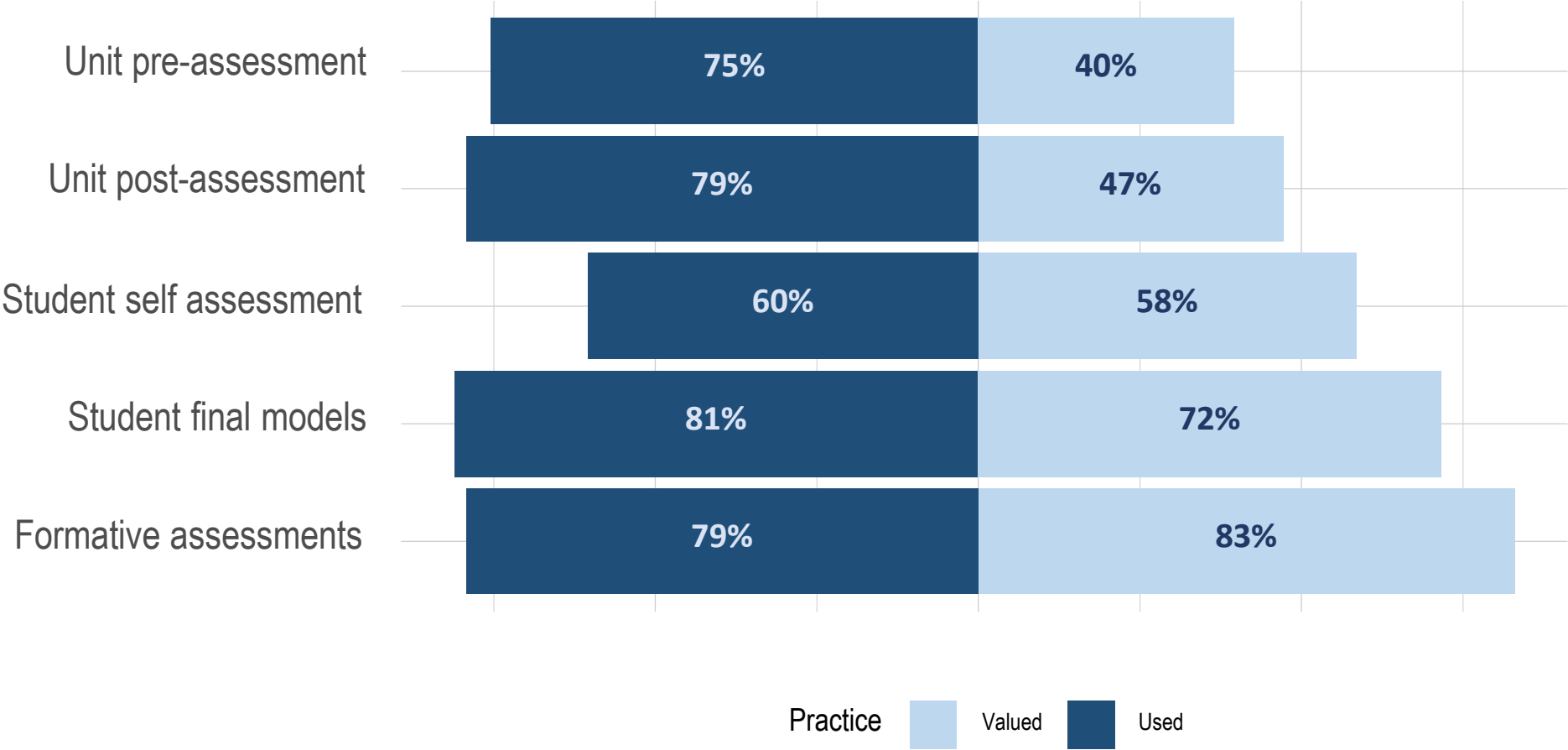
Teachers' Use and Value of Unit-Embedded Assessments (MS)





Embedded Assessments in High School

Teachers' Use and Value of Unit-Embedded Assessments (HS)



Feedback Mechanisms

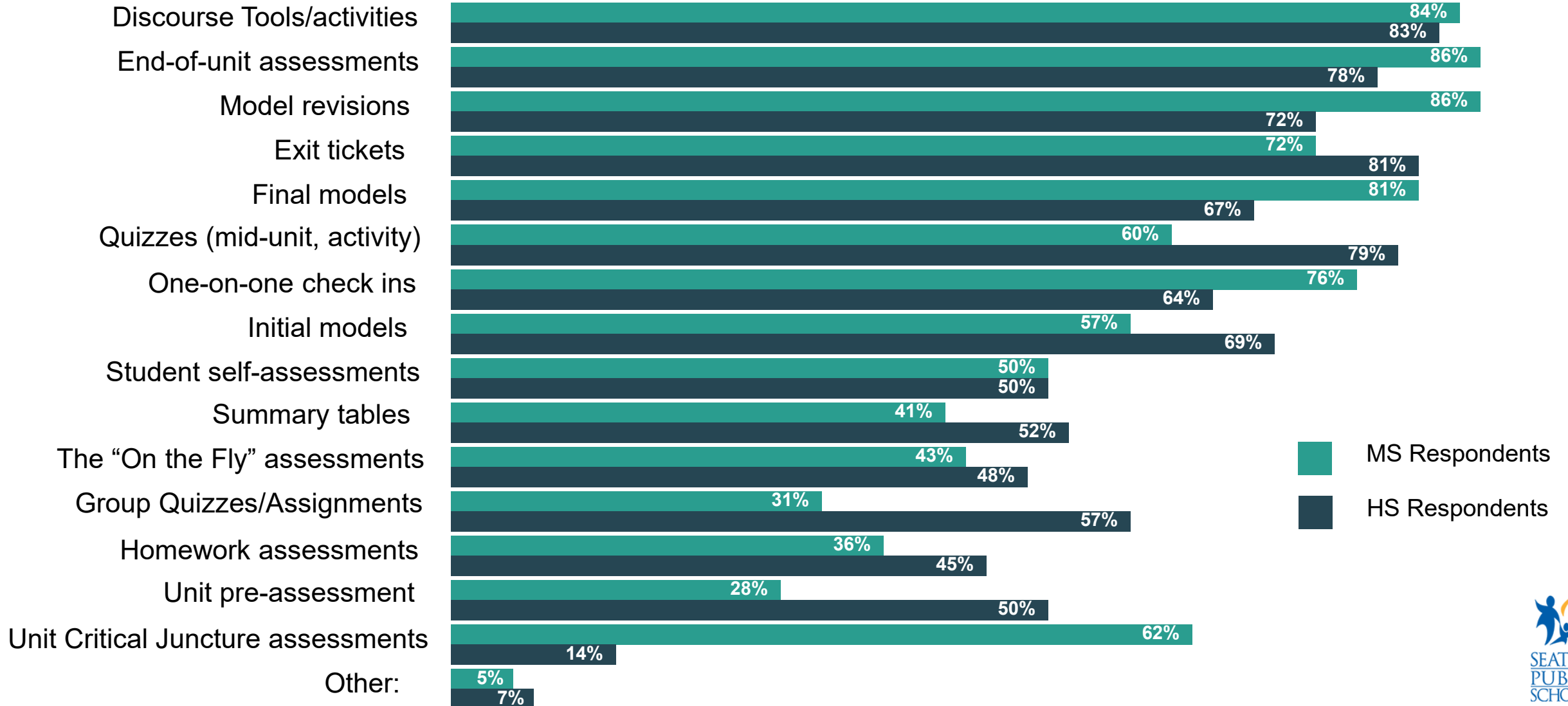
“For your in-class learning (prior to the school closures), how often did you do the following:”

