# Elementary Science Curriculum Implementation

## Findings from the First Year of a Four-Year Study of the District's K-5 Science Curriculum 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. The role of the Research & Evaluation department pertaining to the elementary adoption study is mainly consultative in scope, as SPS will participates in a Networked Improvement Community (NIC) with the University of Washington School of Education, as funded through the Discovery Research K-12 Grant from the National Science Foundation. The middle school and high school studies are conducted internally by the Research & Evaluation department.

**Key Findings for Elementary Science in Year 1:**

Findings from the February 2020 survey of elementary teachers yielded insights in implementation of Amplify Science curriculum in 17 schools, as well as science instructional practices in the remaining non-implementing schools. (Note: Following the COVID-related school closures in March 2020, the District provided open access to elementary Amplify materials online. The elementary findings here only pertain practices *prior to* the closures.)

- Response Rates: We received 370 total teacher responses, about one-fifth of which (18%, n=66) were in schools and grade levels using the Amplify instructional materials.
- Teacher Practices: Compared to non-Amplify Teachers, Amplify Teachers reported: higher rates of professional development in the Next Generation Science Standards (NGSS); higher beliefs in science as a core part of instruction; more time in their school's master schedules for science; higher confidence in the NGSS practice standards; higher perceptions of the value of technology use in science instruction; and more frequent use of formative assessments to inform science instructional practice.
- Student Outcomes: Compared to non-Amplify Teachers, Amplify Teachers reported: Higher confidence in students' ability to engage in scientific discourse; and higher levels of preparedness for the state tests in science (WCAS).
- Equitable Outcomes: In open-ended responses, teachers using the Amplify materials believe that implementing these materials promotes equitable access to science learning by: Grounding science instruction in phenomena and promoting critical thinking as scientists; promoting student discourse; strengthening scientific reading and writing; and providing students with access to spiraled, vertically-aligned concepts system- data.

Regarding practices following the school closures, the SPS Science Department reports that Amplify Science worked closely with their department to modify instructional materials to an online platform making the use of these materials open to all elementary schools. Curriculum specialists created videos, pacing guides, and student packets that were easily accessible in the Spring on the district's website and aired on the district's television channel. This gave all teachers an opportunity to engage in the Amplify tools. Teachers reported high student engagement that provided students with authentic and relevant science experiences.

# Elementary Science Curriculum Implementation

2020 Curriculum & Instruction Teacher Survey

Seattle Public Schools

Research & Evaluation Department

November 2020

Jessica K. Beaver, PhD

# Introduction

Questions about….

- Response rates
- Materials currently in use
- Participation in NGSS professional development
- Orientation of science in core instruction
- Master scheduling

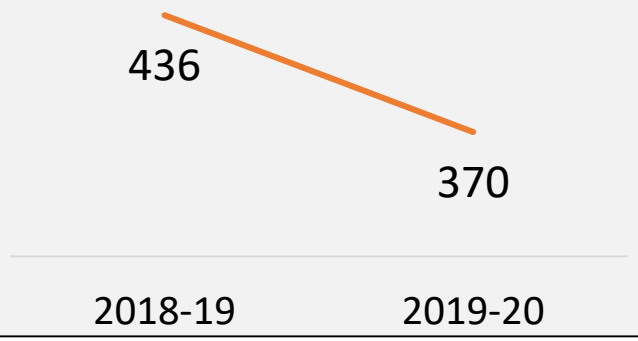
# Response Rates

## Overall K-5 Response Rates

**370**

responses from K-5 science teachers

### Two-year response trend



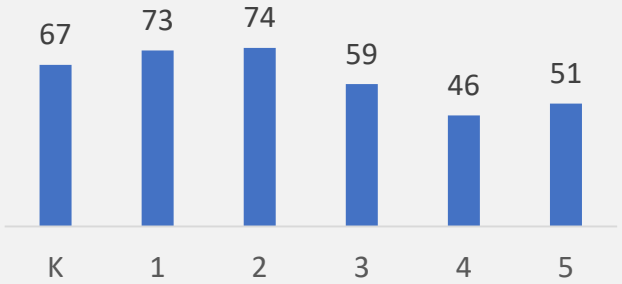

## Responses by Amplify Teachers

### Amplify Teachers by School

| | |
|---|---|
| Adams Elementary | 7 |
| Alki Elementary | 9 |
| Cascadia Elementary | 6 |
| Catharine Blaine K-8 School | 2 |
| Cedar Park Elementary | 2 |
| Fairmount Park Elementary | 9 |
| Hazel Wolf K-8 School | 4 |
| Highland Park Elementary | 6 |
| Kimball Elementary | 1 |
| Lawton Elementary | 2 |
| Magnolia Elementary | 1 |
| North Beach Elementary | 3 |
| Olympic View Elementary | 6 |
| Queen Anne Elementary | 3 |
| Viewlands Elementary | 2 |
| Whittier Elementary | 3 |
| **Grand Total** | **66** |