Action	Expectation (based on best practices)	% Met Expectations (ALL)	% Met Expectations (MS ONLY)	% Met Expectations (HS ONLY)
Use formative assessments	At least 3 times per week	77%	69%	86%
Set student learning goals	At least 2-3 times per unit	73%	71%	74%
Assess students’ final explanations	Once or twice per unit	88%	91%	85%
Use pre-test results	Once or twice per unit	72%	84%	59%

Formative Feedback Mechanisms

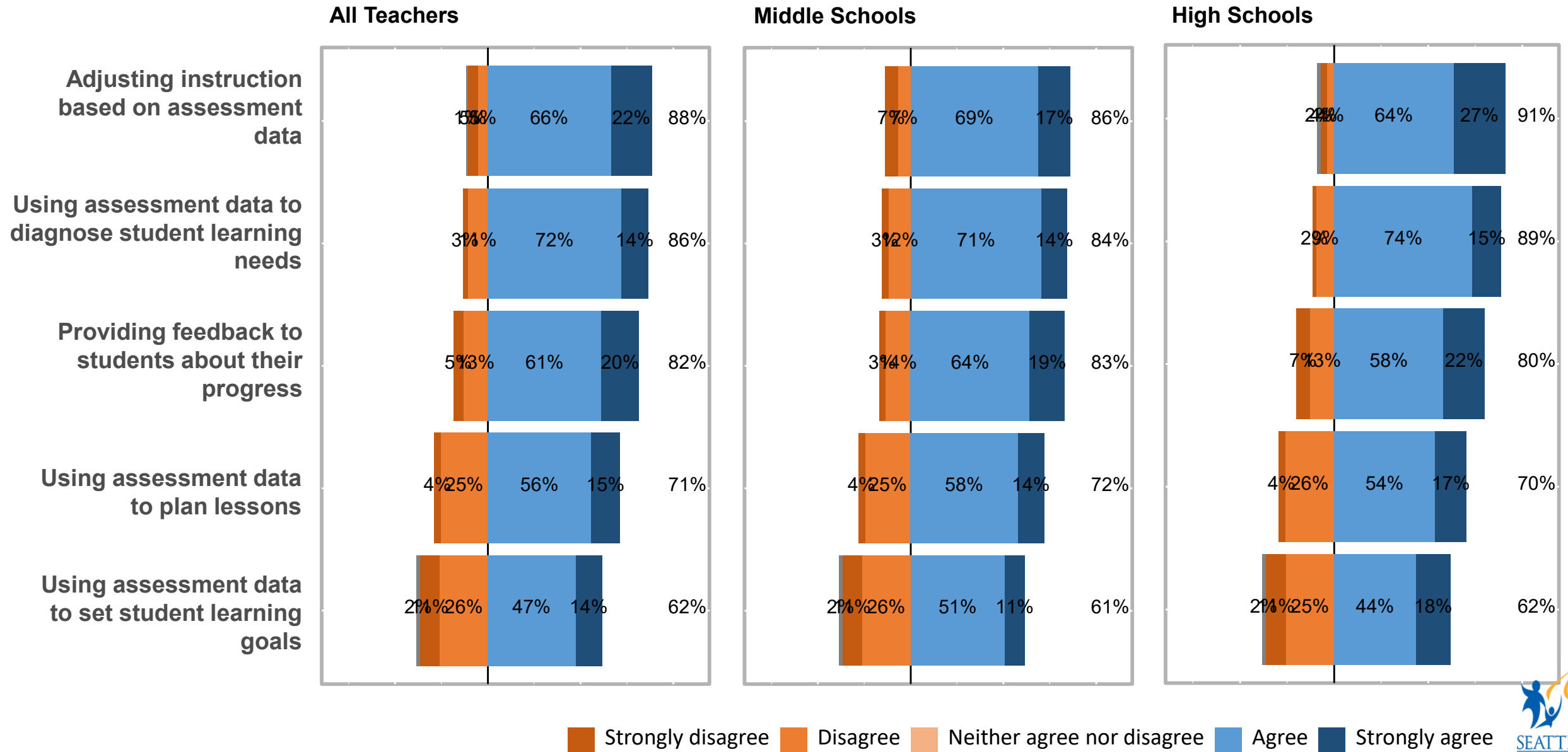
Teacher
Survey

“Prior to the school closures, which assessment tools did you use to provide feedback to your students?”



Educator Assessment Skills

“When I reflect on my assessment practices, I believe I am good at:”



Perceived Student Outcomes

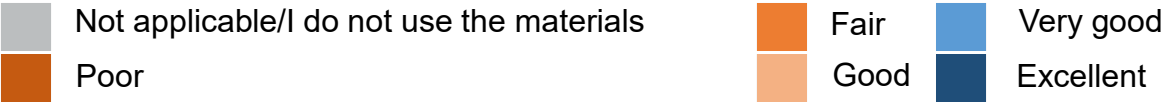
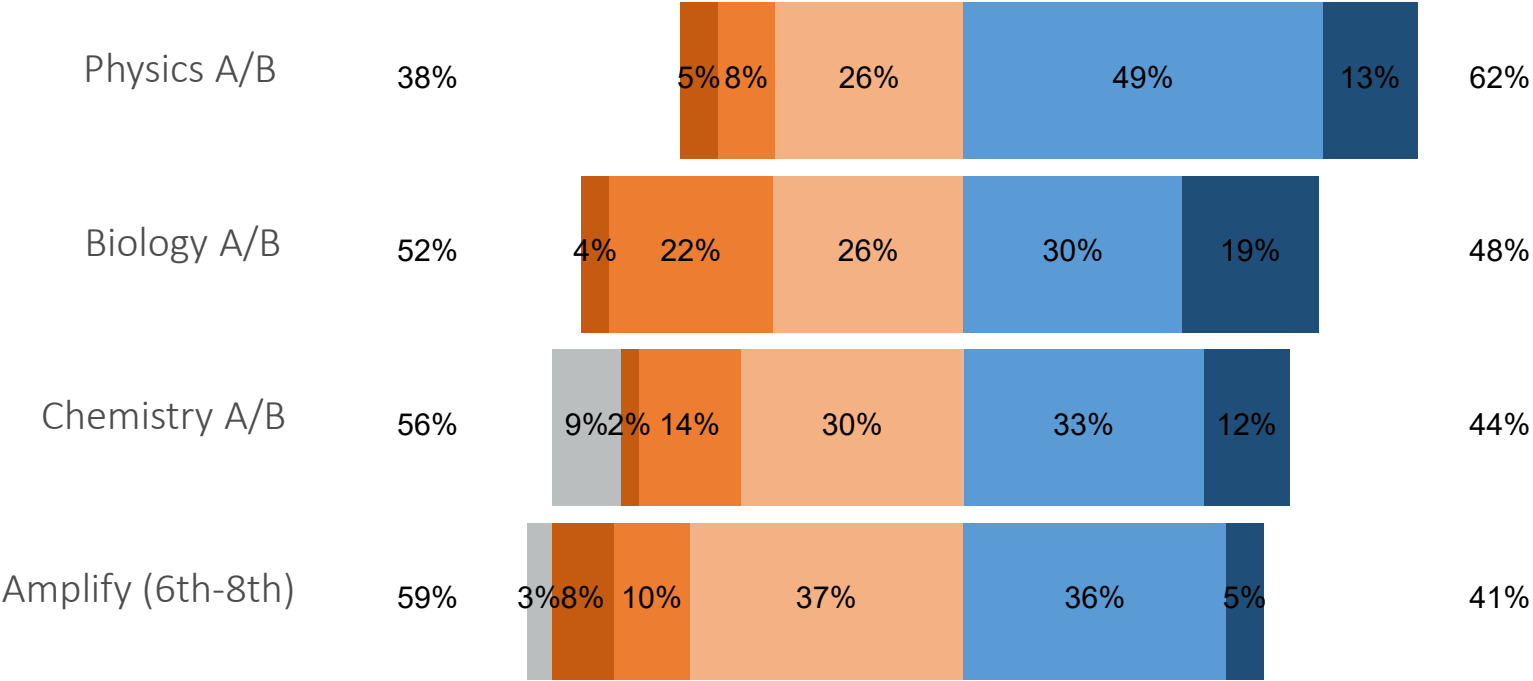
Questions about....

- Student engagement
- Science achievement and learning (reported by subject area)
- WCAS preparedness



Student Engagement

“When I used the adopted instructional materials (prior to school closures), I would rank the engagement of my students as:”

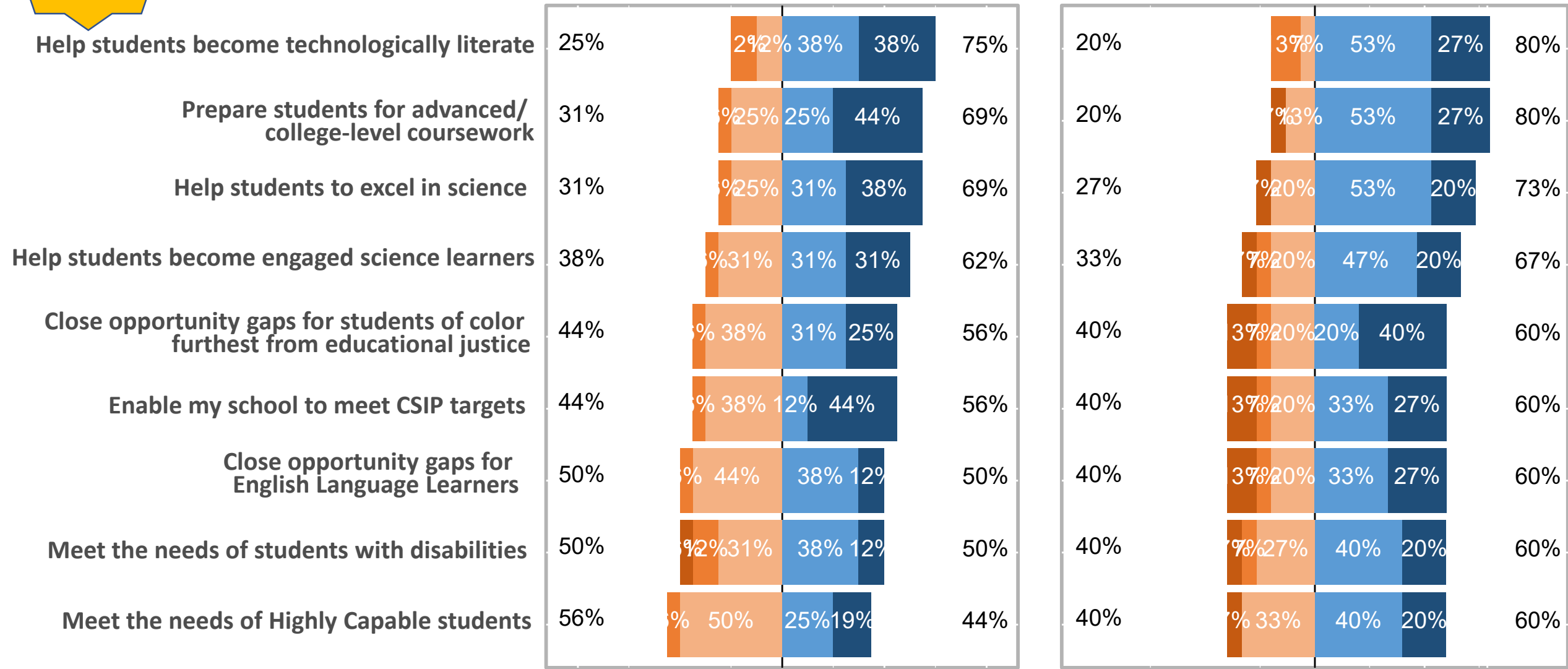




"I believe that implementing the science curriculum 'as intended' will..."