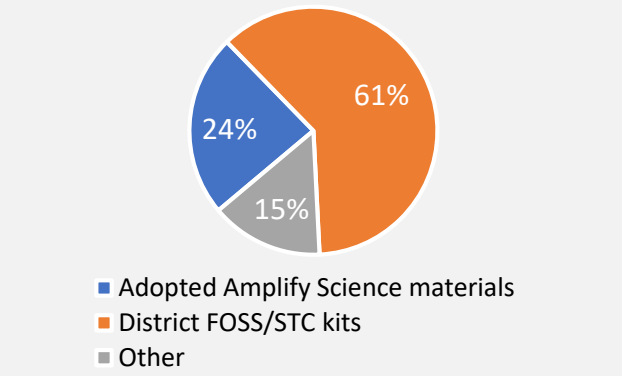
## Responses by Grade Level, Curriculum Material

### Responses by Grade Level

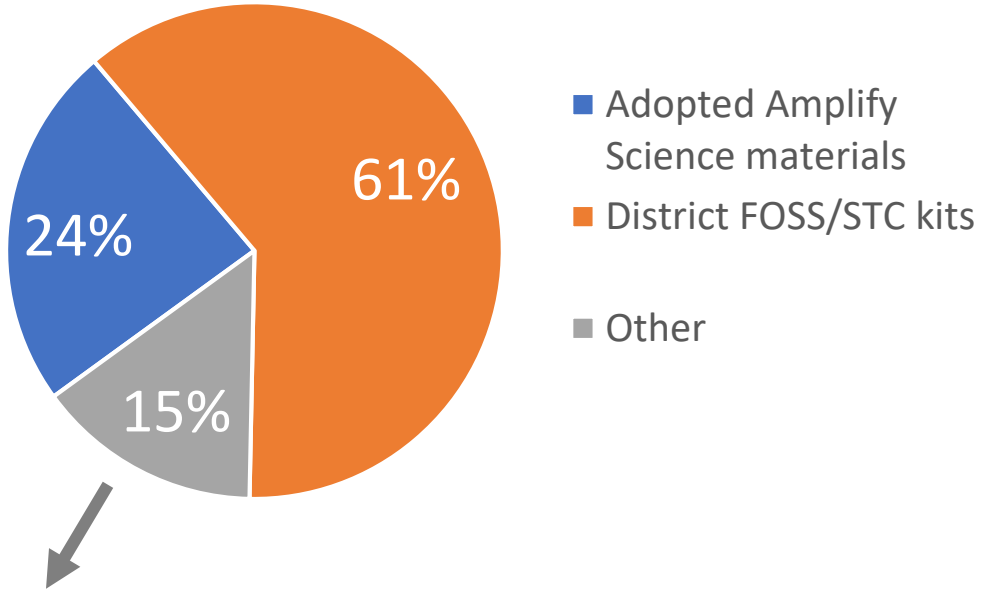



Note: split classrooms counted as higher-level grade

### Curriculum Materials in Use



# Reported Curriculum Materials in Use




- 15 are using Mystery Science
- 14 are developing their own curriculum
- 10 are using some combination of piecemeal units from FOSS Kits and Amplify units
- 4 are using “Ambitious Science Teaching” (NSF/UW)
- 3 are using “Zombie Guacamole” (Washington Green Schools)
- 2 are not teaching science due to scheduling
- 4 are using other materials (Project Lead the Way, Community Waters, an eSTEM kit, American Reading Company)