Middle School (n=17)

High School (n=15)



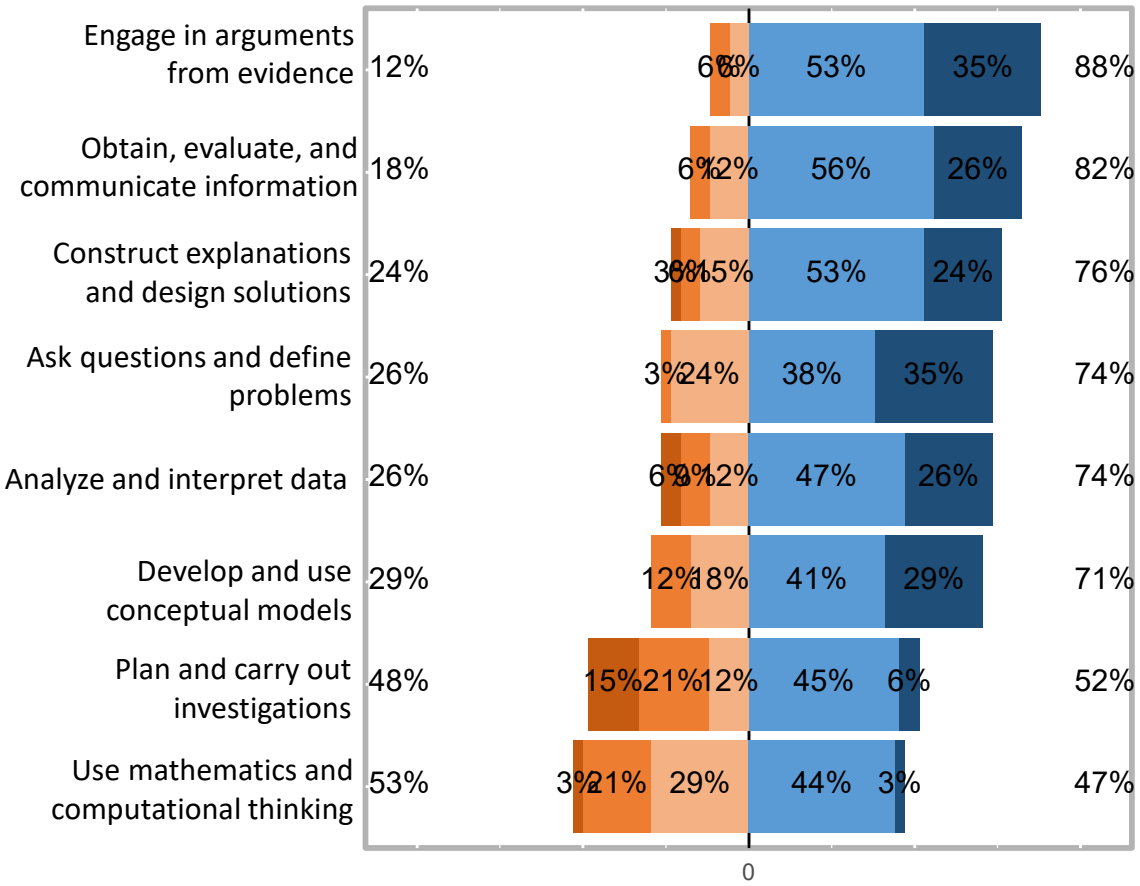
Strongly disagree Somewhat disagree Neither Agree nor Disagree Somewhat agree Strongly agree



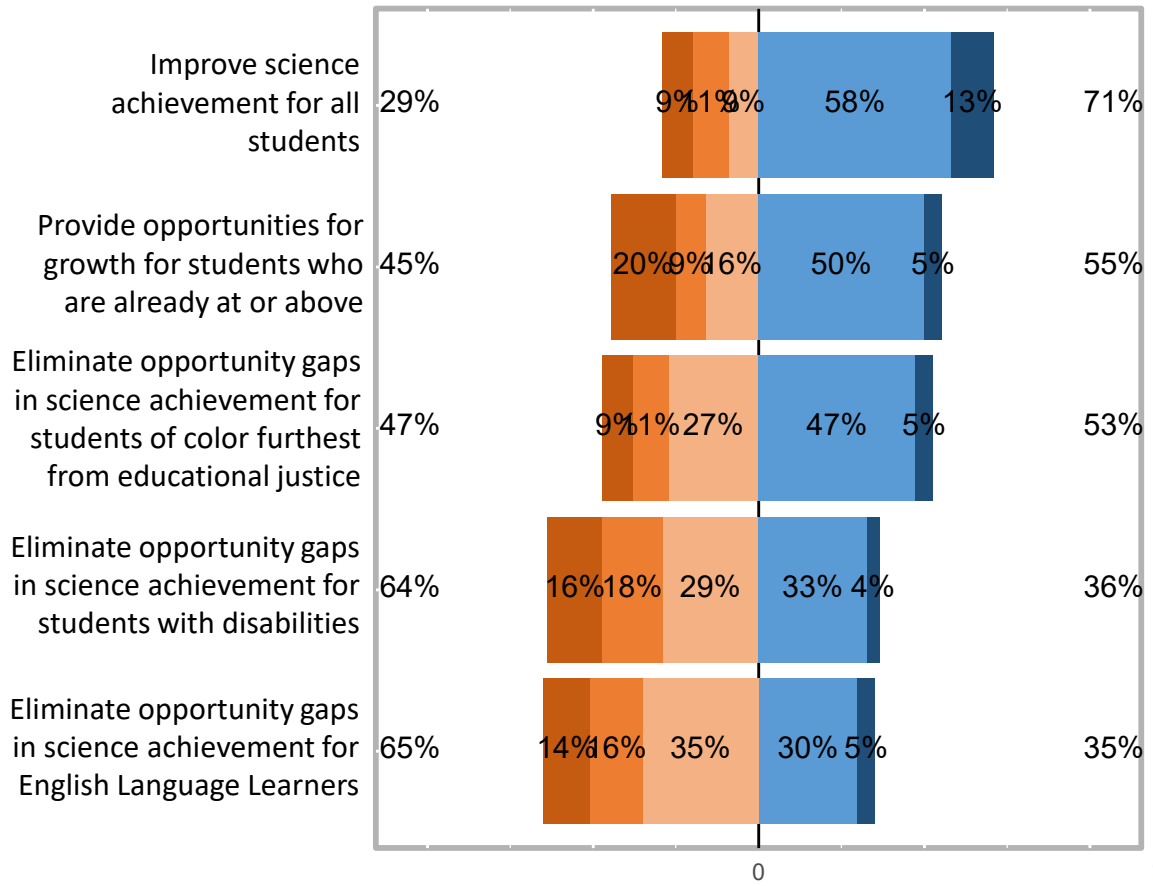
Science Achievement and Learning: Amplify Science

“I feel confident that implementing the adopted Amplify Science curriculum “as intended” will:”

prepare my students to...



help to...