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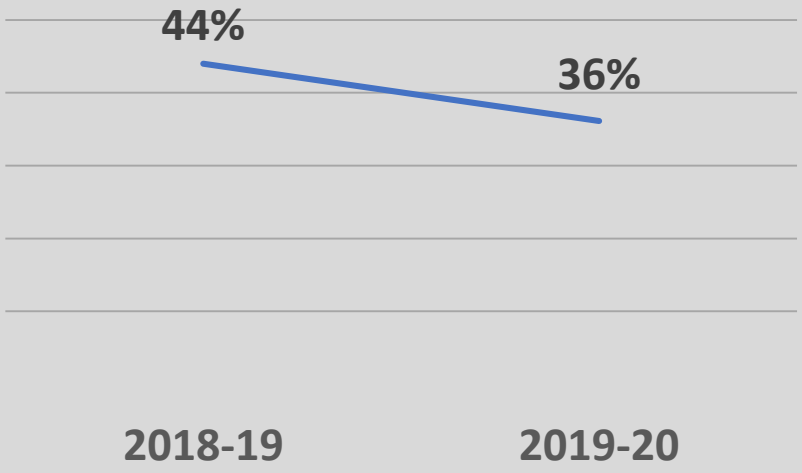
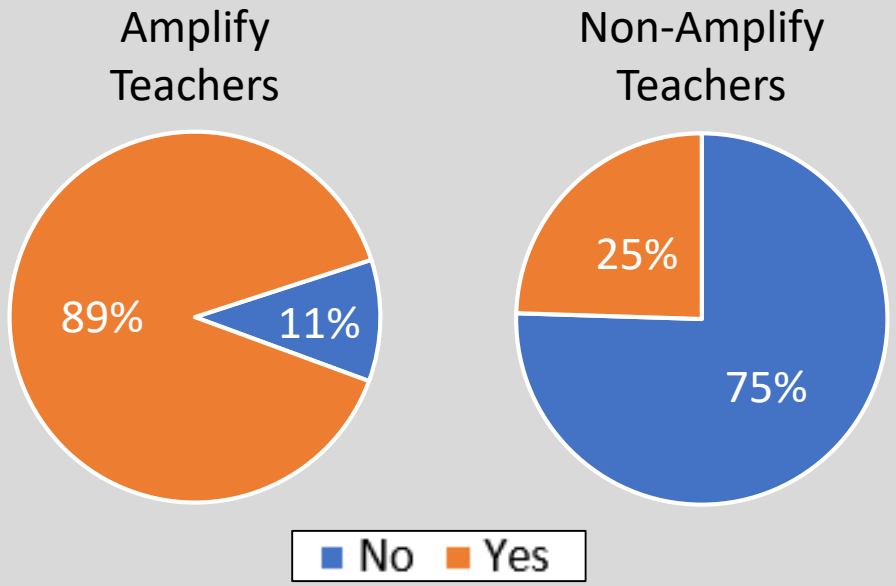
# Participation in district professional development about the NGSS

**Year-to-Year Trends (K5 Overall)**




The percentage of elementary teachers indicating they have participated in a NGSS professional development opportunity dropped by 8 percentage points this year

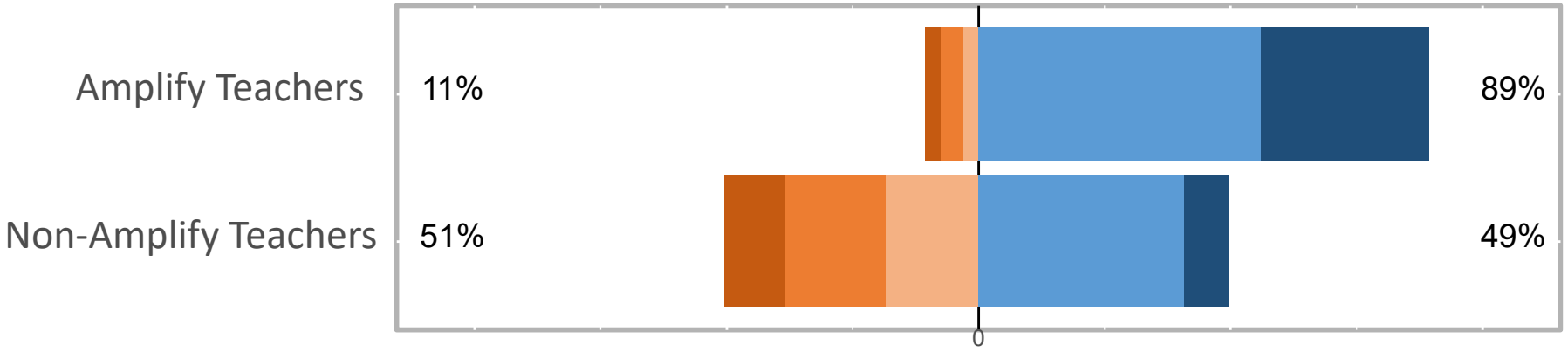
**2019-20 Results (with breakouts)**



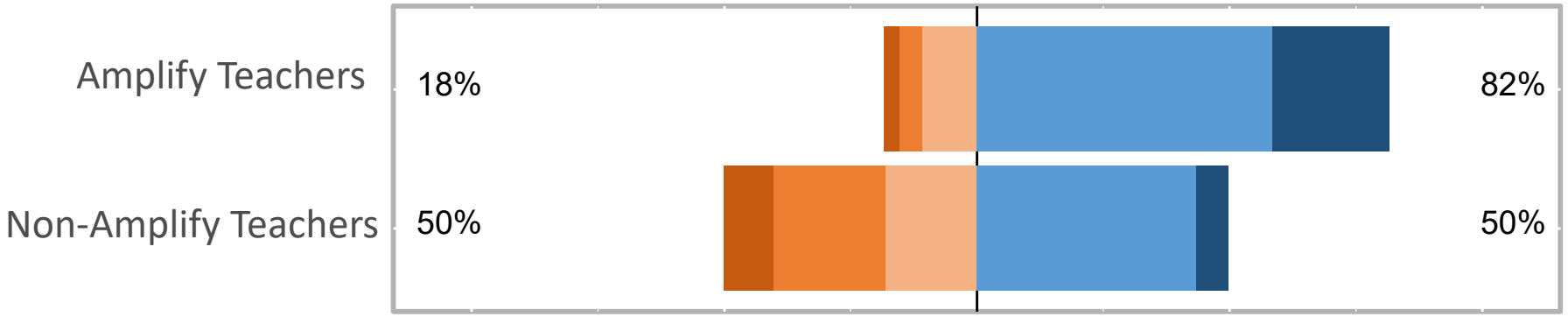

There is a large (64-percentage point) difference in reported NGSS professional development between Year 1 Amplify teachers and non-Amplify teachers

# Positioning of Science in Elementary Schools

**At my school, science is part of core instruction for all students…**




**At my school, there is time for science in the master schedule…**




Strongly disagree | Disagree | Neither agree nor disagree | Agree | Strongly agree

Note: This year SPS shifted the focus of NGSS training to those 17 schools that were in the first year of the adoption

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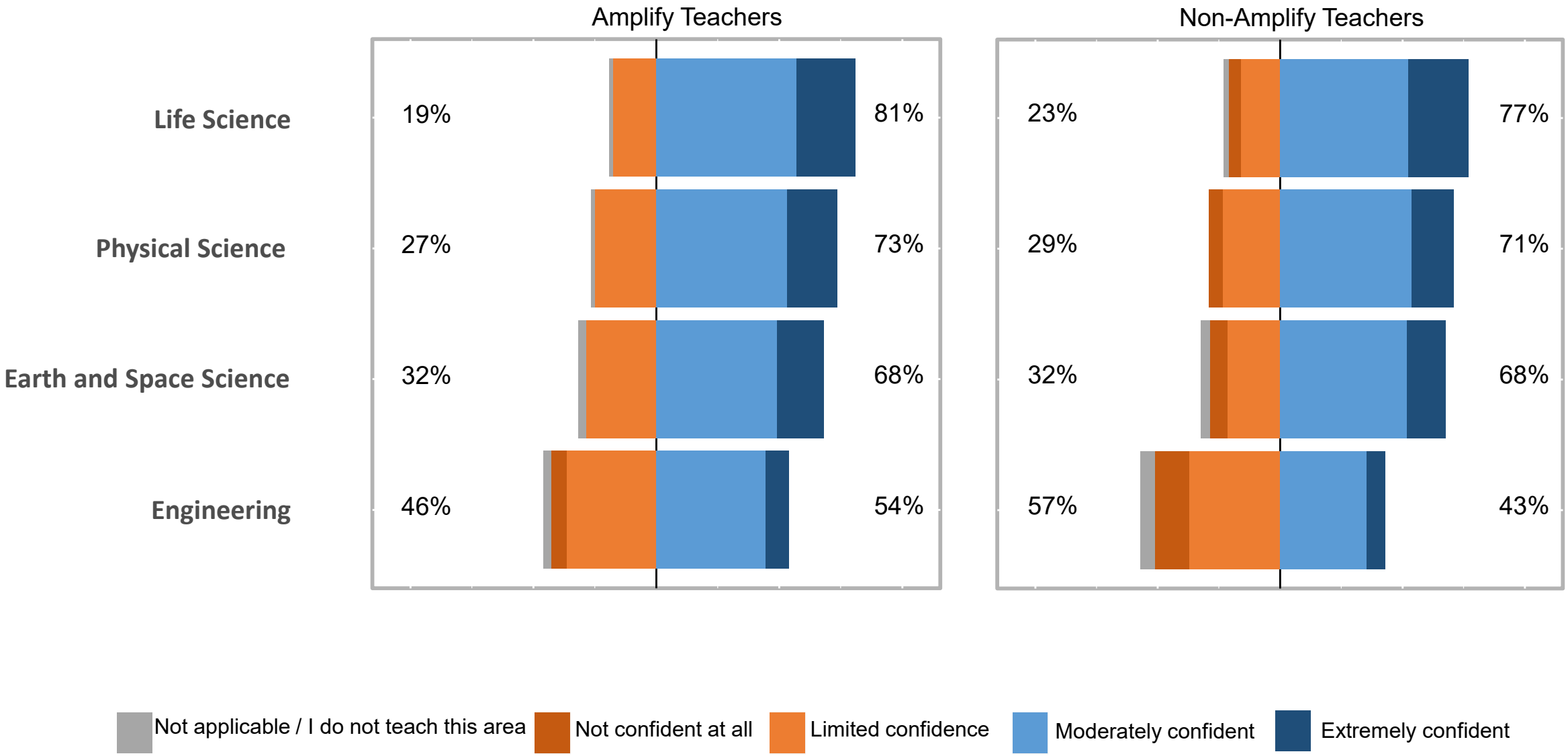
# Teacher Practices and Beliefs

Questions about….