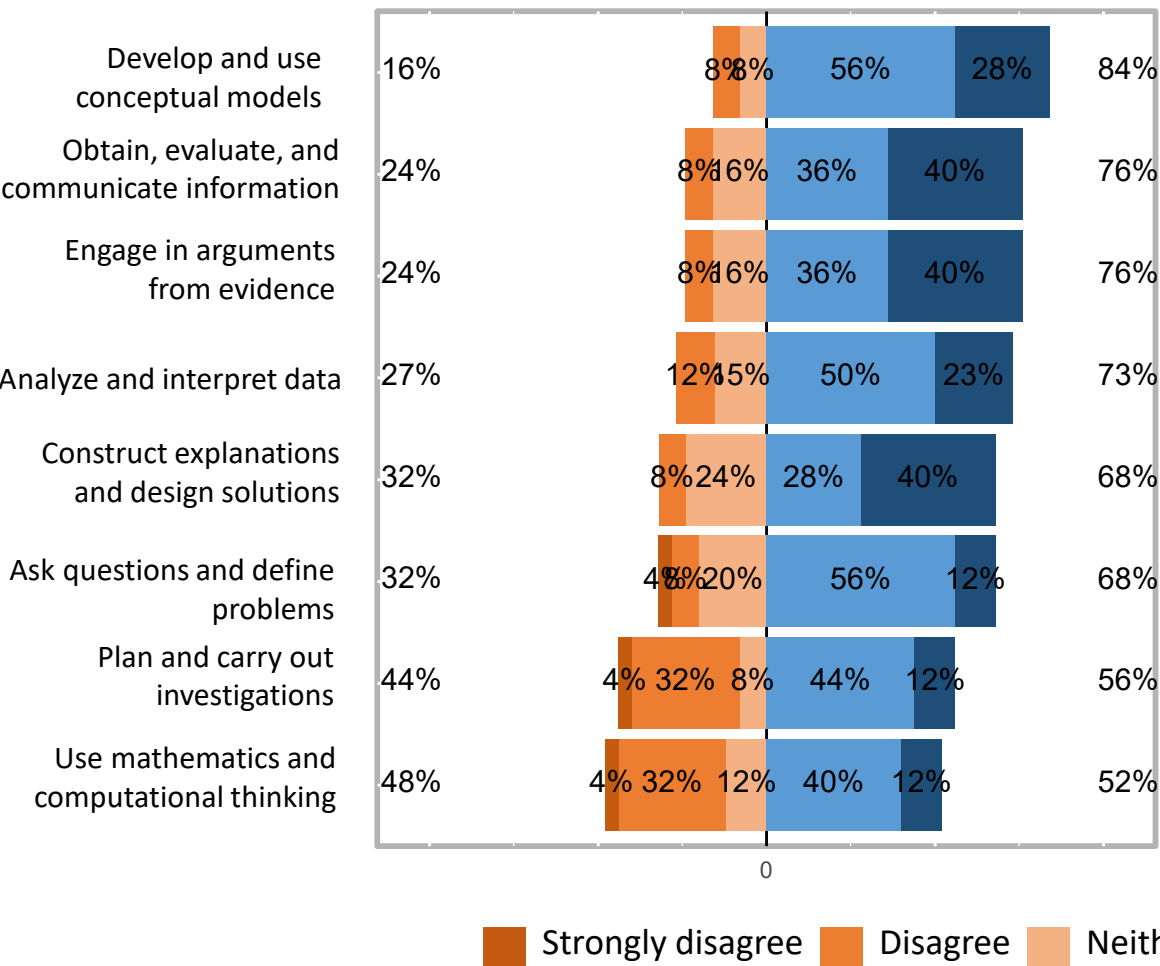
Strongly disagree Disagree Neither agree nor disagree Agree Strongly agree



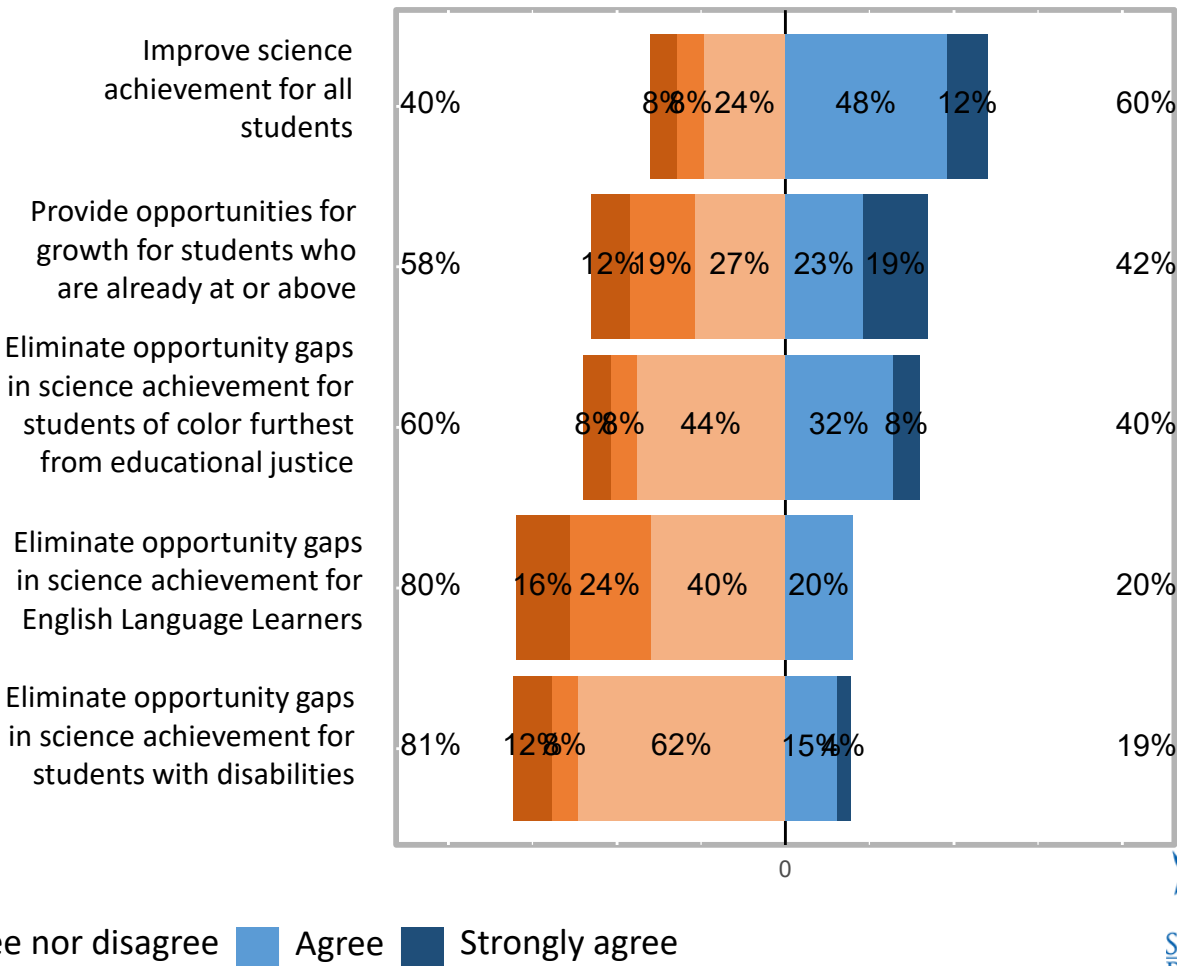
Science Achievement and Learning: Biology

“I feel confident that implementing the adopted Biology curriculum “as intended” will:”

prepare my students to...



help to...