- Confidence in content areas
- Confidence with the practice standards (and year-to-year change)
- Perceived value in technology use
- Literacy integration in science
- Formative assessments

# I feel confident in my content knowledge in the following areas...



# “I feel confident that my current instructional practices prepare my students to…”

| | AMPLIFY (19-20) | CHANGE FROM 18-19 | NON-AMPLIFY (19-20) | CHANGE FROM 18-19 |
|---|---|---|---|---|
| **Ask questions (for science) and define problems (for engineering)** | **82%** | +18% | 58% | -6% |
| **Develop and use conceptual models** | **87%** | +22% | 50% | -15% |
| **Plan and carry out investigations** | **84%** | +11% | 65% | -8% |
| **Analyze and interpret data** | **92%** | +29% | 63% | no change |
| **Use mathematics and computational thinking** | **84%** | +20% | 64% | no change |
| **Construct explanations (for science) and design solutions (for engineering)*** | **85%** | +27% | 44% | -14% |
| **Engage in arguments from evidence** | **89%** | +25% | 59% | -5% |
| **Obtain, evaluate, and communicate information** | **87%** | +22% | 64% | -1% |

Note: Percentages indicate percentage of respondents indicating they feel “Extremely confident” or “Moderately confident” in each area

*At the time of this survey, the engineering unit had not yet been taught

# Perceived value of technology use in science instruction

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

| AMPLIFY | NON-AMPLIFY | ALL | CHANGE (for ALL) |
|---|---|---|---|
| 73% | 68% | 69% | N/A* |

*Question changed from last year

| K-2 | 3-5 |
|---|---|
| 64% | 75% |

Note: Percentages indicate the percentage of respondents indicating they believe technology to be "Extremely valuable" or "Moderately valuable"

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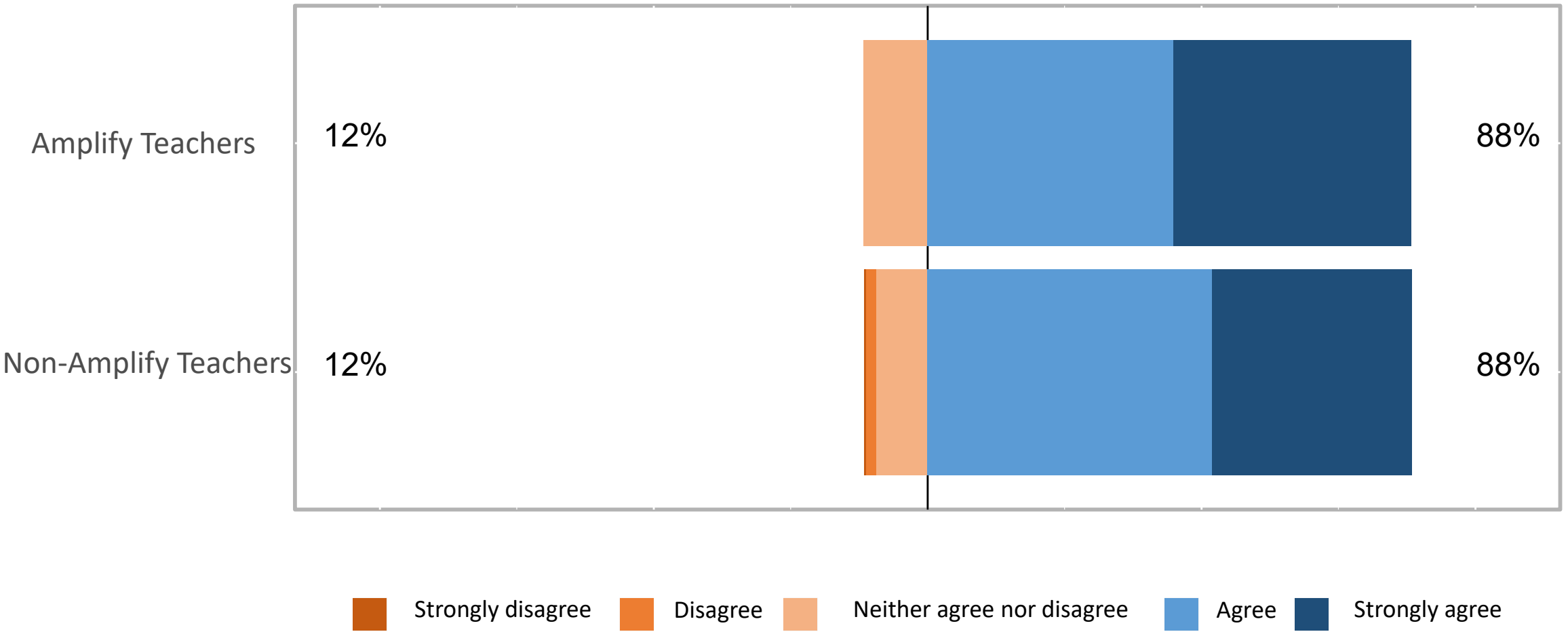
# Beliefs about Literacy Integration in Science

"I believe that science instruction should provide students with the opportunity to improve their literacy skills"

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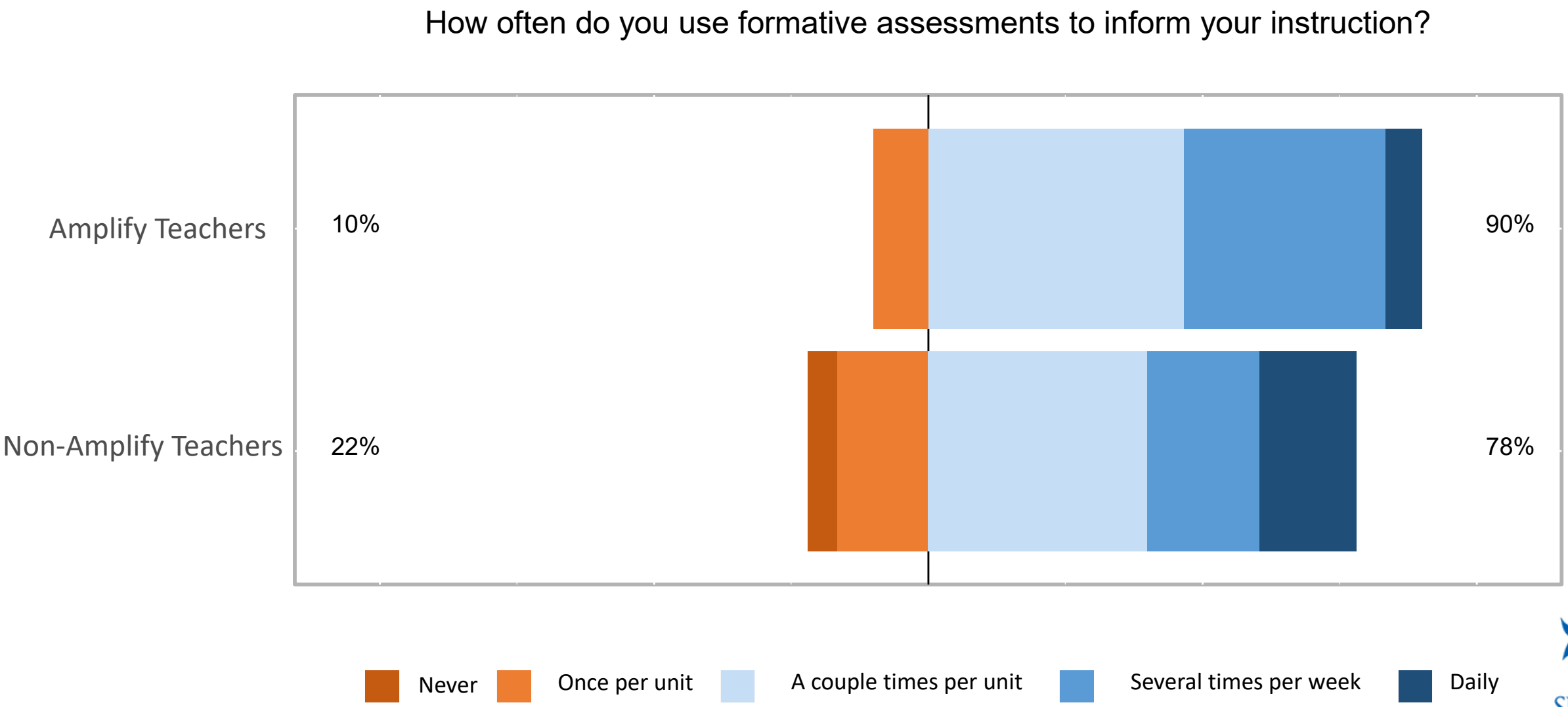
# Formative Assessment Use