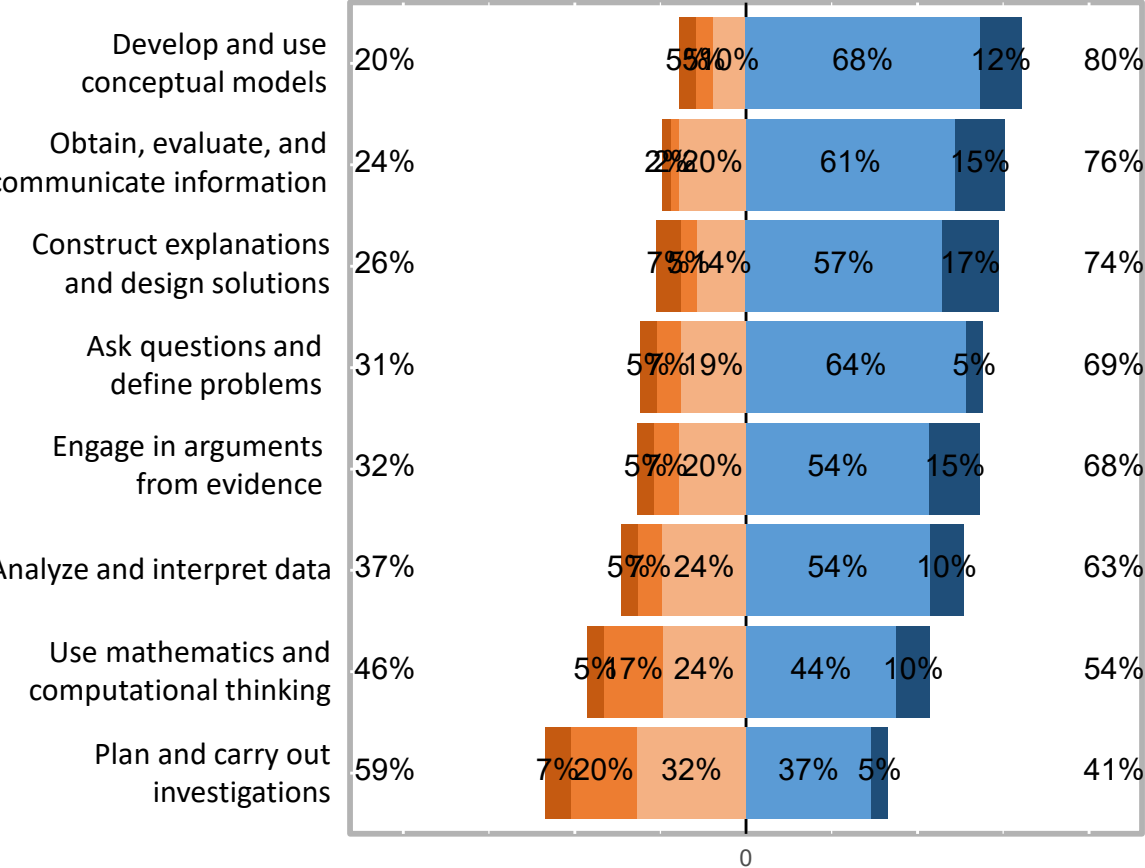




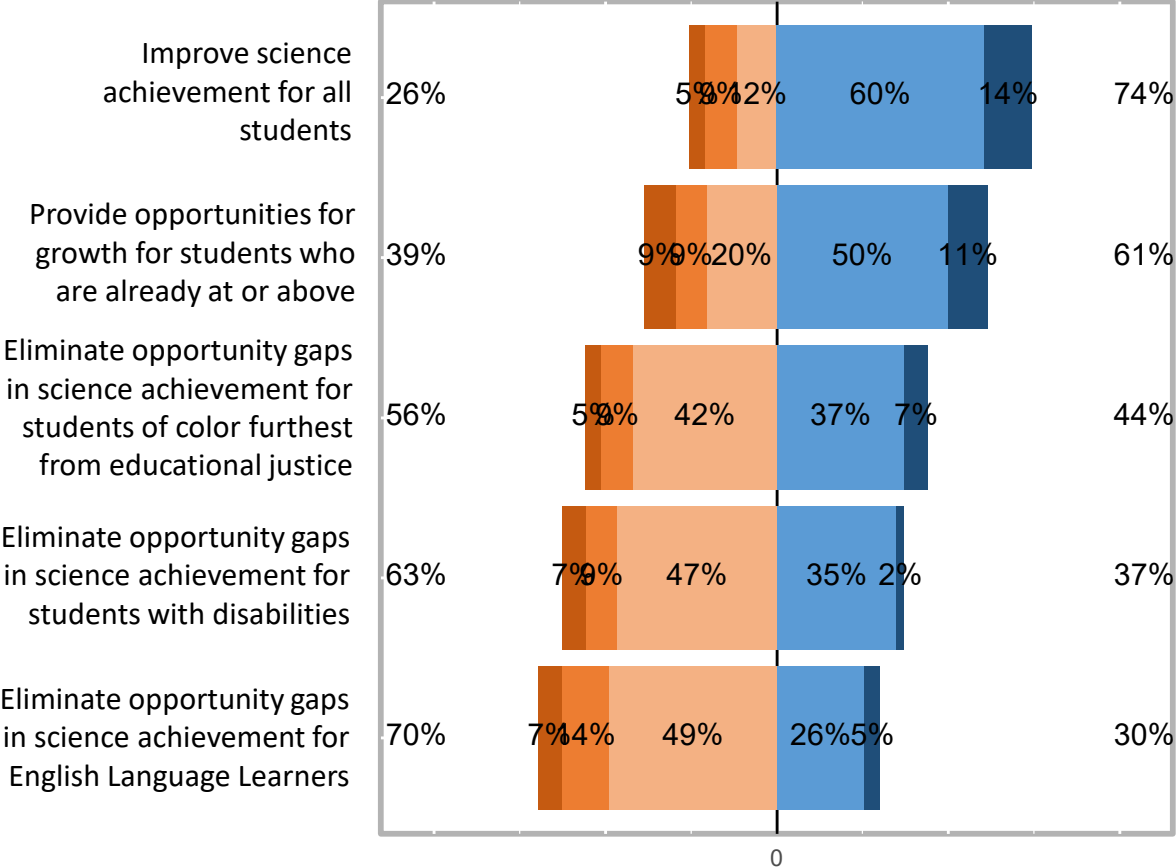
Science Achievement and Learning: Chemistry

“I feel confident that implementing the adopted Chemistry curriculum “as intended” will:

prepare my students to...



help to...