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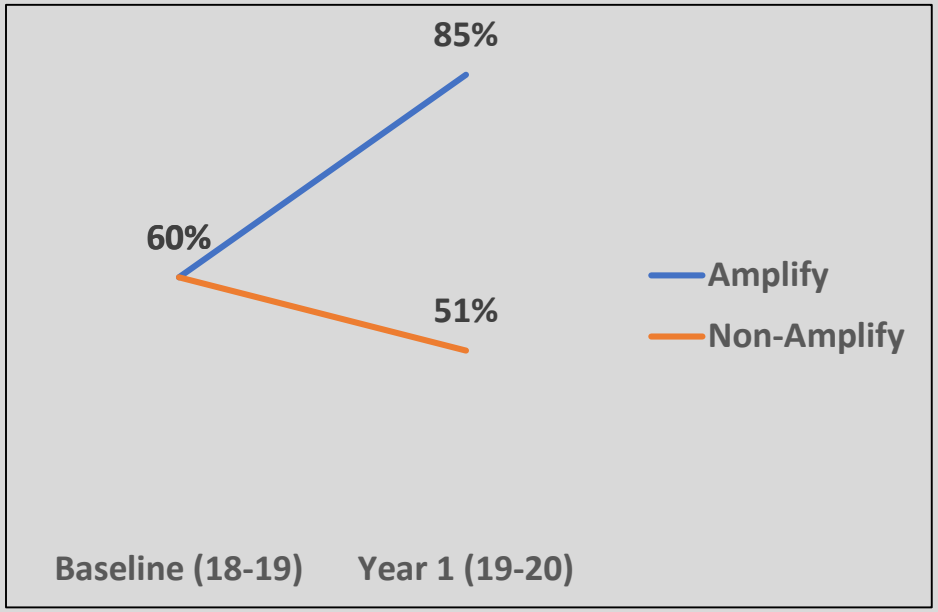
# Student Outcomes

Questions about….

- Students' ability to engage in scientific discourse
- Preparedness for WCAS

# Teacher perceptions of students' ability to engage in scientific discourse

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




| AMPLIFY (19-20) | CHANGE FROM 18-19 |
|---|---|
| 85% | +25% |

| NON-AMPLIFY (19-20) | CHANGE FROM 18-19 |
|---|---|
| 51% | -9% |

Note: Percentages indicate the percentage of respondents indicating they feel "Extremely confident" or "Moderately confident"

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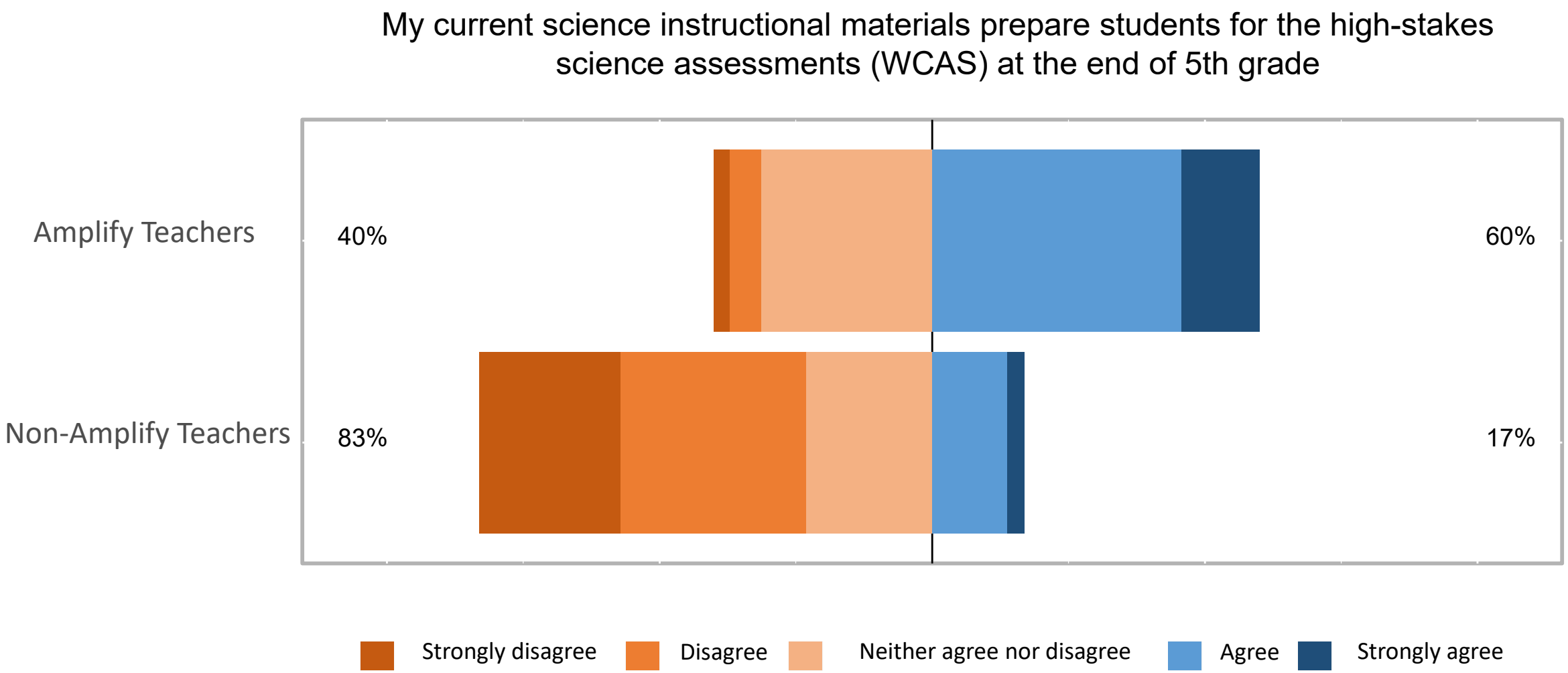
# Preparedness for WCAS tests

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# Concluding Thoughts

Teacher responses to open-ended question:

“In 2019, Seattle Public Schools adopted instructional materials to support science in grades K through 12. Please tell us how the adoption of NGSS-aligned materials will influence your ability to offer equitable opportunities for all students to become scientifically literate.”