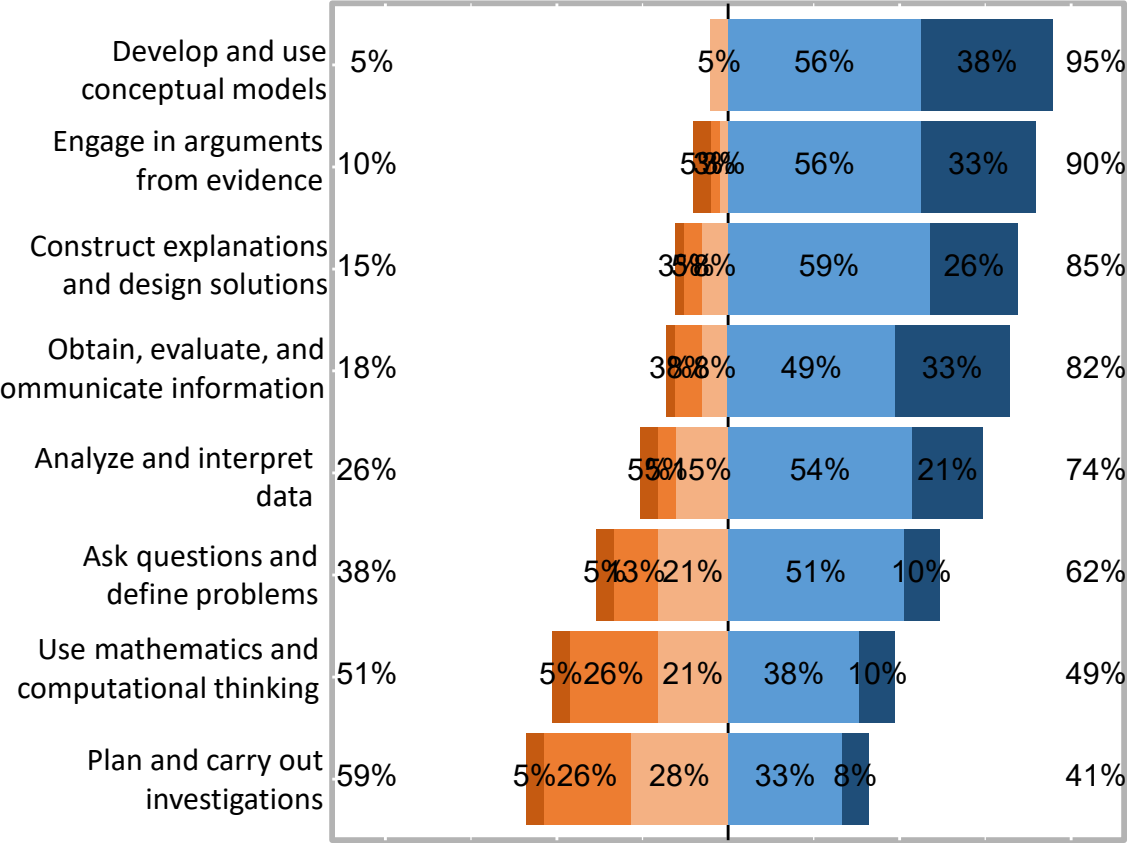
Strongly disagree Disagree Neither agree nor disagree Agree Strongly agree



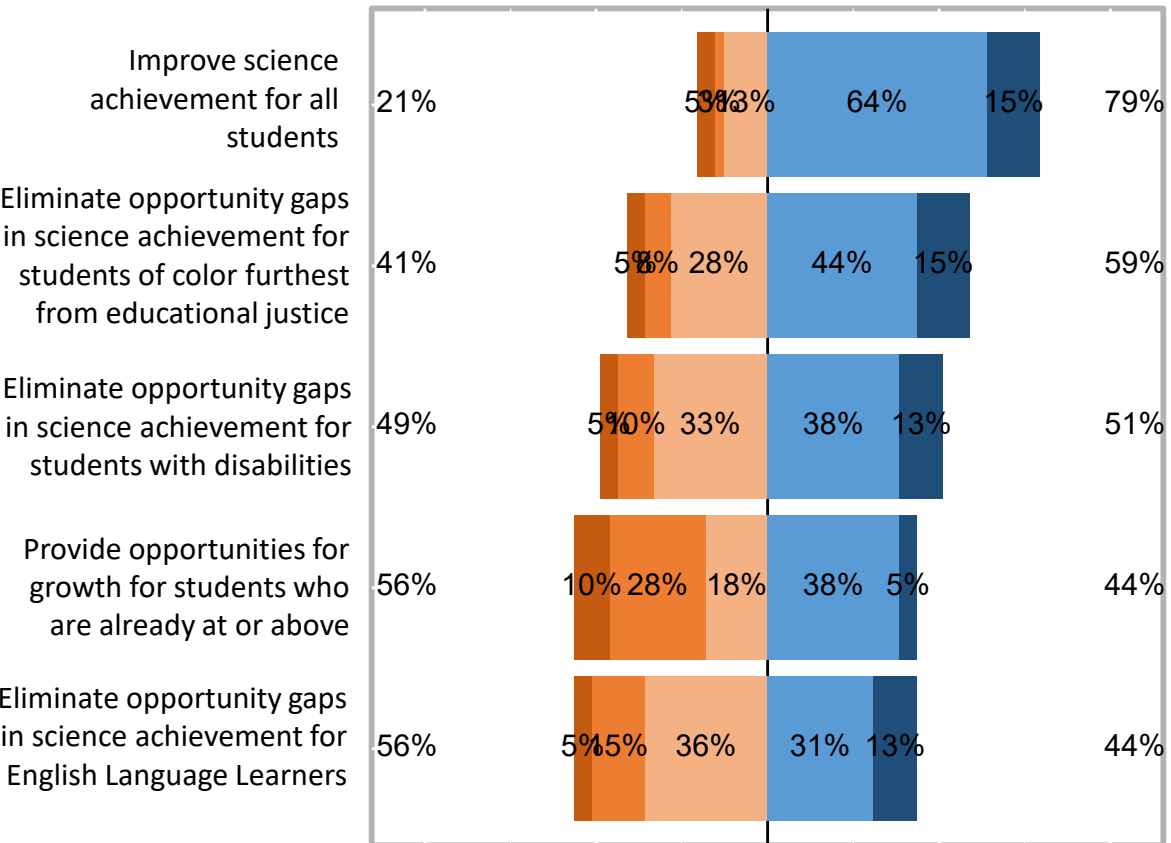
Science Achievement and Learning: Physics

“I feel confident that implementing the adopted Physics curriculum “as intended” will:”

prepare my students to...



help to...