# Thoughts from the 66 Amplify Science teachers

Piloting teachers believe that Amplify Science promotes equitable access to science learning by:

- **Grounding science instruction in phenomena and promoting critical thinking as scientists**
- **Promoting student discourse**
- **Strengthening scientific reading and writing**
- **Providing students with access to spiraled, vertically-aligned concepts system-wide**

*"The adoption is based on phenomena that are new to all or most students. Prior knowledge impacts outcomes minimally. This helps us close the gap that happens with other curriculum that is simply a memorization of facts. [This] allows for students to show what they know in many different ways, making it a fair and equitable practice. – 2nd grade teacher*

*"It has been wonderful to hear my students' ideas before, throughout, and after the unit - they take on the role of scientists and engineers." – Kindergarten teacher*

*"The new Amplify science has definitely increased the rigor of science reading and science writing." – 3rd grade teacher*

*"It's important that all students have access to the same curriculum materials and learning experiences. The Amplify curriculum materials are providing all students in my school with access to the same experiences more than when my school used our previous curriculum." – 5th grade teacher*

# Thoughts from the 66 Amplify Science teachers

Amplify Science teachers have three main concerns with implementation of the new materials:

1. **Not enough hands-on activities for students**
2. **Not enough time to fully implement the curriculum**
3. **Insufficient technology access to support the new curriculum**

*"The Amplify curriculum has a lot of positive pieces that I believe will help all students learn how to engage in scientific thinking and scientific investigations. The program, however, is very cumbersome for the teacher to learn in the beginning and is very repetitive. There is not always enough hands-on activities for young students such as kindergarteners, and way too much discourse."– Kindergarten teacher*

*"I feel very confident in using the Amplify science materials to meet my students' needs. The challenge is not the curriculum; the challenge is making it fit with all other expectations that come with teaching and learning." – 3rd grade teacher*

*"I think the new curriculum is an important step to guarantee the scientific literacy for all students. However, I do think it is inequitable that the technology required has not readily available to use the Amplify curriculum." – 4th grade teacher*

# Thoughts from the 304 non-Amplify teachers

Many teachers are excited to get the Amplify materials, citing:

- **NGSS alignment**
- **A district-wide approach to science instruction**
- **Frustration with old, outdated FOSS kits**
- **Hopes for improved student engagement, increased relevance of lessons**

*"New science materials that align with NGSS are very important. I've been teaching in the district for 20+ years and we've been using the same kits year after year. I piloted the kindergarten kit for first grade in 2018 and my students were very engaged and I felt that the kits allowed students to inquire more."– 1st grade teacher*

*"I am looking forward to training as I believe that children need more science focus and I will be happy to incorporate into my schedule with the hope that the administration will support the shift." – Kindergarten teacher*

*"I can't wait to see how my students blossom with the new NGSS materials next school year." – 2nd grade teacher*

*"I can see this as a great tool for my students, especially the ELL students. NGSS-aligned materials allow my students to engaged in conversations and critical thinking. I think there will be a lot of opportunity to bring their own experience to the lessons." – Kindergarten teacher*

# Thoughts from the 304 non-Amplify teachers

However, teachers also expressed concerns about adopting Amplify, including:

- **Beliefs that the curriculum is poorly calibrated to student needs**
- **Ability to fit science into the master schedule**
- **Worry about whether training and PD will be sufficient (or overly burdensome)**
- **Insufficient technology access**

*"I feel the use of videos and demonstrated experiments takes away from each student having a hands on, engineered experience. Equity should come from all students being able to have a hands on experience. – 2/3 split teacher*

*"[Success] depends on if science becomes more than something we do at the end of the day if we have time. If we continually have to squeeze science in with social studies, art, socio-emotional learning, then I don't think we will be able to give students the opportunity to be scientifically literate." – 5th grade teacher*

*"There are MANY strings attached to joining the adoption (many hours of PD, minimum number of hours of instruction, etc.). While I appreciate that required PD is part of a new adoption, these requirements seem onerous and will be a barrier for many teachers to get on board with the new adoption." – 5th grade teacher*

*"I am not looking forward to Amplify, and we don't even have the technology to support it." – 2nd grade teacher*

# Thank you!

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