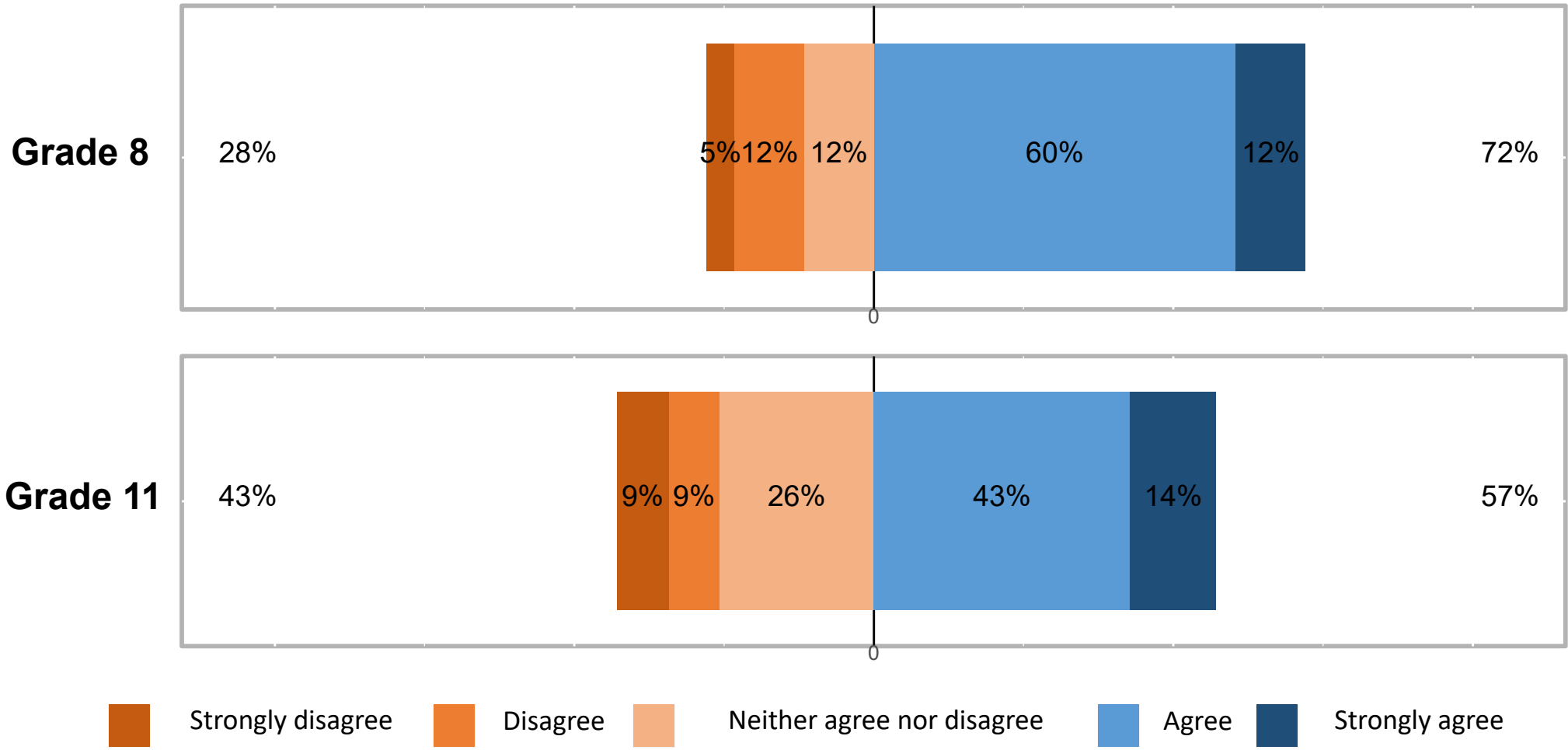


Strongly disagree Disagree Neither agree nor disagree Agree Strongly agree



Perceptions of WCAS Preparedness

“The adopted science instructional materials give me the tools I need to prepare students for the high-stakes science assessments (WCAS)”

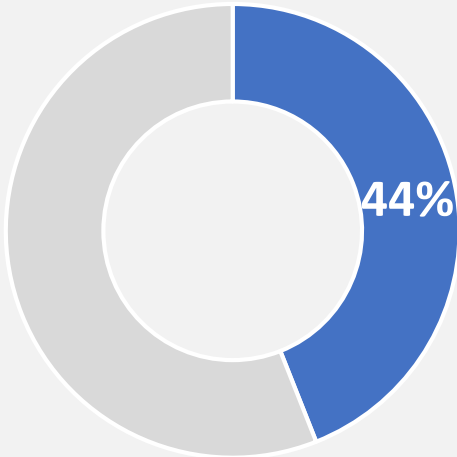


Open-Ended Responses

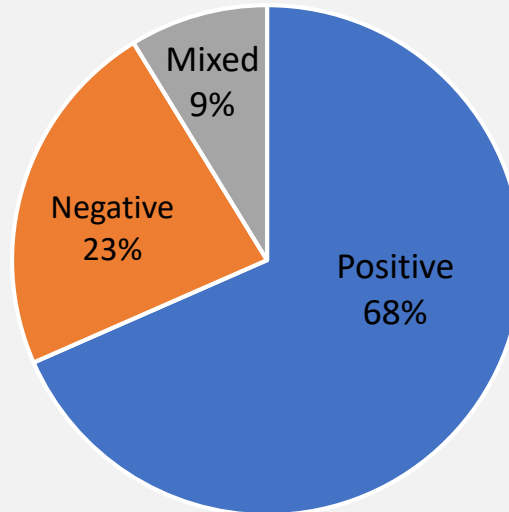
“Please share how the adoption of NGSS-aligned materials allows you to provide equitable opportunities for all students to become scientifically literate.”

Overall Findings

% of Survey Participants who
Commented



Nature of Comments*



Key Topics

1. Value of having common, standardized materials
2. Ease of differentiation
3. Thoughts on curriculum characteristics (phenomenon-based instruction, student discourse, scientific writing, simulations and labs)
4. Perceptions of student engagement, rigor
5. Role of assessments(MS)

*Note: These breakdowns were about the same for Middle School (n=33) and High School (n=25)

Next Steps

In 2020-21, we will continue our implementation study of the Amplify Science and various high school curricula, with specific emphasis on implementation in remote learning environments. Data collection strategies may include surveys, focus groups, and classroom observations, and analysis strategies may also include analysis of student engagement and other student-level data.

Thank you!



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